Technical Appendices

- Appendix E, Activity Levels
- Appendix F, Regional Transportation
- Appendix G, Ground Access to and from Logan Airport
- Appendix H, Noise Abatement
- Appendix I, Air Quality/Emissions Reduction
- Appendix J, Environmental Compliance and Management/Water Quality
- Appendix K, Peak Period Pricing Monitoring Reports
- Appendix L, Reduced/Single Engine Taxiing at Logan Airport Memoranda

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E

Activity Levels

This appendix provides detailed tables in support of Chapter 2, *Activity Levels*:

- Table E-1 Logan Airport Historical Air Passenger and Operations Data
- Table E-2 Logan Airport Changes in Domestic Passenger Operations by Carrier
- Table E-3 Logan Airport Changes in International Passenger Operations by Carrier
- Table E-4 Logan Airport Scheduled Passenger Departures by Destination

Logan Airport Forecast Methodology and Assumptions

- Table E-5 Actual and Forecast Logan Airport Passengers, Cargo, and Aircraft Operations, 2017 and Future Planning Horizon
- Table E-6 Passenger Forecast Assumptions
- Table E-7 Actual and Forecast Logan Airport Passengers, 2017 and Future Planning Horizon
- Table E-8 Average Load Factors and Average Aircraft Size, 2017 and Future Planning Horizon
- Table E-9 Actual and Forecast Logan Airport Operations, 2017 and Future Planning Horizon
- Table E-10 Actual and Forecast Logan Airport Express/Freight (in pounds), 2017 and Future Planning Horizon
- Table E-11 Scheduled Passenger Airline Operations by Aircraft Category, Actual 2017 and Future Planning Horizon
- Table E-12 Cargo Airline Operations by Aircraft Category, Actual 2017 and Future Planning Horizon
- Table E-13 Forecast Logan Airport Operations by Aircraft Type, Actual 2017 and Future Planning Horizon
- Table E-14 Stage Length Assumptions, North American Scheduled Passenger Airline Operations, Future Planning Horizon
- Table E-15 Stage Length Assumptions, Long-Haul International Scheduled Passenger Airline Operations, Future Planning Horizon

Table E-1 Logan Airport Historical Air Passenger and Operations Data

Year	Operations	Air Passengers	Year	Operations	Air Passengers
1980	258,167	14,722,363	1999	494,816	27,052,078
1981	251,961	14,827,684	2000	487,996	27,726,833
1982	244,468	15,867,722	2001	463,125	24,474,930
1983	288,956	17,848,797	2002	392,079	22,696,141
1984	318,959	19,417,971	2003	373,304	22,791,169
1985	349,518	20,448,424	2004	405,258	26,142,516
1986	363,995	21,862,718	2005	409,066	27,087,905
1987	414,968	23,369,002	2006	406,119	27,725,443
1988	407,479	23,732,959	2007	399,537	28,102,455
1989	388,797	22,272,860	2008	371,604	26,102,651
1990	424,568	22,878,191	2009	345,306	25,512,086
1991	430,403	21,450,143	2010	352,643	27,428,962
1992	474,378	22,723,138	2011	368,987	28,907,938
1993	493,093	23,579,726	2012	354,869	29,235,643
1994	458,623	24,468,178	2013	361,339	30,218,631
1995	466,327	24,192,095	2014	363,797	31,634,445
1996	456,226	25,134,826	2015	372,930	33,449,580
1997	482,542	25,567,888	2016	391,222	36,288,042
1998	507,449	26,526,708	**2017**	**401,371**	**38,412,419**

Source: Massport and U.S. Department of Transportation, T-100 Database

Table E-2 Logan Airport Changes in Domestic Passenger Operations by Carrier

Airline	2000	2005	2010	2011	2012	2013	2014	2015	2016	2017	2016-2017 Change	2016-2017 Percent Change
Scheduled Jet Carriers	**233,993**	**190,991**	**203,052**	**207,369**	**203,376**	**211,176**	**214,854**	**225,629**	**235,381**	**242,404**	**7,023**	**3.0%**
AirTran Airlines	3,090	14,580	13,672	12,869								
Alaska Airlines		1,088	1,733	1,757	1,873	2,661	3,090	3,027	3,256	3,351	95	2.9%
America West Airlines	5,116	4,467										
American Airlines[1]	30,821	27,712	21,313	18,943	20,962	22,535	58,222	56,623	55,249	50,766	-4,483	-8.1%
American Trans Air	1,448	2,294										
Continental Airlines	16,894	13,546	10,869									
Delta Air Lines[2]	52,954	36,388	28,980	25,429	23,270	21,139	23,614	30,705	30,476	32,050	1,574	5.2%
Frontier Airlines	1,052		1,094		275					2	2	
Independence Air		4,676										
JetBlue		15,069	49,981	58,737	63,210	73,374	76,247	79,364	84,590	93,485	8,895	10.5%
Midway Airlines	4,096											
Midwest Airlines	3,726	3,570	1,961	2,786								
Northwest Airlines	13,147	9,685										
People Express							170					
Southwest Airlines[3]			13,727	17,413	23,667	23,701	21,967	21,542	24,436	24,129	-307	-1.3%
Spirit Airlines			3,023	3,054	3,365	2,721	2,945	4,896	7,245	8,853	1,608	22.2%
Sun Country Airlines	723		313	509	596	926	1,027	1,414	1,374	1,391	17	1.2%
Trans World Airlines	6,280											
United Airlines[4]	28,092	18,304	16,314	26,425	25,636	25,214	24,374	24,632	25,031	24,623	-408	-1.6%
US Airways[5]	66,554	39,612	36,678	36,421	36,633	35,613						
Virgin America			3,394	3,026	3,889	3,292	3,198	3,426	3,724	3,754	30	0.8%
Regional/Commuter Carriers	**160,041**	**137,203**	**94,535**	**89,586**	**79,790**	**79,922**	**76,682**	**70,274**	**68,204**	**68,753**	**549**	**0.8%**
America West Express	1,267											
American Eagle	62,140	37,394	15,291	6,669	4	4	5	52	6,418	7,046	628	9.8%
Cape Air	31,026	25,018	35,899	35,940	37,184	37,194	35,080	35,994	35,993	33,235	-2,758	-7.7%
Continental Connection			1,809	1,199	131							
Continental Express		12,544	529	902	385							
Delta Connection	15,438	26,557	18,445	23,243	20,925	20,848	20,265	15,466	18,586	22,231	3,645	19.6%
MidAtlantic Express												
Midwest/Republic			258									
Northwest Airlink		5,034										
PenAir					2,268	4,384	4,382	3,747	3,662	3,438	-224	-6.1%
Republic Airlines						58	53	34				
United Express		3,178	2,802	2,763	4,342	5,829	5,628	4,699	3,545	2,803	-742	-20.9%
US Airways Express	50,170	27,478	19,502	18,870	14,551	11,605	11,269	10,282				
Non-Scheduled Operations (Incl. Charter)	**1,008**	**325**	**501**	**106**	**181**	**200**	**164**	**176**	**158**	**176**	**18**	**11.4%**
Total Domestic Operations	**395,042**	**328,519**	**298,117**	**297,061**	**283,347**	**291,298**	**291,700**	**296,079**	**303,743**	**311,333**	**7,590**	**2.5%**

Source: Massport

Notes: Excludes general aviation and all-cargo operations.

1 American Airlines includes US Airways beginning in 2014 (following 2013 merger).

2 Delta Air Lines totals include Northwest Airlines beginning in 2009 (following 2008 merger).

3 Southwest Airlines include AirTran Airways beginning 2012 (following 2011 merger).

4 United Airlines totals include Continental Airlines beginning in 2011 (following 2010 merger).

5 US Airways totals in this chart include America West Airlines beginning in 2006 (following 2005 merger).

Table E-3 Logan Airport Changes in International Passenger Operations by Carrier

Airline	2000	2005	2010	2011	2012	2013	2014	2015	2016	2017	2016-2017 Change	2016-2017 Percent Change
Scheduled Jet Carriers	**27,427**	**24,550**	**20,771**	**24,973**	**25,633**	**23,301**	**25,065**	**28,225**	**34,752**	**37,522**	**2,770**	**8.0%**
Aer Lingus	1,160	1,016	1,097	1,130	1,273	1,513	1,933	1,973	2,066	2,011	-55	-2.7%
Aeromexico		534						345	580	624	44	7.6%
Air Berlin									192	278	86	44.8%
Air Canada	10,047	5,782	3,895	4,125	4,517	1,747	1,084	1,686	2,729	3,982	1,253	45.9%
Air Europa										72	72	
Air France	1,046	1,334	995	1,013	974	955	899	910	900	884	-16	-1.8%
Air Jamaica		349										
Air One												
Alitalia	729	986	624	604	530	542	550	562	558	548	-10	-1.8%
American Airlines[1]	4,657	4,672	2,422	2,149	1,901	447	344	571	533	530	-3	-0.6%
Astraeus				100								
Avianca										226	226	
British Airways	2,159	2,151	2,082	2,161	2,149	2,573	2,678	2,575	2,702	2,522	-180	-6.7%
Canadian Airlines	417											
Cathay Pacific								279	454	652	198	43.6%
Copa Airlines						347	730	646	638	730	92	14.4%
Delta Air Lines[2]	733	749	1,675	3,280	2,531	2,851	3,008	3,122	3,459	3,871	412	11.9%
El Al								152	296	298	2	0.7%
Emirates							600	914	1,382	1,034	-348	-25.2%
Eurowings									72		-72	-100.0%
Finnair		44										
FlyGlobespan												
Hainan Airlines							280	744	961	1,032	71	7.4%
Iberia Airlines			435	445	441	404	332	336	412	464	52	12.6%
Icelandair	726	811	816	928	938	1,120	1,227	1,287	1,338	1,265	-73	-5.5%
Japan Airlines					474	646	731	728	736	730	-6	-0.8%
JetBlue			2,262	5,173	5,902	6,138	6,348	6,488	7,146	7,406	260	3.6%
KLM Royal Dutch Airlines										2	2	
Korean Air Lines	314											
LACSA Airlines												
Lufthansa	1,140	1,564	1,657	1,734	1,784	1,723	1,712	1,687	1,728	1,707	-21	-1.2%
Northwest Airlines	744	727										
Norwegian Air Shuttle								34	656	718	62	9.5%
Olympic Airways	256											
Qatar Airways									552	728	176	31.9%
Sabena	724											
SATA International Airlines		315	403	400	412	466	533	542	630	844	214	34.0%
Scandinavian Airlines									500	536	36	7.2%
SWISS International	926	704	720	725	716	720	722	711	1,020	924	-96	-9.4%
TACA		327										
TACV - Cabo Verde		154	240	236	234	214	186	60				

Table E-3 Logan Airport Changes in International Passenger Operations by Carrier (Continued)

Airline	2000	2005	2010	2011	2012	2013	2014	2015	2016	2017	2016-2017 Change	2016-2017 Percent Change
TAP - Air Portugal	200								378	643	265	70.1%
Thomas Cook Airlines									62	144	82	132.3%
Trans World Airlines												
Turkish Airlines							452	726	658	616	-42	-6.4%
United Airlines	728								21	13	-8	-38.1%
US Airways		1,607	667	49	146	186						
VG Airlines												
Virgin Atlantic Airways	721	724	707	721	711	709	716	702	715	764	49	6.9%
Wow Air								445	678	724	46	6.8%
Regional/Commuter Carriers	**15,594**	**13,112**	**12,494**	**12,153**	**12,270**	**14,378**	**14,720**	**14,153**	**15,204**	**14,597**	**-607**	**-4.0%**
Air Canada Regional	4,088	5,120	7,065	6,803	7,058	9,563	10,364	10,024	9,051	7,497	-1,554	-17.2%
American Eagle Airlines	8,975	4,637	2,480	2,206								
Delta Connection	2,531	3,355	81	1	1,489	1,082	56	38	32	63	31	96.9%
Porter Airlines			2,868	3,143	3,723	3,733	4,300	4,091	3,869	3,899	30	0.8%
Westjet Encore									2,252	3,138	886	39.3%
Non-Scheduled Operations	**2,141**	**1,068**	**305**	**300**	**268**	**277**	**185**	**248**	**63**	**65**	**2**	**3.2%**

Source: Massport.
Note: Excludes general aviation and all-cargo operations.
1 American Airlines includes US Airways beginning in 2014 (following 2013 merger).
2 Delta Air Lines totals include Northwest Airlines beginning in 2009 (following 2008 merger).

Table E-4 Logan Airport Scheduled Passenger Departures by Destination

Destination Airport	Code	2000	2005	2010	2011	2012	2013	2014	2015	2016	2017	2016-2017 Change	2016-2017 Percent Change
Domestic		**210,068**	**163,684**	**149,962**	**152,303**	**143,871**	**147,078**	**149,208**	**152,210**	**155,485**	**160,981**	**5,496**	**3.5%**
New York La Guardia	LGA	11,872	13,350	11,705	11,489	9,564	9,255	9,056	9,352	9,365	11,080	1,715	18.3%
Washington National	DCA	8,474	10,680	9,419	9,793	8,543	8,360	8,645	8,678	8,629	8,759	130	1.5%
Chicago O'Hare	ORD	10,063	7,412	7,403	7,635	7,461	7,733	7,822	7,401	7,139	6,825	-315	-4.4%
Atlanta	ATL	7,110	6,003	5,548	5,569	5,574	5,501	5,454	5,192	5,386	6,656	1,270	23.6%
New York J F Kennedy	JFK	9,899	4,985	7,054	5,969	5,428	5,919	6,139	6,745	6,971	6,391	-580	-8.3%
Baltimore	BWI	1,773	5,029	7,053	6,755	5,910	5,737	5,060	4,897	5,731	5,987	257	4.5%
Philadelphia	PHL	11,785	7,014	6,548	7,985	6,301	7,305	8,092	7,971	5,786	5,298	-488	-8.4%
New York Newark	EWR	5,206	5,626	3,666	4,608	5,228	5,702	5,532	5,366	5,239	5,169	-71	-1.3%
San Francisco	SFO	3,526	2,591	3,711	3,884	4,198	4,038	4,305	4,272	4,551	4,796	245	5.4%
Los Angeles	LAX	3,647	2,655	3,382	3,164	3,544	3,603	4,080	4,456	4,650	4,775	126	2.7%
Nantucket	ACK	5,022	3,452	3,884	3,382	3,469	3,601	3,567	4,311	4,605	4,378	-226	-4.9%
Orlando	MCO	4,914	3,517	3,179	3,580	3,496	3,399	2,883	3,057	3,323	4,234	911	27.4%
Detroit	DTW	2,937	2,827	2,353	2,437	2,314	2,340	3,354	3,875	3,932	3,849	-83	-2.1%
Charlotte	CLT	2,758	3,288	4,180	3,976	3,991	3,911	3,916	3,920	3,878	3,835	-44	-1.1%
Raleigh/Durham	RDU	3,775	4,110	3,259	2,867	3,059	3,313	3,634	3,598	3,718	3,748	30	0.8%
Dallas/Fort Worth	DFW	5,002	3,544	2,938	2,781	3,790	4,147	3,705	3,406	3,418	3,231	-187	-5.5%
Denver	DEN	2,628	1,990	2,812	2,640	2,518	2,433	2,446	2,611	2,839	2,812	-26	-0.9%
Minneapolis	MSP	3,078	1,791	1,927	2,031	2,062	2,200	2,322	2,737	2,865	2,801	-65	-2.3%
Pittsburgh	PIT	3,086	2,021	2,312	3,179	2,498	2,641	2,678	2,457	2,210	2,729	519	23.5%
Fort Lauderdale/Hollywood	FLL	3,327	3,065	2,370	2,517	2,371	2,379	2,173	2,258	2,634	2,709	75	2.9%
Martha's Vineyard	MVY	3,863	2,231	3,218	2,829	2,774	2,740	2,793	2,731	2,929	2,572	-357	-12.2%
Miami	MIA	2,068	2,072	2,238	2,555	2,610	2,555	2,551	2,520	2,523	2,519	-4	-0.2%
Washington Dulles	IAD	8,625	6,139	4,625	3,910	3,014	2,974	2,714	2,505	2,485	2,484	-1	0.0%
Richmond	RIC	1,537	1,404	1,431	1,525	1,481	1,723	2,450	2,603	2,338	2,349	12	0.5%
Buffalo	BUF	950	1,226	2,181	2,183	2,264	2,468	2,433	2,203	2,120	2,249	130	6.1%
Cleveland	CLE	2,797	1,260	1,369	1,326	1,455	1,501	1,260	2,070	2,098	2,216	118	5.6%
Fort Myers	RSW	949	1,525	1,587	1,620	1,738	1,806	1,734	1,742	1,938	2,173	235	12.1%
Tampa	TPA	2,502	1,946	1,246	1,255	1,266	1,195	1,182	1,177	1,429	2,106	678	47.4%
Nashville	BNA	642				153	588	628	688	1,467	2,058	590	40.2%
Seattle/Tacoma	SEA	458	610	1,001	993	1,051	1,378	1,607	1,625	1,907	2,051	144	7.6%
West Palm Beach	PBI	1,674	1,126	1,450	1,380	1,161	1,235	1,389	1,650	1,652	1,856	204	12.3%
Provincetown	PVC	2,023	1,659	2,410	2,086	2,054	1,982	1,929	1,957	1,912	1,610	-302	-15.8%
Phoenix	PHX	1,386	944	1,348	1,895	1,773	1,413	1,557	1,569	1,552	1,609	57	3.7%
Houston Intercontinental	IAH	1,995	1,752	1,717	1,697	1,704	1,789	1,822	1,831	1,618	1,548	-70	-4.3%
Chicago Midway	MDW	868	1,339	1,756	1,751	1,690	1,617	1,542	1,531	1,604	1,521	-83	-5.2%
Indianapolis	IND	765	2,076	1,121	977	936	895	844	1,181	1,595	1,511	-84	-5.3%
Lebanon	LEB			1,734	1,460	1,464	1,460	1,460	1,460	1,464	1,464	0	0.0%
Columbus	CMH	2,708	2,114	972	1,048	972	871	844	1,081	1,591	1,416	-175	-11.0%
Rockland	RKD	1,152	1,374	1,301	1,279	1,282	1,279	1,279	1,372	1,348	1,344	-4	-0.3%
Las Vegas	LAS	1,098	1,679	756	904	737	813	819	1,162	1,216	1,325	109	8.9%
Cincinnati	CVG	2,235	2,637	1,364	1,308	1,272	1,269	1,239	1,218	1,204	1,229	25	2.1%
Augusta	AUG	584	621	1,000	1,187	1,091	1,248	1,248	1,248	1,220	1,220	0	0.0%
Salt Lake City	SLC	1,094	730	669	438	370	584	597	617	1,009	1,156	146	14.5%
Bar Harbor	BHB	1,196	1,154	815	1,030	1,213	1,283	1,156	1,095	1,098	1,111	13	1.2%

Table E-4 Logan Airport Scheduled Passenger Departures by Destination (Continued)

Destination Airport	Code	2000	2005	2010	2011	2012	2013	2014	2015	2016	2017	2016-2017 Change	2016-2017 Percent Change
Albany	ALB	3,433	1,073	647	2,180	1,523	1,183	1,095	1,095	1,098	1,098	0	0.0%
Saranac Lake	SLK		800	1,174	1,157	1,222	1,157	1,095	1,095	1,098	1,098	0	0.0%
Rutland	RUT	1,259	643	1,095	1,148	1,160	1,095	1,095	1,095	1,098	1,098	0	0.0%
Milwaukee	MKE	1,189	2,182	2,213	1,941	1,069	880	674	854	990	1,059	70	7.0%
San Diego	SAN	366	365	571	535	476	859	1,030	1,052	1,042	1,046	4	0.4%
St. Louis	STL	2,187	1,461	934	713	815	748	722	722	745	1,021	275	36.9%
Presque Isle	PQI	1,835	1,017	991	991	993	991	991	991	993	993	0	0.0%
Houston Hobby	HOU						664	1,325	978	1,032	872	-160	-15.5%
Austin	AUS			365	365	366	352	352	444	754	855	100	13.3%
Jacksonville	JAX		428	365	544	619	593	984	767	701	854	153	21.8%
Rochester	ROC	3,644	1,181	908	886	889	878	882	886	767	806	39	5.1%
New Orleans	MSY		191	348	304	335	339	344	365	527	700	173	32.8%
Hyannis	HYA	2,274	1,059	1,165	1,047	1,028	705	731	787	775	697	-79	-10.1%
Kansas City	MCI	597	241	313	536	571	515	669	661	631	684	53	8.3%
Plattsburgh International	PBG			1,025	899	623	639	787	756	697	627	-69	-10.0%
Portland	PDX			352	440	528	615	494	519	555	599	44	7.9%
Charleston	CHS		61				398	474	365	545	593	49	8.9%
Savannah	SAV		78					306	365	370	423	52	14.1%
Westchester County	HPN	6,065	2,256						263	502	422	-80	-15.9%
Myrtle Beach	MYR	105	265	365	365	366	378	383	383	379	375	-4	-1.1%
Dallas Love Field	DAL								153	153	366	213	139.2%
Long Beach	LGB		853	459	296	292	274	270	292	297	353	56	18.9%
Syracuse	SYR	3,876	1,762	991	964	784	626	617	578	314	323	9	2.8%
San Jose	SJC	842	245	232	292	227	205	214	223	236	323	86	36.6%
Harrisburg	MDT	1,307	886	551	574	540	469	434	325	300	314	13	4.4%
Sarasota/Bradenton	SRQ		30	82	242	248	348	181	212	186	248	62	33.3%
Atlantic City Pomona Field	ACY			536	326	355	123	153	166	366	123	-243	-66.4%
Norfolk	ORF	838	1,032		511	667	613	71			105	105	
Sacramento	SMF								48	57	75	18	31.2%
Oakland	OAK		853	195	105	83	83	83	88	79	71	-9	-10.8%
Madison	MSN									9	0	-9	-100.0%
Akron/Canton	CAK		730	475	488	497	557	457	287				
Islip	ISP	4,222	1,581				293	324					
Newport News	PHF		671	549	549	60		31					
Memphis	MEM	972	1,034	1,048	1,029	688	313						
Bangor	BGR	6,644	2,946										
Greensboro	GSO	415	1,120										
Trenton	TTN												
Watertown	ART												
Burlington	BTV	5,913	1,632										
Allentown/Bethlehem	ABE	780	626										
Louisville	SDF												
Manchester	MHT												
Massena	MSS												
Dayton	DAY												
Plattsburgh	PLB												
Portland (ME)	PWM	6,267	1,394										

Table E-4 Logan Airport Scheduled Passenger Departures by Destination (Continued)

Destination Airport	Code	2000	2005	2010	2011	2012	2013	2014	2015	2016	2017	2016-2017 Change	2016-2017 Percent Change
Wilkes-Barre Scranton	AVP	584	420										
Columbia	CAE												
Ithaca	ITH	872											
Elmira/Corning	ELM	441											
Hartford	BDL												
Binghamton	BGM												
Providence	PVD	91											
International		**23,711**	**19,837**	**18,764**	**19,641**	**19,540**	**19,093**	**20,372**	**21,765**	**25,353**	**26,473**	**1,120**	**4.4%**
Toronto Pearson	YYZ	3,691	3,876	3,603	3,737	3,529	3,306	2,715	2,799	3,702	3,861	158	4.3%
Montreal-Trudeau	YUL	3,401	2,578	2,008	2,021	2,009	1,833	1,948	2,047	2,092	2,070	-22	-1.0%
Toronto Island Apt	YTZ			1,535	1,687	2,009	2,009	2,310	2,236	2,018	2,001	-17	-0.8%
London Heathrow	LHR	2,187	2,133	2,331	2,833	2,642	2,134	2,069	2,026	2,058	1,931	-127	-6.2%
San Juan	SJU	1,750	1,237	1,294	1,130	1,031	1,038	1,018	1,068	1,141	1,058	-83	-7.3%
Halifax	YHZ	3,210	1,891	852	744	745	704	704	700	955	1,037	82	8.6%
Reykjavik Keflavik Apt	KEF	393	361	404	531	467	561	614	854	968	964	-5	-0.5%
Paris De Gaulle	CDG	898	853	710	946	619	784	780	916	938	895	-44	-4.7%
Dublin	DUB	223		348	457	480	605	653	653	694	816	122	17.6%
Ottawa	YOW	2,575	864	744	696	623	652	635	630	649	623	-26	-4.0%
Bermuda	BDA	550	518	532	540	511	501	523	536	510	598	88	17.2%
Aruba	AUA	9	338	407	426	405	408	417	417	471	597	126	26.7%
Amsterdam	AMS	366	365	457	553	558	575	536	579	580	580	0	0.0%
Dubai	DXB							306	457	692	518	-174	-25.2%
Frankfurt	FRA	580	575	548	544	572	545	532	536	515	502	-13	-2.5%
Zurich	ZRH	523	356	365	365	366	365	365	365	366	467	101	27.6%
Santo Domingo	SDQ		174	305	275	358	339	401	365	519	406	-113	-21.8%
Tokyo Narita	NRT					236	352	365	365	357	366	9	2.4%
Munich	MUC		210	313	335	357	348	357	357	357	366	9	2.4%
Beijing	PEK							136	287	323	366	43	13.4%
Panama City	PTY							365	334	318	366	48	15.1%
Doha	DOH									284	366	82	28.9%
Lisbon	LIS	44		26	26	48	39	39	44	223	362	139	62.2%
Shannon	SNN	366	737	213	118	144	166	348	352	349	331	-18	-5.1%
Cancun	CUN		207	307	270	217	225	273	264	326	331	5	1.5%
Hong Kong	HKG								140	227	327	100	44.2%
Copenhagen	CPH									293	314	21	7.3%
Ponta Delgada	PDL	30	39	165	170	148	179	209	196	196	314	118	59.9%
Istanbul	IST							236	365	340	310	-30	-8.9%
Mexico City	MEX		234						166	292	301	9	3.0%
Santiago	STI				92	201	214	248	206	275	284	8	3.0%
Rome Leonardo Da Vinci-Fiumicino	FCO		135	313	314	266	271	258	271	271	275	4	1.6%
Punta Cana	PUJ			95	92	139	134	160	174	214	261	48	22.4%
Madrid	MAD			218	231	222	209	166	166	205	258	53	25.7%
London Gatwick	LGW	362								161	218	56	35.0%
Dusseldorf	DUS									101	197	96	95.3%
Saint Thomas	STT	78	108	125	117	156	173	176	184	186	186	1	0.5%

Table E-4 Logan Airport Scheduled Passenger Departures by Destination (Continued)

Destination Airport	Code	2000	2005	2010	2011	2012	2013	2014	2015	2016	2017	2016-2017 Change	2016-2017 Percent Change
Shanghai Pudong	PVG								83	157	157	0	0.0%
Tel Aviv	TLV								75	148	157	9	5.9%
Manchester	MAN	26	241							31	122	91	294.5%
Bogota	BOG										122	122	
Montego Bay	MBJ		238	126	52	69	56	73	56	52	118	65	125.5%
Nassau	NAS		100	180	134	142	108	139	136	133	109	-24	-18.3%
Saint Maarten	SXM			39	43	61	61	52	56	91	95	4	4.5%
Providenciales	PLS	4	43	39	26	69	52	82	86	104	91	-13	-12.2%
Barbados	BGI								9	43	74	31	70.4%
Terceira	TER	44		17	17	17	17	17	31	70	70	0	0.0%
Vancouver	YVR	366	62								62	62	
Port Au Prince	PAP								26	53	62	9	17.4%
Oslo	OSL									57	61	4	7.5%
Fort-de-France	FDF								9	43	26	-17	-40.1%
Pointe-a-Pitre	PTP								9	30	26	-4	-14.6%
Grand Cayman	GCM		31	17		9	26	26	26	43	26	-17	-39.9%
Liberia	LIR							9	26	26	26	0	0.0%
Puerto Plata	POP	4						9	26	26	26	0	0.0%
St. Lucia Hewanorra	UVF							9	26	26	22	-4	-16.5%
Cologne/Bonn	CGN									52		-52	-100.0%
Praia	RAI		9	121	122	109	104	92	30				
Sao Vicente	VXE			4		4							
Charlottetown	YYG												
Helsinki	HEL												
Milan Malpensa	MXP	366	343										
Fredericton	YFC		686										
Quebec	YQB	1,229	30										
Glasgow	GLA												
Connaught	NOC												
Stockholm Arlanda	ARN												
Las Palmas	LPA												
San Salvador	SAL		178										
Ilha Do Sal	SID		56										
Nykoping	NYO		31										
Lerwick Sumburgh Apt	LSI												
Freeport	FPO												
Brussels	BRU	362											
Gander	YQX												
Athens	ATH	74											
Total Scheduled Carrier Operations		**233,779**	**183,520**	**168,726**	**171,945**	**163,411**	**166,171**	**169,579**	**173,974**	**180,838**	**187,454**	**6,616**	**3.7%**

Source: OAG Schedules.

Logan Airport Activity Forecast Methodology and Assumptions

Introduction

The Massachusetts Port Authority (Massport) developed high-level strategic planning forecasts for Boston Logan International Airport (Logan Airport or the Airport) in 2017. These forecasts serve as the basis for Massport's airport and ground transportation planning initiatives and analyses of future environmental impacts. The objective of forecasting is to develop a realistic measure of future growth such that preparations can be made to effectively accommodate its impact on airport facilities. Factors that can influence aviation activity levels include regulatory policy on the local and national level, technological innovations, aviation industry trends, and regional fluctuations in population and employment.

The base year for the forecasts was 2017 with a future horizon of 50 million air passengers, or about 10 to 15 years into the future (Future Planning Horizon). The future forecast was derived by applying standard industry forecasting techniques analyzing: 1) historical trends; 2) recent developments; and 3) outlook for future demand drivers such as the economy and airfares. The forecast is presented below and serves as the basis for the planning, ground traffic, and environmental impacts analyses in the *2017 Environmental Status and Planning Report (2017 ESPR)*. The scope of the planning forecast for Logan Airport included projections of passengers (domestic and international), cargo, and aircraft operations (scheduled passenger, all cargo, charter and general aviation [GA]). Based on the moderate forecast scenario, Massport developed derivative forecasts to support the air quality, noise, and vehicle miles traveled (VMT) analyses for the *2017 ESPR*. The derivative forecasts include the aircraft fleet mix, average daily operations by aircraft type and stage length, and peak month, busy day, activity.

Summary

Table E-5 provides a summary of the 2017 actual and Future Planning Horizon forecast passengers, cargo volume, and aircraft operations at Logan Airport. Enplaned and deplaned passengers are projected to grow by 1.5 percent annually to about 50 million in the Future Planning Horizon. Passenger aircraft operations are forecast to grow by 1.2 percent annually, all-cargo operations are forecast to grow by 0.5 percent annually, and GA operations are forecast to increase by 0.1 percent annually.

Table E-5 Actual and Forecast Logan Airport Passengers, Cargo, and Aircraft Operations, 2017 and Future Planning Horizon[1]

Category	2017 Actual	Future Planning Horizon	Compound Annual Growth (2017-Future Planning Horizon)
Passengers	38,412,419	50,113,905	1.5%
Cargo[2] (pounds)	679,407,977	828,551,499	1.1%
Operations (Passengers)	363,507	447,302	1.2%
Operations (All-Cargo)	6,744	7,377	0.5%
Operations (GA)	31,120	31,685	0.1%

Source: Massport and Inter*VISTAS* 2017 Logan Airport Long-Range Forecast
1 Represents the 10- to 15-year planning horizon.
2 Includes freight and express/small packages. Does not include mail.

Updated Logan Airport Planning Forecast

Massport periodically assesses and updates planning forecasts due to global and local economic and market conditions that have a bearing on aviation activity levels. Logan Airport's passenger traffic reached 38.4 million air passengers in 2017, and that growth continued into 2018, reaching 40.9 million air passengers. The growth is in direct response to the strong national and regional economy. This peak follows unprecedented, consistent growth since 2013 at a 6.2-percent annual average growth, making Logan Airport one of the fastest growing airports in the U.S. in terms of passenger activity levels. The seven-year period of growth since 2010, on which the previous forecast was based, has added almost 11 million new air passengers, equaling a 40-percent increase between 2010 and 2017.

In addition to the national aviation trends described above, since the publication of the *2011 ESPR*, there have been several developments that have affected aviation within the New England region and that have had implications for activity levels at Logan Airport. These include the following:

- Strong economic conditions in Boston including a substantial increase in per capita income compared to the rest of the U.S.
- New international non-stop services led by foreign flag carriers including, but not limited to: Emirates, Qatar Airways, Turkish Airlines, El Al, Cathay Pacific Airways, TAP Air Portugal, Norwegian, and WestJet. These airlines have all entered the Boston market, stimulating local inbound and outbound international passenger demand.
- jetBlue Airways' strategy of forging relationships with the foreign flag carriers in order to facilitate increased connections from jetBlue's Boston network. Markets such as Detroit and Raleigh/Durham connect an increasingly significant number of passengers through Boston onto a diverse group of foreign flag airlines.
- Continued growth by jetBlue Airways and Delta Air Lines. Both carriers have indicated to Massport they will plan to increase the number of departures 10 percent per year at Logan Airport until they reach 200 and 150 daily departures respectively. Southwest Airlines is also expected to expand service in the near future in response to anticipated additional demand.

Passenger Forecast

The region's economic growth is the primary driver of current and future air passenger growth at Logan Airport. Logan Airport serves the 10th largest metropolitan area in the nation. Residents of the Boston metropolitan area have above average incomes and a high propensity for personal and business-related airline travel. Since no airline maintains a connecting hub operation at the Airport, Logan Airport is principally an origin and destination (O&D) airport. Future passenger levels are therefore largely determined by underlying market demand and are not dependent on airlines connecting passengers that transfer from one flight to another. The price of airline travel, which is inversely related to passenger growth, is another factor that affects passenger demand over the long term. Real increases in the price of airline travel (i.e., adjusted for inflation) tend to moderate growth in airport passenger levels. Conversely, price reductions may lead to passenger growth as lower prices entice more people to travel. In the current and foreseeable future operating climate, the price of airline travel is strongly linked to fuel prices.

Rapid technology advances in the aviation sector also have the potential to impact passenger demand and growth. Disruptive technologies affecting the journey to and from the Airport, the ticketing lobby, passenger security, and the experience in the concourse are being developed to improve the passenger experience. Aircraft manufacturers are developing electric and hypersonic aircraft. Biofuels for aircraft are being tested, which will reduce greenhouse emissions. Autonomous flight continues to be researched. For airlines, replacing pilots with technology could lead to major cost savings; the industry could save as much as $30 billion by adopting autonomous flight technology. The long-term impact of disruptive technology advances on passenger activity are still uncertain, however. Therefore, these technological advances are not factored into the Logan Airport passenger forecast.

The passenger forecasts were prepared using standard industry forecasting techniques analyzing: (1) historical patterns of passenger traffic at the Airport; (2) recent trends at the Airport and in the industry; and (3) the outlook for future aviation demand based on economic factors. More specifically, the long-term forecast was based on over 10 years of historical relationships between the main drivers of air traffic demand at Logan Airport: the economy, airfares, and its local share of regional demand **(Table E-6)**.

Table E-6 Passenger Forecast Assumptions

Input[1]	Assumptions Average Annual Growth (through Future Planning Horizon[2])
U.S. Gross Domestic Product (GDP)	2.3%
Regional GDP	2.0%
Regional Total Personal Income	2.2%
Cost of Fuel	1.5%

Source: Inter*VISTAS* 2017 Logan Airport Long-Range Forecast, Woods & Poole.
Notes: Regional defined as the states of MA, RI, and NH.
1 These inputs were updated from the *2011 ESPR*.
2 10- to 15-year timeframe.

Domestic passenger activity levels are forecast to grow by 1.5 percent annually from 31.1 million in 2017, to 40.8 million in the next 10 to 15 years, while international passengers are forecast to grow by 1.4 percent annually from 7.2 million in 2017 to 9.2 million over the same timeframe (see **Table E-7**). Average growth rates in the early years of the forecast are higher than for the overall forecast average due to the inclusion of industry knowledge and airline expansion plans. Growth rates level off in the later years as the forecast relies on economic modeling to predict future passenger demand beyond the initial short-term period.

In the future, domestic passengers are expected to represent approximately 81 percent of all passengers, similar to the proportion or domestic passengers in 2017. The fastest growing international market segment is Central and South America with a projected 3.6-percent annual growth rate. Asia and the Pacific region are forecast to grow by 2.0 percent, with Europe and the Middle East growing by 2.0 percent, and Canada by 1.0 percent. Europe remains Logan Airport's most mature international market. GA passenger traffic is anticipated to remain relatively stable; it is forecast to grow 0.1 percent annually, increasing from 111,874 in 2017 to approximately 114,000 in the next 10 to 15 years.

Overall, passenger activity levels are expected to increase to approximately 50 million annual air passengers and operations are expected to increase to approximately 486,000 in the next 10 to 15 years (the Future Planning Horizon). In this *2017 ESPR,* the Future Planning Horizon activity level serves as the basis for assessing future environmental impacts of airport operations. This increase in projected passenger levels is consistent with previous ESPR analyses.

Over the past 10 years, the U.S. economy has experienced an unprecedented cycle of growth, which has led to significant airline profits and record-breaking passenger levels at U.S. airports. By most statistical measures, the economy is doing well and has rebounded from the 2008/2009 recession. The economy grew nearly 3 percent in 2018 for the second time since the downturn.[1] Although the current economic expansion is the second-longest in U.S. history, many leading economists are forecasting a recession in the near future.

Logan Airport has consistently been resilient to external shocks and periods of weak demand in the past. With a diversified mix of airlines, a thriving regional economy, and a strong local originating and inbound visitor passenger market, the Airport is well positioned to withstand future external shocks. Furthermore, as mentioned above, increased reliance on additional revenue streams (e.g., co-branded credit cards, baggage, on-board food sales) will help sustain airlines during downturns. These factors can help to limit shocks, not just at Logan Airport, but at airports across the country.

1 U.S. Department of Commerce, Bureau of Economic Analysis. 2018. U.S Economy at a Glance Table. https://www.bea.gov/media/3531.

Table E-7 Actual and Forecast Logan Airport Passengers, 2017 and Future Planning Horizon[1]

Passengers	2017	Future Planning Horizon	Average Annual Growth (2017 - Future Planning Horizon)
Scheduled/Charter			
Domestic	**31,100,950**	**40,797,282**	**1.5%**
International	**7,199,595**	**9,202,718**	**1.4%**
Europe/Middle East	4,360,706	6,275,187	2.0%
Canada	1,000,634	1,203,852	1.0%
Bermuda/Caribbean	1,100,769	556,193	(3.7%)
Asia/Pacific	503,386	722,504	2.0%
Central/South America	234,100	444,981	3.6%
Total Scheduled/ Charter	**38,300,545**	**50,000,000**	**1.5%**
General Aviation	111,874	113,905	0.1%
Total Passengers	**38,412,419**	**50,113,905**	**1.5%**

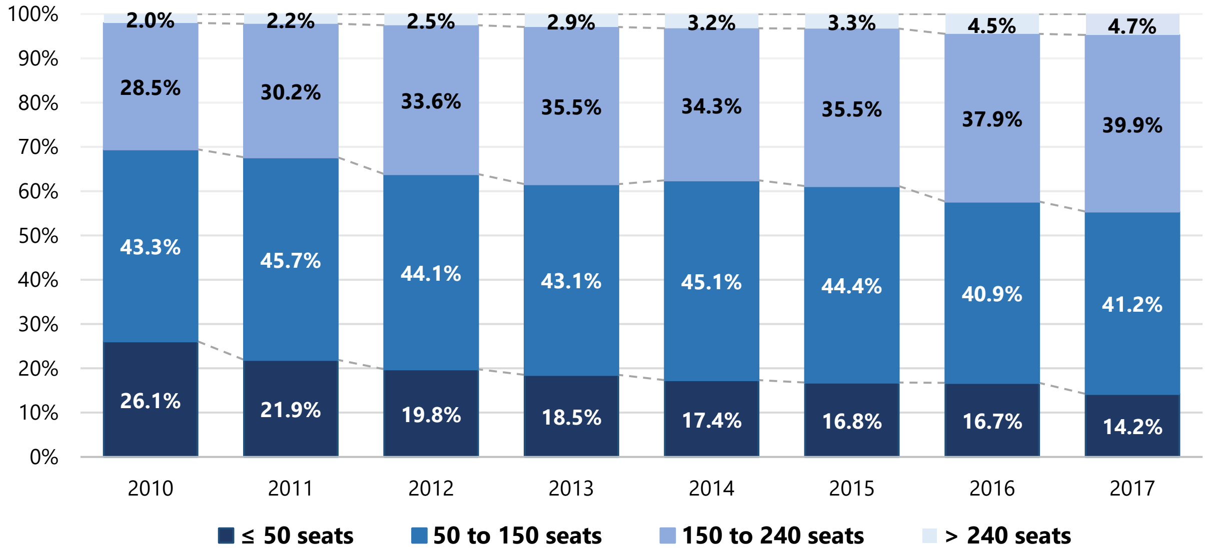
Source: Massport and InterVISTAS 2017 Logan Airport Long-Range Forecast.
1 Represents the 10- to 15-year planning horizon.

Aircraft Operations and Fleet Mix Forecast

Air passenger numbers have increased by 38.5 percent from 2000 to 2017 (**Table E-1**), while aircraft operations have decreased by 17.8 percent, demonstrating more efficient operations. The decline in aircraft operations has resulted from increasing load factors and the introduction of larger aircraft into the market. Between 2010 and 2017, the number of seats per operation increased by over 15, as smaller regional jets and turbo-props were replaced with larger narrow-body aircraft (see **Figure E-1**). The number of aircraft operating with 50 or fewer seats was nearly cut in half during this time, as airlines began taking deliveries of larger aircraft in the Boeing 737 and Airbus A320 families as well as the larger two-class regional jets.

Average load factors are forecast to increase for North American, European, and Asian flights to 86.6 percent, 87.6 percent, and 89.7 percent, respectively, and to decrease slightly for flights to Latin America by 0.5 percent. Average seats per operation are forecast to increase in all regions with the exception of Europe and the Middle East. Average seats per operation are forecast to increase from about 115 to 125 for North America, from about 254 to 265 for Asia, and from about 146 to 154 for Latin America. European destinations are expected to see more long-range, narrow-body aircraft operations, leading to a decrease in average seats per operations from 257 to 251 in the future (see **Table E-8)**.

Figure E-1 Evolution of Aircraft Fleet Mix at Logan Airport, 2010-2017



Source: Inter*VISTAS* 2017.

Table E-8 Average Load Factors and Average Aircraft Size, 2017 and Future Planning Horizon[1]

	Average Load Factors		Average Seats Per Operation	
Region	**2017**	**Future Planning Horizon**	**2017**	**Future Planning Horizon**
North America	85.2%	86.6%	115.1	125.1
Europe/Middle East	79.5%	87.6%	257.0	251.0
Asia	80.9%	89.7%	253.8	265.2
Latin America	86.1%	85.6%	145.7	154.2
Total	**83.2%**	**86.7%**	**124.4**	**134.7**

Source: Inter*VISTAS*, U.S. Department of Transportation T-100 Database.
1 Represents the 10- to 15-year planning horizon.

As shown in **Table E-9**, Logan Airport's total aircraft operations are forecast to increase slightly at an annual rate of 1.1 percent from 2017 through the Future Planning Horizon. All-cargo aircraft operations are forecast to grow at 0.5 percent annually, however the largest absolute growth is still expected to come from passenger aircraft operations with jet aircraft operations increasing by 59,901. Passenger jet operations are expected to increase by 1.1 percent per year, regional jet (RJ) operations are forecast to increase by 2.7 percent per year, and non-jet operations are expected to grow 0.1 percent annually. GA operations are forecast to grow by 0.1 percent annually between 2017 and the Future Planning Horizon, as there has been a national decrease in personal and hobby flying that is somewhat offset by increasing demand for and popularity of business jets.

RJ operations with aircraft less than 100 seats will continue to increase (e.g., Embraer 175, CRJ-900) as airlines replace smaller, 50-seat, regional aircraft. Non-jet aircraft will remain stagnant as there are no to very limited replacement options for propeller aircraft. Cape Air is expected to continue to operate small propeller aircraft and replace its aging aircraft with similar types of aircraft.

Table E-9 Actual and Forecast Logan Airport Operations, 2017 and Future Planning Horizon[1]

Operations	2017	Future Planning Horizon	Difference (2017-Future Planning Horizon)	Compound Annual Growth (2017-Future Planning Horizon)
Passenger				
Jet	279,464	339,365	59,901	1.1%
Regional Jet	39,279	62,857	23,578	2.7%
Non-Jet	44,764	45,079	315	0.1%
Subtotal	363,507	447,302	83,795	1.2%
All-Cargo	6,744	7,377	633	0.5%
General Aviation	31,120	31,685	565	0.1%
Total Operations	401,371	486,364	84,993	1.1%

Source: Massport and Inter*VISTAS*, U.S. Department of Transportation T-100 Database.
Notes: Totals may not add exactly due to rounding
1 Represents the 10- to 15-year planning horizon.

While Logan Airport's passenger levels continue to reach historical highs, aircraft operations in 2017 are well below the historic high in 1998 of 507,000. From 2000 to 2017, the annual number of passengers at Logan Airport increased by 38.5 percent, while the annual number of aircraft operations decreased by 17.8 percent. The declining operations resulted from the accelerated removal of turbo-prop aircraft, the addition of larger aircraft, and increasing load factors. The airlines serving Logan Airport were able to accommodate a greater number of passengers at lower service levels. This trend is expected to continue through the Future Planning Horizon with forecast operations of 486,364. Increasing aircraft capacity and increasing load factors will drive the slower growth in aircraft operations as compared to the passenger growth.

Cargo Forecast

Historically, changes in air cargo activity have mirrored those of gross domestic product (GDP), but declining unit revenues, improved productivity, and globalization of the air cargo industry have also affected the growth in air cargo traffic. Furthermore, the air cargo industry has seen significant structural changes as well. Among these changes are air cargo security regulations issued by the Federal Aviation Administration (FAA) and the Transportation Security Administration (TSA), maturation of the domestic express market, a shift from air to other transport modes (primarily truck), and the growth in international trade from the Open Skies[2] agreements.

Similar to the airline industry, cargo activity at Logan Airport has also undergone significant changes. The unprecedented growth in long-haul international commercial air service has led to an increase in international cargo of 71 percent since 2010. Among the top 10 U.S. airports, Logan Airport was the fastest growing airport for wide-body flights over the past five years. Carried in the aircraft belly compartment, international cargo ("international belly") is a key contributor to the profitability of long-haul international passenger services. International cargo now accounts for approximately 39 percent of Logan Airport's cargo shipments, up from 27 percent in 2010. International cargo is forecast to grow by an annual rate of 1.7 percent through the Future Planning Horizon and represent 43 percent of the Airport's total cargo.

The integrated cargo airlines, dominated by FedEx and UPS, currently account for 92 percent of the domestic cargo market at Logan Airport. The domestic commercial airlines at the Airport have become increasingly less dependent on cargo. In late 2015, jetBlue Airways made a strategic decision not to carry cargo system-wide.

The total volume of cargo at Logan Airport is forecast to increase by 1.1 percent annually from approximately 679 million pounds in 2017 to 829 million pounds in the Future Planning Horizon. International belly is forecast to grow the fastest at 1.7 percent per year as the growth in international wide-body aircraft operations continues. The express all-cargo market is projected to increase by 0.8 percent a year, while the domestic belly market is forecast to decrease by 0.4 percent per year **(Table E-10).**

Table E-10 Actual and Forecast Logan Airport Express/Freight (in pounds), 2017 and Future Planning Horizon[1]

Type	2017	Future Planning Horizon	Average Annual Growth (2017-Future Planning Horizon)
Domestic Belly	37,604,311	35,296,758	(0.4%)
International Belly	265,794,588	357,928,053	1.7%
Express All-Cargo	376,009,078	435,326,688	0.8%
Total	679,407,977	828,551,499	1.1%

Source: Massport and InterVISTAS 2017 Logan Long Range Forecast.
Notes: Numbers in parentheses ( ) indicate negative numbers.
1 Represents the 10- to 15-year planning horizon.

2 Open Skies Agreements – Since 1992, the U.S has pursued an "open-skies" policy designed to eliminate government involvement in airline decision-making about routes, capacity, and pricing in international markets. Open Skies agreements have vastly expanded international passenger and cargo flights to and from the U.S., promoting increased travel and trade, enhancing productivity, and spurring high-quality job opportunities and economic growth. The U.S. has reciprocal Open Skies air transport agreements with over 120 partners.

Derivative Forecasts

Derivative forecasts based on the Future Planning Horizon were developed to support the air quality, noise, and VMT analyses for the *2017 ESPR*. The derivative forecasts include:

- Annual aircraft operations by aircraft type (to support air quality modeling);
- Average daily arriving and departing operations by aircraft type and stage length (to support noise modeling); and
- Peak month, busy day, arriving and departing origin-destination passengers by time of day (to support VMT modeling).

Aircraft Fleet Forecast

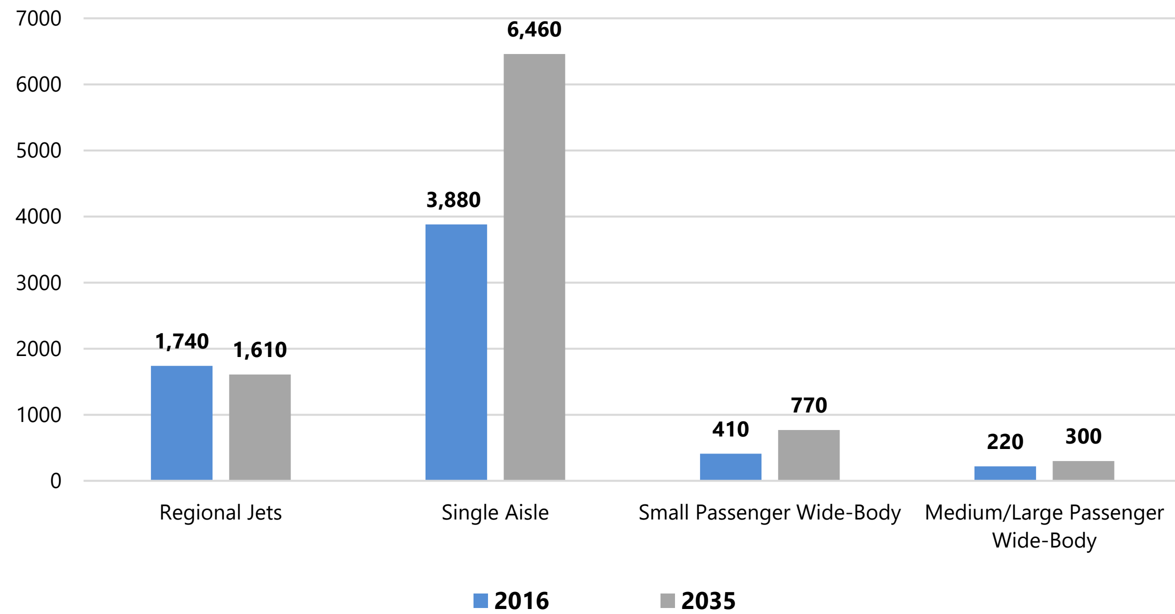
The Future Planning Horizon operations forecast is based on anticipated changes in passenger airline fleets both in North America and worldwide. The 2017 Boeing Current Market Outlook and the 2017 Airbus Global Market Forecast served as guiding documents for the aircraft fleet mix projections. These aircraft manufacturer reports are the result of comprehensive modeling of a number of factors, and they serve as industry standards for accurately forecasting changes in airplane demand.

Passenger Airlines

The North American passenger airline fleet is projected to grow 46 percent between 2016 and 2035,[3] with single aisle aircraft accounting for nearly 90 percent of that growth. Conversely, the RJ fleet is expected to contract in the future, yielding share to the single aisle segment. Small wide-body passenger airplanes are also projected to become more important for additional international non-stop flights as well as for serving secondary markets. **Figure E-2** summarizes the changes in fleet composition from 2016 to 2035. The number of RJs is expected to decrease from 1,740 to 1,610, the number of single aisle aircraft is expected to increase from 3,880 to 6,460, small passenger wide-bodies are forecast to grow from 410 to 770, and medium/large passenger wide-body aircraft are forecast to grow from 220 to 300.

3 The Boeing Market Outlook looks ahead 20 years and uses the timeframe from 2016 to 2035, which is the most applicable time period available for reference.

Figure E-2 Actual and Forecast North American Passenger Airline Aircraft Fleet, 2016 and 2035



Source: Boeing Current Market Outlook, 2017.
Note: The Boeing Market Outlook looks ahead 20 years and uses the timeframe from 2016 to 2035, which is the most applicable time period available for reference.

New aircraft types are expected to introduce market opportunities for passenger service at Logan Airport, in addition to replacing older, aging aircraft types. The Boeing 737 MAX[4] and the Airbus 320neo (new engine option) narrow-body family of aircraft can become important players in introducing thin, international destinations. New long-haul destinations will be served with modern wide-body aircraft, such as the Boeing 787 and the Airbus 350. Airbus 380 operations are forecast to be present in the Future Planning Horizon, operating to large international hub airports. However, no growth is expected in this more than 400-seat, ultra-wide-body segment. Operations with small RJs are forecast to decline, as airlines shift to larger RJs, such as the Embraer E175 and CRJ-900.

Table E-11 summarizes the existing 2017 and forecast Future Planning Horizon aircraft fleet mix for scheduled passenger airlines at Logan Airport. Over the forecast period, it is assumed that Cape Air will continue to serve Cape Cod and Massachusetts Island markets, as well as small Essential Air Service markets, from Logan Airport with small piston powered aircraft (nine seats). Piston operations are assumed to remain relatively constant over the forecast period.

Operations of RJs with 50 or fewer seats are forecast to decline, reflecting the decline in the number of small RJs in airline fleets. In addition, there is currently no aircraft in development to replace these aging 50 seat RJs.

4 As of the publication of this report, all Boeing 737 MAX 8 aircraft were grounded per order of the Federal Aviation Administration.

Overall, the percentage of operations with aircraft having 50 or fewer seats is forecast to decline from 4.6 percent in 2017 to 2.1 percent in the Future Planning Horizon.

Activity in turboprops and RJs with more than 50 seats is forecast to increase as airlines add more of these types of aircraft to their fleets. Increases are also projected for small and large narrow-bodies with a notable shift to large narrow-bodies with over 150 seats. In the Future Planning Horizon, the large narrow-body category will account for approximately 44.3 percent of scheduled airline operations compared to 39.4 percent in 2017. Increases in wide-body aircraft operations are also projected to support growth in international air travel demand. Strong growth in the wide-body aircraft, especially those with more than 240 seats, reflects the introduction of the larger variations of the fuel-efficient Boeing 787 Dreamliner and Boeing 777 aircraft. These mid-sized aircraft are ideally suited for serving long-haul markets from Logan Airport.

Table E-11 Scheduled Passenger Airline Operations by Aircraft Category, Actual 2017 and Future Planning Horizon[1]

Aircraft Category	Actual 2017 Operations	Percent of Total	Future Planning Horizon Operations	Percent of Total	Percent Change (2017-Future Planning Horizon)
Pistons	33,235	9.1%	33,016	7.4%	(0.7%)
TP ≤ 50 seats	4,477	1.2%	4,444	1.0%	(0.7%)
TP > 50 seats	7,052	1.9%	7,619	1.7%	8.0%
RJ ≤ 50 seats	12,310	3.4%	5,079	1.1%	(58.7%)
RJ > 50 seats	26,969	7.4%	57,778	12.9%	114.2%
NB ≤ 150 seats	114,596	31.5%	115,238	25.8%	0.6%
NB > 150 seats	143,041	39.4%	198,095	44.3%	38.5%
WB ≤ 240 seats	2,942	0.8%	3,175	0.7%	7.9%
WB > 240 seats	18,885	5.2%	22,857	5.1%	21.0%
Total	363,507	100.0%	447,302	100%	23.1%

Source: Massport and Inter*VISTAS*.
Notes: Numbers in parentheses ( ) indicate negative numbers.
TP – turboprop, RJ – regional jet, NB – narrow-body, WB – wide-body
1 Represents the 10- to 15-year planning horizon.

Cargo Airlines

FedEx and UPS continue to dominate cargo operations at Logan Airport. These two carriers have started retiring their aging Airbus 300/310 and MD-10/11 fleets and replacing them primarily with Boeing 757F and 767F aircraft. Narrow-body and wide-body cargo jet aircraft operations are both forecast to grow, as summarized in **Table E-12**. A 9.4-percent increase in cargo operations is expected to occur between 2017 and the Future Planning Horizon with no non-jet cargo aircraft.

Table E-12 Cargo Airline Operations by Aircraft Category, Actual 2017 and Future Planning Horizon[1]

Aircraft Category	Actual 2017 Operations	Percent of Total	Future Planning Horizon Operations	Percent of Total	Percent Change (2017-Future Planning Horizon)
Narrow-body Jet	580	8.6%	1,302	17.6%	124.5%
Wide-body Jet	5,778	85.7%	6,075	82.4%	5.1%
Non-Jet	386	5.7%	0%	0.0%	(100.0%)
Total	6,744	100.0%	7,377	100.0%	9.4%

Source: Massport and InterVISTAS
Notes: Numbers in parentheses ( ) indicate negative numbers.
1 Represents the 10- to 15-year planning horizon.

General Aviation

GA aircraft are organized by aircraft category for the purpose of this report. The categories are: single-engine piston, multi-engine piston, business jet, and turbo-prop. A balanced growth is expected in all four categories. Business jet operations are expected to grow at a slightly higher rate due to increasing demand and popularity of these aircraft, while piston aircraft are expected to grow a lower rate due to the national decline in personal and hobby flying.

Table E-13 provides a detailed summary of the Future Planning Horizon forecast by user category and aircraft type.

Table E-13 Forecast Logan Airport Operations by Aircraft Type, Actual 2017 and Future Planning Horizon[1]

Category/Aircraft Type	2017 Operations	Future Planning Horizon Operations
Scheduled + Charter Passenger Airlines		
Airbus A220-100	0	5,714
Airbus A220-300	0	57,143
Airbus A310	768	0
Airbus A319	21,023	30,476
Airbus A319 NEO	0	317
Airbus A320	57,592	62,857
Airbus A320 NEO	0	8,889
Airbus A321	23,431	32,063
Airbus A321 NEO	30	17,460
Airbus A330-200	5,861	1,270
Airbus A330-300	1,987	5,714
Airbus A330-900 NEO	0	3,175
Airbus A340-200	44	0
Airbus A340-300	330	0
Airbus A340-500	9	0

Table E-13 Forecast Logan Airport Operations by Aircraft Type, Actual 2017 and Future Planning Horizon¹ (Continued)

Category/Aircraft Type	2017 Operations	Future Planning Horizon Operations
Airbus A340-600	190	0
Airbus A350-900	1,221	1,270
Airbus A380	184	635
ATR 42-600	0	1,270
Boeing 717-200	5,476	3,175
Boeing 737-300	3,233	0
Boeing 737-400	102	0
Boeing 737-700	17,885	15,238
Boeing 737 MAX 7	0	3,175
Boeing 737-800	36,623	35,238
Boeing 737 MAX 8	32	20,000
Boeing 737-900	14,396	13,333
Boeing 737 MAX 9	0	5,079
Boeing 747-400	900	0
Boeing 747-8	687	635
Boeing 757-200	7,383	0
Boeing 757-300	2,053	3,175
Boeing 767-200	4	0
Boeing 767-300	2,089	635
Boeing 767-400	28	0
Boeing 777-200	2,316	3,810
Boeing 777-300	2,098	1,905
Boeing 777-9	0	635
Boeing 787-8	83	2,540
Boeing 787-9	3,036	3,810
Cessna 402	33,235	0
Bombardier Canadair Regional Jet 200	9,464	0
Bombardier Canadair Regional Jet 700	2,872	1,905
Bombardier Canadair Regional Jet 705	705	0
Bombardier Canadair Regional Jet 900	9,495	18,413
De Havilland DHC-8 Dash 8-100	86	0
De Havilland DHC-8 Dash 8-300	58	0
De Havilland DHC-8 Dash 8-400	7,052	7,619
Embraer 140	0	4,444
Embraer 145	2,844	635
Embraer 170	4,508	8,254
Embraer 175	9,389	29,206
Embraer 190	65,824	0

Table E-13 Forecast Logan Airport Operations by Aircraft Type, Actual 2017 and Future Planning Horizon[1] (Continued)

Category/Aircraft Type	2017 Operations	Future Planning Horizon Operations
McDonnell Douglas MD-80	1,150	0
McDonnell Douglas MD-90	1,482	0
Pilatus PC-12	945	0
Saab SF 340	3,388	3,175
Tecnam P2012 Traveler	0	33,016
Subtotal	**363,507**	**447,302**
Cargo Airlines		
Airbus 300-600	2,110	0
Airbus A310-200	224	0
Antonov An-124	6	0
Boeing 727-200	6	0
Boeing 757-200	574	1,302
Boeing 767-200	214	0
Boeing 767-300	2,475	6,075
Cessna 208	386	0
McDonnell Douglas MD-10	571	0
McDonnell Douglas MD-11	178	0
Subtotal	**6,744**	**7,377**
General Aviation		
Multi-engine piston	565	575
Business Jet	24,306	24,802
Single-engine piston	1,152	1,163
Turboprop	4,839	4,887
Helicopter	258	258
Subtotal	**31,120**	**31,685**
Grand Total	**401,371**	**486,364**

Source: Inter*VISTAS*.
Notes: Totals may not add exactly due to rounding
1 Represents the 10- to 15-year planning horizon.

Operations by Stage Length and Time-of-Day

A forecast of aircraft operations by stage length and time of day has also been developed for the Future Planning Horizon. An average day, peak month future schedule was developed with consideration to the aforementioned aircraft fleet mix expectations, and the stage length was analyzed directly from this schedule.

The stage length assumptions specific to North American operations and long-haul international operations are summarized in **Tables E-14** and **E-15**. In North America, more than a quarter of the operations have stage lengths longer than 1,000 nautical miles, but flights with stage lengths up to 500 nautical miles continue to dominate operations at Logan Airport. An increase in the international long-haul operations can be seen for flights with stage lengths of more than 5,500 nautical miles due to flights to the Middle East and Asia. Stage lengths between 2,501 and 3,500 nautical miles will continue to dominate, which mostly consists of flights to European destinations.

Table E-14 Stage Length Assumptions, North American Scheduled Passenger Airline Operations, Future Planning Horizon[1]

Stage Length (nm)	Pistons	TP ≤ 50	TP > 50	RJ ≤ 50	RJ > 50	NB ≤ 150	NB > 150	WB ≤ 240	WB > 240	Total	Percent of Total
0 to 500	33,016	4,444	7,619	5,079	36,825	75,453	19,631	0	0	182,069	44%
501 to 1,000	0	0	0	0	15,873	33,578	60,270	0	0	109,721	27%
1,001 to 1,500	0	0	0	0	5,079	3,145	53,293	0	0	61,518	15%
1,501 to 2,500	0	0	0	0	0	1,255	54,559	0	1,270	57,084	14%
Total	**33,016**	**4,444**	**7,619**	**5,079**	**57,778**	**113,431**	**187,754**	**0**	**1,270**	**410,391**	**100%**

Source: Inter*VISTAS*.
Notes: Totals may not add exactly due to rounding
nm – nautical miles
TP – Turboprop
RJ – Regional jet
NB – Narrow-body jet
WB – Wide-body jet
1 Represents the 10- to 15-year planning horizon.

Table E-15 Stage Length Assumptions, Long-Haul International Scheduled Passenger Airline Operations, Future Planning Horizon[1]

Stage Length (nm)	NB ≤ 150	NB > 150	WB ≤ 240	WB > 240	Total	Percent of Total
1,501 to 2,500	1,573	3,810	635	0	6,017	16%
2,501 to 3,500	0	6,338	1,905	15,209	23,452	64%
3,501 to 4,500	0	0	635	1,270	1,905	5%
4,501 to 5,500	0	0	0	635	635	2%
5,501 to 6,500	0	0	0	3,810	3,810	10%
Over 6,500	0	0	0	635	635	2%
Total	**1,573**	**10,148**	**3,175**	**21,558**	**36,453**	**100%**

Source: Inter*VISTAS*.
Notes: Totals may not add exactly due to rounding
nm – nautical miles
TP – Turboprop
RJ – Regional jet
NB – Narrow-body jet
WB – Wide-body jet
1 Represents the 10- to 15-year planning horizon.

Tables E-16 and **E-17** summarize stage length assumptions for cargo operations and charter airline operations, respectively. Cargo airline destinations and flight patterns are largely maintained from 2017 observed operations. The 501 to 1000 nautical mile stage length segment will make up 71 percent of total cargo flights in the Future Planning Horizon. Charter airline operational data were derived from the U.S. Department of Transportation (DOT) database. Charter airline stage lengths are more evenly distributed than cargo flight stage lengths. Sixty percent of charter operations will be in the 1,000 nautical mile range.

Table E-16 Stage Length Assumptions, Cargo Operations, Future Planning Horizon[1]

Stage Length (nm)	Narrow-Body Jet	Wide-Body Jet	Non-Jet	Total	Percent of Total
0 to 500	434	1,302	0	1,736	24%
501 to 1000	868	4,339	0	5,207	71%
1001 to 1500	0	434	0	434	6%
1501 to 2500	0	0	0	0	0%
Total	**1,302**	**6,075**	**0**	**7,377**	**100%**

Source: Inter*VISTAS.*
Notes: Totals may not add exactly due to rounding.
nm – nautical miles
1 Represents the 10- to 15-year planning horizon.

Table E-17 Stage Length Assumptions, Charter Airline Operations, Future Planning Horizon[1]

Stage Length (nm)	NB ≤ 150	NB > 150	WB ≤ 240	WB > 240	Total	Percent of Total
0 to 500	102	51	0	0	154	34%
501 to 1000	73	48	0	0	121	26%
1001 to 1500	29	40	0	0	69	15%
1501 to 2500	29	44	0	0	73	16%
2501 to 3500	0	11	0	29	40	9%
Total	**234**	**194**	**0**	**29**	**457**	**100%**

Source: Inter*VISTAS.*
Notes: Totals may not add exactly due to rounding.
nm – nautical miles
1 Represents the 10- to 15-year planning horizon.

Table E-18 summarizes arrival and departure times of North American passenger, long-haul international passenger, cargo, charter, and GA flights organized by stage length. Nighttime hours are defined as 10:00 PM to 7:00 AM. The results presented here are based on the Future Planning Horizon average day, peak month flight schedule, which was developed from airline schedules for an average day in August 2017.

Table E-18 Time-of-Day Assumptions by User Category and Stage Length (Future Planning Horizon[1])

User Category	Stage Length (nm)	Arrivals Day	Arrivals Night	Departures Day	Departures Night
Sched Psgr - North America	0 to 500	93.4%	6.6%	91.6%	8.4%
Sched Psgr - North America	501 to 1,000	82.1%	17.9%	88.4%	11.6%
Sched Psgr - North America	1,001 to 1,500	82.5%	17.5%	86.6%	13.4%
Sched Psgr - North America	1,501 to 2,500	65.6%	34.4%	92.2%	7.8%
Sched Psgr - Long-Haul Int'l	1,501 to 2,500	100.0%	0.0%	80.0%	20.0%
Sched Psgr - Long-Haul Int'l	2,501 to 3,500	97.3%	2.7%	86.5%	13.5%
Sched Psgr - Long-Haul Int'l	3,501 to 4,500	100.0%	0.0%	33.3%	66.7%
Sched Psgr - Long-Haul Int'l	4,501 to 5,500	0.0%	100.0%	100.0%	0.0%
Sched Psgr - Long-Haul Int'l	5,501 to 6,500	100.0%	0.0%	83.3%	16.7%
Sched Psgr - Long-Haul Int'l	over 6,500	0.0%	100.0%	0.0%	100.0%
Cargo	0 to 500	33.3%	66.7%	25.0%	75.0%
Cargo	501 to 1,000	53.8%	46.2%	58.3%	41.7%
Cargo	1,001 to 1,500	100.0%	0.0%	100.0%	0.0%
Charter	0 to 500	91.2%	8.8%	88.7%	11.3%
Charter	501 to 1,000	82.5%	17.5%	86.8%	13.2%
Charter	1,001 to 1,500	87.9%	12.1%	98.1%	1.9%
Charter	2,501 to 3,500	56.7%	43.3%	98.0%	2.0%
General Aviation	0 to 500	92.7%	7.3%	92.5%	7.5%
General Aviation	501 to 1,000	100.0%	0.0%	75.0%	25.0%
General Aviation	1,001 to 1,500	100.0%	0.0%	100.0%	0.0%

Source: Inter*VISTAS*.
Notes: nm – nautical miles
1 Represents the 10- to 15-year planning horizon.

Peak Month, Busy Day Hourly Passenger Forecast

The peak passenger forecast reflects a busy weekday of the peak month at Logan Airport in terms of passenger numbers. The peak month is usually a summer month as more people travel due to summer vacations. In 2017, the peak month for passenger traffic was August, and the selected busy day was August 4, 2017. The percentage of O&D passengers was determined from U.S. Department of Transportation T-100 data for the month of August. Then the selected peak month peak day passenger numbers were compared to the average day peak month passenger numbers. The ratio of these two numbers was applied to the Future Planning Horizon forecast to predict peak month, busy day passengers.

Table E-19 shows the peak month busy day local passengers for domestic and international destinations. 2017 is actual data, the Future Planning Horizon is forecasted data. As shown, the portion of domestic local passengers is 94.0 percent, and the portion of international local passengers is 89.4 percent. Busy day domestic passenger traffic is 2.4 percent higher than average day domestic traffic, and busy day international passenger traffic is 7.2 percent higher than average day international traffic in the peak month. Busy day local domestic passengers increase from 94,556 in 2017 to 129,542 in the future planning horizon. For international passengers, this number increases from 20,161 to 28,765.

Table E-19 Peak Month Busy Day Local Passengers, 2017 Base Year and Future Planning Horizon[1]

	2017 Domestic	2017 International	Future Planning Horizon Domestic	Future Planning Horizon International
Annual Enplaned + Deplaned Passengers	31,100,950	7,199,595	40,797,282	9,202,718
Percent Peak Month	9.6%	10.7%	9.6%	10.7%
Peak Month Enplaned + Deplaned Passengers	2,973,507	772,817	3,916,539	984,691
Percent Local	94.0%	89.4%	94.0%	89.4%
Peak Month Local Passengers	2,795,097	690,898	3,681,547	880,314
Peak Month, Average Day Local Passengers	92,304	18,803	126,457	26,827
Busy Day as a Percent of Average Day	102.4%	107.2%	102.4%	107.2%
Peak Month, Busy Day Local Passengers	**94,556**	**20,161**	**129,542**	**28,765**

Source: Massport and Inter*VISTAS*.
1 Represents the 10- to 15-year planning horizon.

Forecast busy day passengers are also distributed by terminal, as shown in **Table E-20**. The terminal distribution forecast for the Future Planning Horizon assumes the airline locations from a proposed Massport future gate allocation plan. According to this plan, Terminal A has 21 narrow-body equivalent gates, Terminal B has 37, and Terminal C has 27. The forecast also assumes that Terminal B will see more passenger traffic once planned renovations are complete.

Table E-20 Actual and Assumed Future Distribution of Passengers by Terminal

Terminal	Narrow-Body Equivalent Gates	Percent of Total	2017 Peak Month Passengers	Future Planning Horizon[1] Peak Month Passengers
A	21	24.7%	28.2%	27.7%
B	37	43.5%	37.2%	37.5%
C	27	31.8%	34.6%	34.8%
Total	**85**	**100%**	**100%**	**100%**

Source: Massport and Inter*VISTAS*.
1 Represents the 10- to 15-year planning horizon.

Actual and forecast local passengers by terminal for the peak month, busy day are shown in **Table E-21**. The forecast assumes that Southwest Airlines will move operations to Terminal B, Alaska Airlines (and Virgin America) will operate out of Terminal A, and Spirit Airlines will operate out of Terminal C. It is also assumed that Terminal E gates are used by airlines with limited frequency operations, such as Sun Country Airlines. Emirates and Aer Lingus are expected to move back from Terminal C to Terminal E, but other international departures by U.S. carriers will still occur in domestic terminals. Based on these assumptions, domestic passenger numbers are forecast to increase from 94,556 to 129,542, and international passengers are forecast to grow from 20,162 to 28,765 in the Future Planning Horizon.

Table E-21 Peak Month Busy Day Local Passengers by Terminal, 2017 Actual and Future Planning Horizon[1]

Terminal	2017 Domestic	2017 International	Future Planning Horizon Domestic	Future Planning Horizon International
A	27,060	1,629	35,482	2,746
B	35,839	2,025	49,814	2,395
C	31,657	2,124	44,246	2,877
E	0	14,384	0	20,747
Total Airport	**94,556**	**20,162**	**129,542**	**28,765**

Source: Inter*VISTAS*

1 Represents the 10- to 15-year planning horizon.

The hourly distribution of 2017 passengers by terminal is developed using published flight schedules, which provide departure and arrival times, seat counts, and airline assignments by terminal. The hourly distribution of passengers by terminal is shown for the busy day, peak month in 2017 in **Table E-22**.

Table E-22 Distribution of Passengers by Hour for a Busy Day of the Peak Month, 2017

	Terminal A		Terminal B		Terminal C		Terminal E		Total Airport		
Hour	**Arrive**	**Depart**	**Arrive**	**Depart**	**Arrive**	**Depart**	**Arrive**	**Depart**	**Arrive**	**Depart**	**Total**
00:00-00:59	2.6%	0.0%	6.2%	0.0%	3.1%	0.0%	0.0%	0.0%	3.5%	0.0%	1.8%
01:00-01:59	3.2%	0.0%	0.7%	0.0%	0.0%	0.0%	0.0%	3.6%	1.0%	0.4%	0.7%
02:00-02:59	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
03:00-03:59	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
04:00-04:59	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
05:00-05:59	3.1%	7.1%	1.4%	5.9%	3.7%	2.2%	0.0%	0.0%	2.3%	4.4%	3.4%
06:00-06:59	1.0%	6.1%	0.8%	11.3%	4.3%	7.3%	0.0%	0.7%	1.8%	7.6%	4.7%
07:00-07:59	1.3%	9.2%	3.8%	4.3%	7.4%	11.3%	3.1%	2.7%	4.2%	7.5%	5.8%
08:00-08:59	3.1%	4.7%	3.9%	7.8%	1.8%	7.4%	0.0%	0.0%	2.6%	6.0%	4.3%
09:00-09:59	4.1%	3.8%	4.0%	6.1%	5.8%	4.8%	0.0%	2.6%	4.0%	4.7%	4.4%
10:00-10:59	6.5%	5.4%	5.4%	6.5%	3.8%	5.1%	0.6%	0.0%	4.5%	5.0%	4.8%
11:00-11:59	3.5%	6.0%	5.2%	3.6%	2.1%	5.8%	0.0%	0.7%	3.1%	4.6%	3.8%
12:00-12:59	3.8%	4.0%	4.6%	7.7%	3.1%	2.8%	10.9%	0.0%	4.8%	4.4%	4.6%
13:00-13:59	8.4%	2.7%	4.4%	4.3%	5.7%	2.3%	6.8%	3.0%	6.1%	3.1%	4.6%
14:00-14:59	6.9%	8.1%	4.2%	5.0%	4.2%	3.5%	8.4%	2.1%	5.4%	5.0%	5.2%
15:00-15:59	5.8%	4.3%	6.4%	4.5%	7.0%	4.0%	11.5%	0.7%	7.1%	3.9%	5.5%
16:00-16:59	5.6%	8.4%	6.6%	7.0%	8.9%	9.4%	6.1%	0.0%	7.0%	7.3%	7.1%
17:00-17:59	8.4%	8.7%	10.3%	5.6%	5.4%	6.4%	8.3%	18.3%	8.1%	8.1%	8.1%
18:00-18:59	4.9%	7.3%	4.7%	10.0%	6.2%	7.5%	11.9%	2.4%	6.2%	7.7%	6.9%
19:00-19:59	7.2%	10.6%	4.4%	5.4%	6.5%	7.5%	17.3%	12.3%	7.5%	8.2%	7.8%
20:00-20:59	4.0%	1.8%	5.9%	2.5%	6.5%	4.4%	7.0%	6.1%	5.8%	3.3%	4.5%
21:00-21:59	4.5%	1.9%	6.8%	2.5%	3.4%	6.1%	4.2%	20.8%	4.9%	5.5%	5.2%
22:00-22:59	5.8%	0.0%	5.4%	0.0%	4.4%	1.4%	3.8%	11.7%	5.0%	1.8%	3.4%
23:00-23:59	6.2%	0.0%	4.9%	0.0%	6.9%	0.7%	0.0%	12.2%	5.1%	1.6%	3.4%
Peak Percent	**8.4%**	**10.6%**	**10.3%**	**11.3%**	**8.9%**	**11.3%**	**17.3%**	**20.8%**	**8.1%**	**8.2%**	**8.1%**
Peak Hour	**17:00-17:59**	**19:00-19:59**	**17:00-17:59**	**06:00-06:59**	**16:00-16:59**	**07:00-07:59**	**19:00-19:59**	**21:00-21:59**	**17:00-17:59**	**19:00-19:59**	**17:00-17:59**

Source: Massport and Inter*VISTAS*

Table E-23 provides an overview of hourly distribution forecast of terminal passengers for a busy day of the peak month for the Future Planning Horizon. For the forecast, the ratios between the average day, peak month and the busy day, peak month in 2017 were applied to create a passenger distribution for the busy day, peak month for the Future Planning Horizon. The flight schedules were grown based on these ratios, and gate assignments were adjusted based on expected airline terminal relocations, as explained earlier.

Table E-23 Assumed Distribution of Terminal Passengers by Hour for a Busy Day of the Peak Month, Future Planning Horizon[1]

	Terminals A, B, and C		Terminal E	
Hour	**Arrive**	**Depart**	**Arrive**	**Depart**
00:00-00:59	2.8%	0.0%	0.0%	1.0%
01:00-01:59	1.5%	0.0%	0.0%	2.3%
02:00-02:59	0.0%	0.0%	0.0%	0.0%
03:00-03:59	0.0%	0.0%	0.0%	0.0%
04:00-04:59	0.0%	0.0%	0.0%	0.0%
05:00-05:59	1.3%	2.8%	1.8%	0.0%
06:00-06:59	2.4%	7.5%	0.0%	0.5%
07:00-07:59	3.5%	8.9%	2.1%	1.7%
08:00-08:59	4.9%	6.2%	0.0%	0.0%
09:00-09:59	4.4%	7.7%	1.6%	1.5%
10:00-10:59	5.0%	5.5%	1.5%	0.0%
11:00-11:59	5.3%	5.2%	1.9%	0.0%
12:00-12:59	4.3%	5.9%	7.2%	0.5%
13:00-13:59	5.8%	3.5%	13.3%	3.8%
14:00-14:59	5.6%	5.9%	11.0%	1.5%
15:00-15:59	6.8%	5.5%	7.3%	1.6%
16:00-16:59	6.8%	7.0%	10.8%	3.1%
17:00-17:59	7.1%	6.8%	6.1%	12.6%
18:00-18:59	4.8%	6.9%	12.6%	14.5%
19:00-19:59	6.0%	7.5%	9.4%	10.7%
20:00-20:59	5.3%	4.6%	5.8%	4.3%
21:00-21:59	6.0%	1.7%	4.2%	21.5%
22:00-22:59	5.8%	0.5%	3.4%	8.6%
23:00-23:59	4.8%	0.3%	0.0%	10.1%
Peak Percent	**7.1%**	**8.9%**	**13.3%**	**21.5%**
Peak Hour	**17:00-17:59**	**07:00-07:59**	**13:00-13:59**	**21:00-21:59**

Source: Massport and Inter*VISTAS*
Notes: Gate assignments planned for the Future Planning Horizon (based on Massport assumptions for 2021).
1 Represents the 10- to 15-year planning horizon.

Arriving and departing passengers by terminal and hour of the day in 2017 are shown in **Table E-24**. In 2017, Terminal B was the busiest terminal with nearly 40,000 local passengers. Terminal C was the second busiest with over 37,000 passengers, followed by Terminal A with over 30,000 passengers. Terminal E handled close to 16,000 local passengers.

Table E-24 Peak Month Busy Day Passengers by Terminal and by Hour, 2017

	Terminal A		Terminal B		Terminal C		Terminal E		Total Airport		
Hour	**Arrive**	**Depart**	**Arrive**	**Depart**	**Arrive**	**Depart**	**Arrive**	**Depart**	**Arrive**	**Depart**	**Total**
00:00-00:59	390	-	1,225	-	568	-	-	-	2,182	-	2,182
01:00-01:59	477	-	146	-	-	-	-	255	623	255	879
02:00-02:59	-	-	-	-	-	-	-	-	-	-	-
03:00-03:59	-	-	-	-	-	-	-	-	-	-	-
04:00-04:59	-	-	-	-	-	-	-	-	-	-	-
05:00-05:59	453	1,110	286	1,185	680	418	-	-	1,420	2,713	4,133
06:00-06:59	143	954	161	2,270	785	1,391	-	51	1,089	4,666	5,755
07:00-07:59	190	1,428	752	857	1,353	2,145	269	188	2,564	4,618	7,182
08:00-08:59	462	737	779	1,559	331	1,392	-	-	1,572	3,688	5,260
09:00-09:59	606	591	798	1,233	1,049	906	-	183	2,454	2,914	5,367
10:00-10:59	960	834	1,071	1,305	685	957	51	-	2,767	3,096	5,862
11:00-11:59	522	941	1,023	719	379	1,102	-	51	1,924	2,812	4,736
12:00-12:59	557	622	905	1,554	567	525	955	-	2,983	2,702	5,685
13:00-13:59	1,236	413	871	857	1,036	434	598	213	3,741	1,918	5,659
14:00-14:59	1,014	1,260	828	998	762	665	738	152	3,342	3,075	6,417
15:00-15:59	850	672	1,264	912	1,269	759	1,009	51	4,392	2,395	6,786
16:00-16:59	826	1,302	1,304	1,410	1,613	1,787	538	-	4,281	4,499	8,780
17:00-17:59	1,240	1,348	2,032	1,132	977	1,218	728	1,290	**4,977**	4,989	**9,967**
18:00-18:59	721	1,135	931	2,013	1,122	1,430	1,042	168	3,814	4,746	8,560
19:00-19:59	1,055	1,648	862	1,084	1,184	1,425	1,517	871	4,619	**5,028**	9,647
20:00-20:59	595	276	1,174	501	1,179	828	613	430	3,561	2,034	5,595
21:00-21:59	659	291	1,354	500	620	1,156	370	1,471	3,004	3,419	6,423
22:00-22:59	849	-	1,067	-	807	269	335	829	3,057	1,098	4,156
23:00-23:59	915	-	975	-	1,256	134	-	864	3,145	998	4,143
Total	**14,717**	**15,565**	**19,808**	**20,088**	**18,223**	**18,942**	**8,763**	**7,068**	**61,511**	**61,662**	**123,173**

Source: Massport and Inter*VISTAS*
Notes: Bold indicates airport-wide peak hour passengers.

Table E-25 shows a similar peak month, busy day passenger distribution by terminal and time of day for the forecast year. Terminal B is expected to remain the busiest terminal with nearly 55,000 local passengers, followed by Terminal C with over 49,000 passengers. Terminal A is forecast to process over 39,000 passengers, and Terminal E is forecast to process over 26,000 local passengers in the Future Planning Horizon.

Table E-25 Peak Month Busy Day Passengers by Terminal and by Hour, Future Planning Horizon[1]

	Terminal A		Terminal B		Terminal C		Terminal E		Total Airport		
Hour	**Arrive**	**Depart**	**Arrive**	**Depart**	**Arrive**	**Depart**	**Arrive**	**Depart**	**Arrive**	**Depart**	**Total**
00:00-00:59	799	-	1,064	-	131	-	-	117	1,994	117	2,111
01:00-01:59	-	-	884	-	179	-	-	277	1,063	277	1,339
02:00-02:59	-	-	-	-	-	-	-	-	-	-	-
03:00-03:59	-	-	-	-	-	-	-	-	-	-	-
04:00-04:59	-	-	-	-	-	-	-	-	-	-	-
05:00-05:59	300	296	148	1,248	462	488	257	-	1,166	2,032	3,198
06:00-06:59	614	1,208	-	2,108	1,054	2,177	-	63	1,668	5,556	7,224
07:00-07:59	880	2,505	829	1,856	733	2,144	298	206	2,740	6,711	9,451
08:00-08:59	704	1,088	1,256	2,070	1,471	1,420	-	-	3,432	4,579	8,011
09:00-09:59	856	1,534	1,108	1,874	1,131	2,219	225	179	3,320	5,806	9,126
10:00-10:59	918	782	1,252	1,544	1,329	1,707	219	-	3,718	4,033	7,751
11:00-11:59	1,063	1,104	1,885	1,229	806	1,503	277	-	4,031	3,836	7,867
12:00-12:59	748	921	1,259	2,267	1,047	1,137	1,035	63	4,089	4,388	8,476
13:00-13:59	972	670	1,519	882	1,600	1,016	1,918	453	6,010	3,021	9,031
14:00-14:59	1,515	1,626	1,170	1,507	1,251	1,168	1,583	177	5,520	4,478	9,998
15:00-15:59	1,311	1,086	1,875	1,614	1,615	1,355	1,045	189	5,846	4,244	10,089
16:00-16:59	1,599	1,279	1,970	2,330	1,207	1,526	1,559	371	**6,336**	5,507	11,842
17:00-17:59	1,403	2,064	2,077	1,796	1,507	1,137	880	1,488	5,867	6,485	12,352
18:00-18:59	699	1,171	1,292	1,955	1,421	1,902	1,821	1,714	5,233	6,742	11,975
19:00-19:59	1,099	1,943	1,770	1,469	1,377	2,125	1,357	1,257	5,602	**6,794**	**12,396**
20:00-20:59	751	602	1,565	1,207	1,435	1,576	837	508	4,589	3,893	8,481
21:00-21:59	966	462	2,014	238	1,234	573	607	2,535	4,821	3,807	8,628
22:00-22:59	1,250	-	859	254	1,954	141	483	1,010	4,546	1,406	5,951
23:00-23:59	753	-	1,659	-	966	183	-	1,194	3,378	1,377	4,754
Total	**19,200**	**20,342**	**27,455**	**27,448**	**23,910**	**25,496**	**14,402**	**11,800**	**84,967**	**85,087**	**170,053**

Source: Massport and InterVISTAS
Notes: Gate assignments planned for the Future Planning Horizon (based on Massport assumptions for 2021). Bold indicates airport-wide peak hour passengers.
1 Represents the 10- to 15-year planning horizon.

Conclusion

Passenger demand continues to grow at Logan Airport and it is forecast to increase from over 38 million scheduled and charter passengers in 2017 to 50 million passengers in the Future Planning Horizon, translating to a 1.5-percent compound annual growth rate. Passenger aircraft operations are expected to increase at a lower average annual rate of 1.2 percent, increasing from over 363,000 to over 447,000. Average passenger throughput is expected to increase from 104 passengers per operation in 2017 to 117 passengers per operation in the Future Planning Horizon. This discrepancy between passenger and operations growth rate will be the result of airlines flying larger aircraft and operating aircraft with larger seat capacities. New aircraft types will be entering service (e.g. Boeing 737 MAX, Airbus 320 NEO family) that will open new market opportunities besides replacing older, aging aircraft. The 50-seat RJ market is expected to shrink as more carriers shift operations to larger, 76- to 90-seat, aircraft (e.g. Embraer 175/195). Long-haul operations will continue to grow with Europe remaining the most mature international market, but Central and South America growing the fastest.

F

Regional Transportation

This appendix provides detailed tables in support of Chapter 4, *Regional Transportation*:

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Table F-1 Aircraft Operations by Classification for New England's Airports, 2000 to 2017

Airport	Bradley International	T.F. Green	Manchester-Boston Regional	Portland International Jetport	Burlington	Bangor	Tweed-New Haven	Worcester Regional	Portsmouth International	Hanscom Field[2]	Subtotal	Logan[3]	Total
2000													
Commercial	132,062	103,750	61,506	47,609	45,745	21,446	5,260	4,029	6,104	6,572	434,083	452,763	886,846
General Aviation[1]	31,863	52,184	45,740	56,571	59,377	34,831	56,200	46,518	31,601	204,512	619,397	35,233	654,630
Military & Other	5,811	2,764	586	2,072	10,241	26,507	328	495	9,973	1,287	60,064	0	60,064
Total	**169,736**	**158,698**	**107,832**	**106,252**	**115,363**	**82,784**	**61,788**	**51,042**	**47,678**	**212,371**	**1,113,544**	**487,996**	**1,601,540**
2001													
Commercial	128,638	100,606	61,669	47,770	47,261	18,286	4,581	5,631	4,485	6,414	425,341	434,386	859,727
General Aviation[1]	30,478	45,095	44,358	62,014	61,986	35,230	56,092	45,464	30,148	197,770	608,635	28,739	637,374
Military & Other	5,913	2,635	607	2,259	11,821	26,623	437	917	8,221	1,252	60,685	0	60,685
Total	**165,029**	**148,336**	**106,634**	**112,043**	**121,068**	**80,139**	**61,110**	**52,012**	**42,854**	**205,436**	**1,094,661**	**463,125**	**1,557,786**
2002													
Commercial	113,194	96,595	62,346	45,899	38,929	24,412	3,827	4,062	5,059	6,603	400,926	366,476	767,402
General Aviation[1]	27,838	45,473	29,549	57,720	59,679	35,711	62,163	52,277	28,333	210,221	608,964	25,596	634,560
Military & Other	6,085	2,587	376	2,162	12,167	27,297	593	418	8,220	1,424	61,329	0	61,329
Total	**147,117**	**144,655**	**92,271**	**105,781**	**110,775**	**87,420**	**66,583**	**56,757**	**41,612**	**218,248**	**1,071,219**	**392,072**	**1,463,291**
2003													
Commercial	103,917	84,301	68,184	42,658	38,293	25,626	3,705	868	4,552	2,956	375,060	344,644	719,704
General Aviation[1]	27,115	42,878	29,552	44,036	50,461	36,706	54,224	55,972	24,866	190,789	556,599	28,660	585,259
Military & Other	4,214	2,496	324	1,449	11,466	32,938	776	378	7,720	1,142	62,903	0	62,903
Total	**135,246**	**129,675**	**98,060**	**88,143**	**100,220**	**95,270**	**58,705**	**57,218**	**37,138**	**194,887**	**994,562**	**373,304**	**1,367,866**
2004													
Commercial	108,823	83,496	75,360	46,474	41,719	24,970	4,501	0	3,981	4,308	393,632	374,022	767,654
General Aviation[1]	32,269	34,878	27,438	41,547	54,709	29,884	58,881	61,343	25,962	175,301	542,212	31,236	573,448
Military & Other	4,100	346	749	1,338	12,404	29,676	1,010	530	7,797	1,195	59,145	0	59,145
Total	**145,192**	**118,720**	**103,547**	**89,359**	**108,832**	**84,530**	**64,392**	**61,873**	**37,740**	**180,804**	**994,989**	**405,258**	**1,400,247**

Table F-1 Aircraft Operations by Classification for New England's Airports, 2000 to 2017 (Continued)

Airport	Bradley International	T.F. Green	Manchester-Boston Regional	Portland International Jetport	Burlington	Bangor	Tweed-New Haven	Worcester Regional	Portsmouth International	Hanscom Field[2]	Subtotal	Logan[3]	Total
2005													
Commercial	119,048	88,374	76,342	42,661	43,987	25,976	6,137	2,727	3,197	3,627	412,076	377,830	789,906
General Aviation[1]	33,341	28,138	26,369	36,191	49,888	30,016	60,893	62,743	25,446	165,424	518,449	31,236	549,685
Military & Other	3,701	241	479	1,405	11,468	24,154	1,063	519	7,669	904	51,603	0	51,603
Total	**156,090**	**116,753**	**103,190**	**80,257**	**105,343**	**80,146**	**68,093**	**65,989**	**36,312**	**169,955**	**982,128**	**409,066**	**1,391,194**
2006													
Commercial	111,341	81,282	67,326	38,663	41,342	23,466	5,177	3,793	3,981	3,057	379,428	374,675	754,103
General Aviation[1]	34,548	25,510	25,074	35,572	44,471	29,848	51,702	56,770	25,962	167,560	497,017	31,444	528,461
Military & Other	4,348	229	738	1,536	9,299	22,359	1,157	609	7,797	1,433	49,505	0	49,505
Total	**150,237**	**107,021**	**93,138**	**75,771**	**95,112**	**75,673**	**58,036**	**61,172**	**37,740**	**172,050**	**925,950**	**406,119**	**1,332,069**
2007													
Commercial	107,097	80,525	69,134	41,450	39,928	22,571	4,594	3,162	4,270	3,477	376,208	370,905	747,113
General Aviation[1]	29,308	22,984	23,959	31,724	47,521	25,542	51,200	61,296	27,000	160,992	481,526	28,632	510,158
Military & Other	5,097	242	644	1,384	9,528	20,949	944	879	8,017	1,438	49,122	0	49,122
Total	**141,502**	**103,751**	**93,737**	**74,558**	**96,977**	**69,062**	**56,738**	**65,337**	**39,287**	**165,907**	**906,856**	**399,537**	**1,306,393**
2008													
Commercial	98,194	73,096	63,505	40,834	37,832	19,282	4,013	2,553	1,347	104	340,760	347,784	688,544
General Aviation[1]	22,908	19,470	16,198	31,869	46,391	27,143	44,642	43,763	31,051	164,195	447,630	23,820	471,450
Military & Other	3,637	187	840	974	9,688	20,449	243	886	7,993	1,590	46,487	0	46,487
Total	**124,739**	**92,753**	**80,543**	**73,677**	**93,911**	**66,874**	**48,898**	**47,202**	**40,391**	**165,889**	**834,877**	**371,604**	**1,206,481**
2009													
Commercial	82,021	62,233	54,336	35,909	31,153	16,485	3,096	2,527	422	0	288,182	333,064	621,246
General Aviation[1]	19,586	19,438	14,354	25,473	32,872	19,558	37,722	41,700	25,161	148,696	384,560	12,242	396,802
Military & Other	2,726	260	1,163	778	8,628	16,267	486	17	6,851	1,215	38,391	0	38,391
Total	**104,333**	**81,931**	**69,853**	**62,160**	**72,653**	**52,310**	**41,304**	**44,244**	**32,434**	**149,911**	**711,133**	**345,306**	**1,056,439**

Table F-1 Aircraft Operations by Classification for New England's Airports, 2000 to 2017 (Continued)

Airport	Bradley International	T.F. Green	Manchester-Boston Regional	Portland International Jetport	Burlington	Bangor	Tweed-New Haven	Worcester Regional	Portsmouth International	Hanscom Field[2]	Subtotal	Logan[3]	Total
2010													
Commercial	80,418	60,128	53,971	35,035	29,538	16,190	3,201	1,629	1,516	0	281,626	337,961	619,587
General Aviation[1]	18,759	21,096	13,636	24,776	36,106	20,142	31,884	41,843	25,674	161,942	395,858	14,682	410,540
Military & Other	3,028	347	933	446	4,776	15,525	381	572	7,707	1,795	35,510	0	35,510
Total	**102,205**	**81,571**	**68,540**	**60,257**	**70,420**	**51,857**	**35,466**	**44,044**	**34,897**	**163,737**	**712,994**	**352,643**	**1,065,637**
2011													
Commercial	86,838	57,194	51,379	35,157	29,166	16,177	3,367	2,017	1,717	750	283,762	340,757	624,519
General Aviation[1]	16,483	21,774	12,497	21,453	42,562	19,503	33,919	44,050	27,056	160,840	400,137	28,230	428,367
Military & Other	3,630	369	874	533	5,890	13,220	310	634	8,158	1,409	35,027	0	35,027
Total	**106,951**	**79,337**	**64,750**	**57,143**	**77,618**	**48,900**	**37,596**	**46,701**	**36,931**	**162,999**	**718,926**	**368,987**	**1,087,913**
2012													
Commercial	79,704	50,301	45,379	33,118	27,067	14,826	3,936	1,639	502	635	257,107	326,755	583,862
General Aviation[1]	15,589	24,781	12,504	20,864	42,352	18,069	34,775	42,655	30,186	164,841	406,616	28,114	434,730
Military & Other	3,726	434	1,073	584	7,079	11,503	416	740	7,917	738	34,210	0	34,210
Total	**99,019**	**75,516**	**58,956**	**54,566**	**76,498**	**44,398**	**39,127**	**45,034**	**38,605**	**166,214**	**697,933**	**354,869**	**1,052,802**
2013													
Commercial	78,213	48,340	43,572	31,076	26,814	14,707	4,094	1,586	560	253	249,215	334,657	583,872
General Aviation[1]	15,192	24,729	11,432	20,021	40,413	15,535	28,794	32,888	28,951	153,706	371,661	26,682	398,343
Military & Other	2,558	435	1,224	471	6,972	11,045	423	593	7,573	529	31,823	0	31,823
Total	**95,963**	**73,504**	**56,228**	**51,568**	**74,199**	**41,287**	**33,311**	**35,067**	**37,084**	**154,488**	**652,699**	**361,339**	**1,014,038**
2014													
Commercial	79,060	44,351	38,674	29,538	26,057	14,428	4,795	2,368	8,278	256	247,805	337,381	585,186
General Aviation[1]	14,752	29,490	12,293	16,535	40,858	15,548	26,273	29,138	24,440	133,437	342,764	26,416	369,180
Military & Other	2,665	1,036	908	560	6,842	11,567	529	956	7,621	602	33,286	0	33,286
Total	**96,477**	**74,877**	**51,875**	**46,633**	**73,757**	**41,543**	**31,597**	**32,462**	**40,339**	**134,295**	**623,855**	**363,797**	**987,652**

Table F-1 Aircraft Operations by Classification for New England's Airports, 2000 to 2017 (Continued)

Airport	Bradley International	T.F. Green	Manchester-Boston Regional	Portland International Jetport	Burlington	Bangor	Tweed-New Haven	Worcester Regional	Portsmouth International	Hanscom Field[2]	Subtotal	Logan[3]	Total
2015													
Commercial	76,425	42,417	38,060	30,415	25,178	13,618	6,316	2,414	8,547	220	243,610	344,764	588,374
General Aviation[1]	14,402	22,700	12,934	17,916	41,576	16,487	27,711	35,711	26,848	127,467	343,752	28,166	371,918
Military & Other	2,680	430	811	567	5,912	10,684	685	889	7,499	592	30,749	0	30,749
Total	**93,507**	**65,547**	**51,805**	**48,898**	**72,666**	**40,789**	**34,712**	**39,014**	**42,894**	**128,279**	**618,111**	**372,930**	**991,041**
2016													
Commercial	77,174	43,659	40,589	32,171	26,405	14,603	7,195	2,616	9,435	266	254,113	360,442	614,555
General Aviation[1]	14,460	26,032	14,447	18,334	38,614	16,815	28,811	31,858	29,043	120,891	339,305	30,780	370,085
Military & Other	3,178	397	501	488	6,114	11,271	683	780	8,913	632	32,957	0	32,957
Total	**94,812**	**70,088**	**55,537**	**50,993**	**71,133**	**42,689**	**36,689**	**35,254**	**47,391**	**121,789**	**626,375**	**391,222**	**1,017,597**
2017													
Commercial	78,435	45,831	37,850	32,845	26,684	15,874	6,820	2,925	9,597	295	257,156	370,251	627,407
General Aviation[1]	13,233	26,274	13,169	18,392	34,386	17,157	18,389	26,332	31,555	128,018	326,905	31,120	358,025
Military & Other	3,006	490	697	568	5,080	9,985	574	850	8,150	759	30,159	0	30,159
Total	**94,674**	**72,595**	**51,716**	**51,805**	**66,150**	**43,016**	**25,783**	**30,107**	**49,302**	**129,072**	**614,220**	**401,371**	**1,015,591**

Source: Massport, Federal Aviation Administration (FAA) Tower Counts, and individual airport records.

1 Includes itinerant and local general aviation operations at the regional airports. There are no local (touch-and-go training) operations at Logan Airport.

2 Commercial operations at Hanscom Field include scheduled commercial operations only; other air taxi operations counted as GA.

3 Operations at Logan Airport include international operations.

Table F-2 Percentage Change in Aircraft Operations by Classification for New England's Airports, 2000 to 2017

Airport	Bradley International	T.F. Green	Manchester-Boston Regional	Portland International Jetport	Burlington	Bangor	Tweed-New Haven	Worcester Regional	Portsmouth International	Hanscom Field[2]	Subtotal	Logan[3]	Total
2000 to 2001													
Commercial	(2.59%)	(3.03%)	0.27%	0.34%	3.31%	(14.73%)	(12.91%)	39.76%	(26.52%)	(2.40%)	(2.01%)	(4.06%)	(3.06%)
General Aviation[1]	(4.35%)	(13.58%)	(3.02%)	9.62%	4.39%	1.15%	(0.19%)	(2.27%)	(4.60%)	(3.30%)	(1.74%)	(18.43%)	(2.64%)
Military & Other	1.76%	(4.67%)	3.58%	9.03%	15.43%	0.44%	33.23%	85.25%	(17.57%)	(2.72%)	1.03%	-	1.03%
Total	**(2.77%)**	**(6.53%)**	**(1.11%)**	**5.45%**	**4.95%**	**(3.20%)**	**(1.10%)**	**1.90%**	**(10.12%)**	**(3.27%)**	**(1.70%)**	**(5.10%)**	**(2.73%)**
2001 Percent of Total	**10.59%**	**9.52%**	**6.85%**	**7.19%**	**7.77%**	**5.14%**	**3.92%**	**3.34%**	**2.75%**	**13.19%**	**70.27%**	**29.73%**	**100.00%**
2001 to 2002													
Commercial	(12.01%)	(3.99%)	1.10%	(3.92%)	(17.63%)	33.50%	(16.46%)	(27.86%)	12.80%	2.95%	(5.74%)	(15.63%)	(10.74%)
General Aviation[1]	(8.66%)	0.84%	(33.39%)	(6.92%)	(3.72%)	1.37%	10.82%	14.99%	(6.02%)	6.30%	0.05%	(10.94%)	(0.44%)
Military & Other	2.91%	(1.82%)	(38.06%)	(4.29%)	2.93%	2.53%	35.70%	(54.42%)	(0.01%)	13.74%	1.06%	-	1.06%
Total	**(10.85%)**	**(2.48%)**	**(13.47%)**	**(5.59%)**	**(8.50%)**	**9.09%**	**8.96%**	**9.12%**	**(2.90%)**	**6.24%**	**(2.14%)**	**(15.34%)**	**(6.07%)**
2002 Percent of Total	**10.05%**	**9.89%**	**6.31%**	**7.23%**	**7.57%**	**5.97%**	**4.55%**	**3.88%**	**2.84%**	**14.91%**	**73.21%**	**26.79%**	**100.00%**
2002 to 2003													
Commercial	(8.20%)	(12.73%)	9.36%	(7.06%)	(1.63%)	4.97%	(3.19%)	(78.63%)	(10.02%)	(55.23%)	(6.45%)	(5.96%)	(6.22%)
General Aviation[1]	(2.60%)	(5.71%)	0.01%	(23.71%)	(15.45%)	2.79%	(12.77%)	7.07%	(12.24%)	(9.24%)	(8.60%)	11.97%	(7.77%)
Military & Other	(30.75%)	(3.52%)	(13.83%)	(32.98%)	(5.76%)	20.67%	30.86%	(9.57%)	(6.08%)	(19.80%)	2.57%	-	2.57%
Total	**(8.07%)**	**(10.36%)**	**6.27%**	**(16.67%)**	**(9.53%)**	**8.98%**	**(11.83%)**	**0.81%**	**(10.75%)**	**(10.70%)**	**(7.16%)**	**(4.79%)**	**(6.52%)**
2003 Percent of Total	**9.89%**	**9.48%**	**7.17%**	**6.44%**	**7.33%**	**6.96%**	**4.29%**	**4.18%**	**2.72%**	**14.25%**	**72.71%**	**27.29%**	**100.00%**
2003 to 2004													
Commercial	4.72%	(0.95%)	10.52%	8.95%	8.95%	(2.56%)	21.48%	(100.00%)	(12.54%)	45.74%	4.95%	8.52%	6.66%
General Aviation[1]	19.01%	(18.66%)	(7.15%)	(5.65%)	8.42%	(18.59%)	8.59%	9.60%	4.41%	(8.12%)	(2.58%)	8.99%	(2.02%)
Military & Other	(2.71%)	(86.14%)	131.17%	(7.66%)	8.18%	(9.90%)	30.15%	40.21%	1.00%	4.64%	(5.97%)	-	(5.97%)
Total	**7.35%**	**(8.45%)**	**5.60%**	**1.38%**	**8.59%**	**(11.27%)**	**9.69%**	**8.14%**	**1.62%**	**(7.23%)**	**0.04%**	**8.56%**	**2.37%**
2004 Percent of Total	**10.37%**	**8.48%**	**7.39%**	**6.38%**	**7.77%**	**6.04%**	**4.60%**	**4.42%**	**2.70%**	**12.91%**	**71.06%**	**28.94%**	**100.00%**

Table F-2 Percentage Change in Aircraft Operations by Classification for New England's Airports, 2000 to 2017 (Continued)

Airport	Bradley International	T.F. Green	Manchester-Boston Regional	Portland International Jetport	Burlington	Bangor	Tweed-New Haven	Worcester Regional	Portsmouth International	Hanscom Field[2]	Subtotal	Logan[3]	Total
2004 to 2005													
Commercial	9.40%	5.84%	1.30%	(8.20%)	5.44%	4.03%	36.35%	-	(19.69%)	(15.81%)	4.69%	1.02%	2.90%
General Aviation[1]	3.32%	(19.32%)	(3.90%)	(12.89%)	(8.81%)	0.44%	3.42%	2.28%	(1.99%)	(5.63%)	(4.38%)	0.00%	(4.14%)
Military & Other	(9.73%)	(30.35%)	(36.05%)	5.01%	(7.55%)	(18.61%)	5.25%	(2.08%)	(1.64%)	(24.35%)	(12.75%)	-	(12.75%)
Total	**7.51%**	**(1.66%)**	**(0.34%)**	**(10.19%)**	**(3.21%)**	**(5.19%)**	**5.75%**	**6.65%**	**(3.78%)**	**(6.00%)**	**(1.29%)**	**0.94%**	**(0.65%)**
2005 Percent of Total	**11.22%**	**8.39%**	**7.42%**	**5.77%**	**7.57%**	**5.76%**	**4.89%**	**4.74%**	**2.61%**	**12.22%**	**70.60%**	**29.40%**	**100.00%**
2005 to 2006													
Commercial	(6.47%)	(8.02%)	(11.81%)	(9.37%)	(6.01%)	(9.66%)	(15.64%)	39.09%	24.52%	(15.72%)	(7.92%)	(0.84%)	(4.53%)
General Aviation1	3.62%	(9.34%)	(4.91%)	(1.71%)	(10.86%)	(0.56%)	(15.09%)	(9.52%)	2.03%	1.29%	(4.13%)	0.67%	(3.86%)
Military & Other	17.48%	(4.98%)	54.07%	9.32%	(18.91%)	(7.43%)	8.84%	17.34%	1.67%	58.52%	(4.07%)	-	(4.07%)
Total	**(3.75%)**	**(8.34%)**	**(9.74%)**	**(5.59%)**	**(9.71%)**	**(5.58%)**	**(14.77%)**	**(7.30%)**	**3.93%**	**1.23%**	**(5.72%)**	**(0.72%)**	**(4.25%)**
2006 Percent of Total	**11.28%**	**8.03%**	**6.99%**	**5.69%**	**7.14%**	**5.68%**	**4.36%**	**4.59%**	**2.83%**	**12.92%**	**69.51%**	**30.49%**	**100.00%**
2006 to 2007													
Commercial	(3.81%)	(0.93%)	2.69%	7.21%	(3.42%)	(3.81%)	(11.26%)	(16.64%)	7.26%	13.74%	(0.85%)	(1.01%)	(0.93%)
General Aviation1	(15.17%)	(9.90%)	(4.45%)	(10.82%)	6.86%	(14.43%)	(0.97%)	7.97%	4.00%	(3.92%)	(3.12%)	(8.94%)	(3.46%)
Military & Other	17.23%	5.68%	(12.74%)	(9.90%)	2.46%	(6.31%)	(18.41%)	44.33%	2.82%	0.35%	(0.77%)	-	(0.77%)
Total	**(5.81%)**	**(3.06%)**	**0.64%**	**(1.60%)**	**1.96%**	**(8.74%)**	**(2.24%)**	**6.81%**	**4.10%**	**(3.57%)**	**(2.06%)**	**(1.62%)**	**(1.93%)**
2007 Percent of Total	**10.83%**	**7.94%**	**7.18%**	**5.71%**	**7.42%**	**5.29%**	**4.34%**	**5.00%**	**3.01%**	**12.70%**	**69.42%**	**30.58%**	**100.00%**
2007 to 2008													
Commercial	(8.31%)	(9.23%)	(8.14%)	(1.49%)	(5.25%)	(14.57%)	(12.65%)	(19.26%)	(68.45%)	(97.01%)	(9.42%)	(6.23%)	(7.84%)
General Aviation1	(21.84%)	(15.29%)	(32.39%)	0.46%	(2.38%)	6.27%	(12.81%)	(28.60%)	15.00%	1.99%	(7.04%)	(16.81%)	(7.59%)
Military & Other	(28.64%)	(22.73%)	30.43%	(29.62%)	1.68%	(2.39%)	(74.26%)	0.80%	(0.30%)	10.57%	(5.36%)	-	(5.36%)
Total	**(11.85%)**	**(10.60%)**	**(14.08%)**	**(1.18%)**	**(3.16%)**	**(3.17%)**	**(13.82%)**	**(27.76%)**	**2.81%**	**(0.01%)**	**(7.94%)**	**(6.99%)**	**(7.65%)**
2008 Percent of Total	**10.34%**	**7.69%**	**6.68%**	**6.11%**	**7.78%**	**5.54%**	**4.05%**	**3.91%**	**3.35%**	**13.75%**	**69.20%**	**30.80%**	**100.00%**

Table F-2 Percentage Change in Aircraft Operations by Classification for New England's Airports, 2000 to 2017 (Continued)

Airport	Bradley International	T.F. Green	Manchester-Boston Regional	Portland International Jetport	Burlington	Bangor	Tweed-New Haven	Worcester Regional	Portsmouth International	Hanscom Field[2]	Subtotal	Logan[3]	Total
2008 to 2009													
Commercial	(16.47%)	(14.86%)	(14.44%)	(12.06%)	(17.65%)	(14.51%)	(22.85%)	(1.02%)	(68.67%)	(100.00%)	(15.43%)	(4.23%)	(9.77%)
General Aviation1	(14.50%)	(0.16%)	(11.38%)	(20.07%)	(29.14%)	(27.94%)	(15.50%)	(4.71%)	(18.97%)	(9.44%)	(14.09%)	(48.61%)	(15.83%)
Military & Other	(25.05%)	39.04%	38.45%	(20.12%)	(10.94%)	(20.45%)	100.00%	(98.08%)	(14.29%)	(23.58%)	(17.42%)	-	(17.42%)
Total	**(16.36%)**	**(11.67%)**	**(13.27%)**	**(15.63%)**	**(22.64%)**	**(21.78%)**	**(15.53%)**	**(6.27%)**	**(19.70%)**	**(9.63%)**	**(14.82%)**	**(7.08%)**	**(12.44%)**
2009 Percent of Total	**9.88%**	**7.76%**	**6.61%**	**5.88%**	**6.88%**	**4.95%**	**3.91%**	**4.19%**	**3.07%**	**14.19%**	**67.31%**	**32.69%**	**100.00%**
2009 to 2010													
Commercial	(1.95%)	(3.38%)	(0.67%)	(2.43%)	(5.18%)	(1.79%)	3.39%	(35.54%)	259.24%	-	(2.27%)	1.47%	(0.27%)
General Aviation1	(4.22%)	8.53%	(5.00%)	(2.74%)	9.84%	2.99%	(15.48%)	0.34%	2.04%	8.91%	2.94%	19.93%	3.46%
Military & Other	11.08%	33.46%	(19.78%)	(42.67%)	(44.65%)	(4.56%)	(21.60%)	3264.71%	12.49%	47.74%	(7.50%)	-	(7.50%)
Total	**(2.04%)**	**(0.44%)**	**(1.88%)**	**(3.06%)**	**(3.07%)**	**(0.87%)**	**(14.13%)**	**(0.45%)**	**7.59%**	**9.22%**	**0.26%**	**2.12%**	**0.87%**
2010 Percent of Total	**9.59%**	**7.65%**	**6.43%**	**5.65%**	**6.61%**	**4.87%**	**3.33%**	**4.13%**	**3.27%**	**15.37%**	**66.91%**	**33.09%**	**100.00%**
2010 to 2011													
Commercial	7.98%	(4.88%)	(4.80%)	0.35%	(1.26%)	(0.08%)	5.19%	23.82%	13.26%	-	0.76%	0.83%	0.80%
General Aviation1	(12.13%)	3.21%	(8.35%)	(13.41%)	17.88%	(3.17%)	6.38%	5.27%	5.38%	(0.68%)	1.08%	92.28%	4.34%
Military & Other	19.88%	6.34%	(6.32%)	19.51%	23.32%	(14.85%)	(18.64%)	10.84%	5.85%	(21.50%)	(1.36%)	-	(1.36%)
Total	**4.64%**	**(2.74%)**	**(5.53%)**	**(5.17%)**	**10.22%**	**(5.70%)**	**6.01%**	**6.03%**	**5.83%**	**(0.45%)**	**0.83%**	**4.63%**	**2.09%**
2011 Percent of Total	**9.83%**	**7.29%**	**5.95%**	**5.25%**	**7.13%**	**4.49%**	**3.46%**	**4.29%**	**3.39%**	**14.98%**	**66.08%**	**33.92%**	**100.00%**
2012 to 2013													
Commercial	(1.87%)	(3.90%)	(3.98%)	(6.17%)	(0.93%)	(0.80%)	4.01%	(3.23%)	11.55%	(60.16%)	(3.07%)	2.42%	0.00%
General Aviation1	(2.55%)	(0.21%)	(8.57%)	(4.04%)	(4.58%)	(14.02%)	(17.20%)	(22.90%)	(4.09%)	(6.75%)	(8.60%)	(5.09%)	(8.37%)
Military & Other	(31.35%)	0.23%	14.07%	(19.35%)	(1.51%)	(3.98%)	1.68%	(19.86%)	(4.35%)	(28.32%)	(6.98%)	-	(6.98%)
Total	**(3.09%)**	**(2.66%)**	**(4.63%)**	**(5.49%)**	**(3.01%)**	**(7.01%)**	**(14.86%)**	**(22.13%)**	**(3.94%)**	**(7.05%)**	**(6.48%)**	**1.82%**	**(3.68%)**
2013 Percent of Total	**9.46%**	**7.25%**	**5.54%**	**5.09%**	**7.32%**	**4.07%**	**3.28%**	**3.46%**	**3.66%**	**15.23%**	**64.37%**	**35.63%**	**100.00%**

Table F-2 Percentage Change in Aircraft Operations by Classification for New England's Airports, 2000 to 2017 (Continued)

Airport	Bradley International	T.F. Green	Manchester-Boston Regional	Portland International Jetport	Burlington	Bangor	Tweed-New Haven	Worcester Regional	Portsmouth International	Hanscom Field[2]	Subtotal	Logan[3]	Total
2013 to 2014													
Commercial	1.08%	(8.25%)	(11.24%)	(4.95%)	(2.82%)	(1.90%)	17.12%	49.31%	1378.21%	1.19%	(0.57%)	0.81%	0.23%
General Aviation1	(2.90%)	19.25%	7.53%	(17.41%)	1.10%	0.08%	(8.76%)	(11.40%)	(15.58%)	(13.19%)	(7.78%)	(1.00%)	(7.32%)
Military & Other	4.18%	138.16%	(25.82%)	18.90%	(1.86%)	4.73%	25.06%	61.21%	0.63%	13.80%	4.60%	-	4.60%
Total	**0.54%**	**1.87%**	**(7.74%)**	**(9.57%)**	**(0.60%)**	**0.62%**	**(5.15%)**	**(7.43%)**	**8.78%**	**(13.07%)**	**(4.42%)**	**0.68%**	**(2.60%)**
2014 Percent of Total	**9.77%**	**7.58%**	**5.25%**	**4.72%**	**7.47%**	**4.21%**	**3.20%**	**3.29%**	**4.08%**	**13.60%**	**63.17%**	**36.83%**	**100.00%**
2014 to 2015													
Commercial	(3.33%)	(4.36%)	(1.59%)	2.97%	(3.37%)	(5.61%)	31.72%	1.94%	3.25%	(14.06%)	(1.69%)	2.19%	0.54%
General Aviation1	(2.37%)	(23.02%)	5.21%	8.35%	1.76%	6.04%	5.47%	22.56%	9.85%	(4.47%)	0.29%	6.62%	0.74%
Military & Other	0.56%	(58.49%)	(10.68%)	1.25%	(13.59%)	(7.63%)	29.49%	(7.01%)	(1.60%)	(1.66%)	(7.62%)	-	(7.62%)
Total	**(3.08%)**	**(12.46%)**	**(0.13%)**	**4.86%**	**(1.48%)**	**(1.81%)**	**9.86%**	**20.18%**	**6.33%**	**(4.48%)**	**(0.92%)**	**2.51%**	**0.34%**
2015 Percent of Total	**9.44%**	**6.61%**	**5.23%**	**4.93%**	**7.33%**	**4.12%**	**3.50%**	**3.94%**	**4.33%**	**12.94%**	**62.37%**	**37.63%**	**100.00%**
2015 to 2016													
Commercial	0.98%	2.93%	6.64%	5.77%	4.87%	7.23%	13.92%	8.37%	10.39%	20.91%	4.31%	4.55%	4.45%
General Aviation1	0.40%	14.68%	11.70%	2.33%	(7.12%)	1.99%	3.97%	(10.79%)	8.18%	(5.16%)	(1.29%)	9.28%	(0.49%)
Military & Other	18.58%	(7.67%)	(38.22%)	(13.93%)	3.42%	5.49%	(0.29%)	(12.26%)	18.86%	6.76%	7.18%	-	7.18%
Total	**1.40%**	**6.93%**	**7.20%**	**4.28%**	**(2.11%)**	**4.66%**	**5.70%**	**(9.64%)**	**10.48%**	**(5.06%)**	**1.34%**	**4.90%**	**2.68%**
2016 Percent of Total	**9.32%**	**6.89%**	**5.46%**	**5.01%**	**6.99%**	**4.20%**	**3.61%**	**3.46%**	**4.66%**	**11.97%**	**61.55%**	**38.45%**	**100.00%**
2016 to 2017													
Commercial	1.63%	4.97%	(6.75%)	2.10%	1.06%	8.70%	(5.21%)	11.81%	1.72%	10.90%	1.20%	2.72%	2.09%
General Aviation1	(8.49%)	0.93%	(8.85%)	0.32%	(10.95%)	2.03%	(36.17%)	(17.35%)	8.65%	5.90%	(3.65%)	1.10%	(3.26%)
Military & Other	(5.41%)	23.43%	39.12%	16.39%	(16.91%)	(11.41%)	(15.96%)	8.97%	(8.56%)	20.09%	(8.49%)	-	(8.49%)
Total	**(0.15%)**	**3.58%**	**(6.88%)**	**1.59%**	**(7.01%)**	**0.77%**	**(29.73%)**	**(14.60%)**	**4.03%**	**5.98%**	**(1.94%)**	**2.59%**	**(0.20%)**
2017 Percent of Total	**9.32%**	**7.15%**	**5.09%**	**5.10%**	**6.51%**	**4.24%**	**2.54%**	**2.96%**	**4.85%**	**12.71%**	**60.48%**	**39.52%**	**100.00%**

Source: Massport, Federal Aviation Administration (FAA) Tower Counts, and individual airport records.

1 Includes itinerant and local general aviation operations at the regional airports. There are no local (touch-and-go training) operations at Logan Airport.

2 Commercial operations at Hanscom Field include scheduled commercial operations only; other air taxi operations counted as GA.

3 Operations at Logan Airport include international operations.

Table F-3 Scheduled Passenger Operations by Market and Carrier for Bradley International Airport

			Departures												Departing Seats											
Carrier	Market	Code	2000	2005	2010	2011	2012	2013	2014	2015	2016	2017	'16-'17 Change	'16-'17 Pct. Change	2000	2005	2010	2011	2012	2013	2014	2015	2016	2017	'16-'17 Change	'16-'17 Pct. Change
Jet Carriers																										
Aer Lingus	Dublin	DUB									66	305	239	361.7%									11,657	53,934	42,277	362.7%
Alaska	Chicago O'Hare	ORD	30										-	-	4,050										-	-
America West	Columbus	CMH	149										-	-	18,441										-	-
America West	Las Vegas	LAS	210										-	-	27,469										-	-
America West	Phoenix	PHX	275	365									-	-	37,772	54,570									-	-
American	Charlotte	CLT							1,763	1,775	1,918	1,982	64	3.3%							257,645	244,756	278,511	306,378	27,867	10.0%
American	Chicago O'Hare	ORD	2,139	1,570							240	671	431	179.6%	304,855	203,929							35,717	102,663	66,946	187.4%
American	Dallas/Fort Worth	DFW	1,343	1,052	1,052	1,078	1,068	1,069	1,008	695	678	678	-	0.0%	185,922	136,897	160,983	172,457	170,811	171,017	157,952	103,576	101,001	103,275	2,274	2.3%
American	Los Angeles	LAX	214					122	243		205	330	125	61.0%	31,244					19,520	38,880		30,588	50,150	19,562	64.0%
American	Miami	MIA	366	365	413	516	366	396	476	400	365	361	-4	-1.0%	51,427	49,990	63,559	82,560	58,560	63,360	74,981	59,600	54,342	55,105	763	1.4%
American	Philadelphia	PHL							265	31	271	382	111	41.0%							29,004	3,069	28,245	38,044	9,799	34.7%
American	New York J F Kennedy	JFK											-	-											-	-
American	San Juan	SJU	366	365	365	365	91						-	-	69,348	84,425	55,856	58,400	14,560						-	-
American	St. Louis	STL											-	-											-	-
American	Washington National	DCA							103	18	17	4	-13	-76.5%							12,536	2,196	1,680	567	-1,113	-66.3%
Boston-Maine Airways	Fort Lauderdale/Hollywood	FLL		13									-	-		1,993									-	-
Continental	Cleveland	CLE	582	131									-	-	68,974	16,262									-	-
Continental	Houston Intercontinental	IAH	366	313									-	-	45,790	34,072									-	-
Continental	New York Newark	EWR	331										-	-	38,916										-	-
Delta	Atlanta	ATL	2,192	3,098	2,099	2,094	2,105	2,109	2,391	2,374	2,360	2,290	-70	-3.0%	392,835	479,098	300,185	310,149	317,331	319,290	355,968	354,751	354,943	343,403	-11,540	-3.3%
Delta	Boston	BOS	4										-	-	634										-	-
Delta	Cancun	CUN			35	35	17	13	17	35	39	35	-4	-10.3%			5,470	5,397	2,735	1,973	2,571	5,207	5,956	5,049	-907	-15.2%
Delta	Cincinnati	CVG	1,464	1,373						4			-	-	244,837	196,741						471			-	-
Delta	Detroit	DTW			1,003	658	506	753	1,053	1,375	1,366	1,333	-33	-2.4%			129,228	91,657	73,117	110,361	145,867	187,833	184,729	183,762	-967	-0.5%

Table F-3 Scheduled Passenger Operations by Market and Carrier for Bradley International Airport (Continued)

			Departures												Departing Seats											
Carrier	Market	Code	2000	2005	2010	2011	2012	2013	2014	2015	2016	2017	'16-'17 Change	'16-'17 Pct. Change	2000	2005	2010	2011	2012	2013	2014	2015	2016	2017	'16-'17 Change	'16-'17 Pct. Change
Jet Carriers																										
Delta	Fort Lauderdale/Hollywood	FLL	732	673	237	210							-	-	87,108	133,927	33,674	29,280							-	-
Delta	Fort Myers	RSW			99	90							-	-			13,104	12,780							-	-
Delta	Las Vegas	LAS			9								-	-			1,394								-	-
Delta	Los Angeles	LAX		100	83								-	-		19,928	13,257								-	-
Delta	Minneapolis	MSP			758	576	511	549	605	858	662	803	141	21.3%			99,431	79,418	75,291	82,545	87,377	114,722	96,039	105,445	9,406	9.8%
Delta	New York J F Kennedy	JFK	183										-	-	39,894										-	-
Delta	Orlando	MCO	1,838	1,095	261	608		57			4	0	-4	-100.0%	218,705	217,905	99,129	88,041		8,514			471	0	-471	-100.0%
Delta	Salt Lake City	SLC		27									-	-		3,986									-	-
Delta	Tampa	TPA		678	813	120							-	-		134,894	33,625	15,420							-	-
Delta	West Palm Beach	PBI	732	516	205	120							-	-	87,108	102,684	37,536	16,500							-	-
Frontier Airlines	Denver	DEN											-	-											-	-
jetBlue	Washington National	DCA							402	730	714	730	16	2.2%							40,229	85,300	77,600	73,000	-4,600	-5.9%
jetBlue	Fort Lauderdale/Hollywood	FLL			101	599	627	612	590	590	568	726	158	27.8%			15,086	90,231	94,029	91,800	87,836	88,479	85,264	108,836	23,572	27.6%
jetBlue	Fort Myers	RSW						61	181	212	242	242	-	0.0%						9,150	27,150	31,800	36,300	36,300	-	0.0%
jetBlue	Orlando	MCO			101	730	723	730	747	730	746	730	-16	-2.1%			15,086	109,860	108,300	109,500	112,071	109,500	111,100	109,500	-1,600	-1.4%
jetBlue	San Juan	SJU					366	365	405	465	561	587	26	4.6%					54,900	54,793	60,729	69,686	84,150	88,114	3,964	4.7%
jetBlue	Tampa	TPA						61	365	365	365	409	44	12.1%						9,150	44,693	48,750	54,750	61,286	6,536	11.9%
jetBlue	West Palm Beach	PBI					366	365	365	365	387	365	-22	-5.7%					45,700	54,750	44,907	45,550	51,929	51,700	-229	-0.4%
Laker Airways (Bahamas)	Freeport	FPO	39										-	-	5,850										-	-
Midway Airlines	Raleigh/Durham	RDU	683										-	-	69,213										-	-
Midwest/Republic	Milwaukee	MKE	619										-	-	44,455										-	-
Northwest	Amsterdam	AMS											-	-											-	-
Northwest	Detroit	DTW	1,699	1,451									-	-	215,750	192,679									-	-

Table F-3 Scheduled Passenger Operations by Market and Carrier for Bradley International Airport (Continued)

			Departures												Departing Seats											
Carrier	Market	Code	2000	2005	2010	2011	2012	2013	2014	2015	2016	2017	'16-'17 Change	'16-'17 Pct. Change	2000	2005	2010	2011	2012	2013	2014	2015	2016	2017	'16-'17 Change	'16-'17 Pct. Change
Jet Carriers																										
Northwest	Fort Myers	RSW											-	-											-	-
Northwest	Minneapolis	MSP	1,177	1,042									-	-	135,570	140,194									-	-
Northwest	Orlando	MCO											-	-											-	-
Northwest	Tampa	TPA											-	-											-	-
Northwest	West Palm Beach	PBI											-	-											-	-
Norwegian Air Shuttle	Edinburgh	EDI										70	70	-										13,124	13,124	-
Southwest	Atlanta	ATL						174	1,086	172			-	-						20,391	131,627	24,482			-	-
Southwest	Baltimore	BWI	2,841	3,094	2,700	2,708	2,658	2,610	2,448	2,435	2,514	2,486	-28	-1.1%	389,158	423,878	367,534	367,414	362,995	372,650	353,791	353,038	372,278	363,930	-8,348	-2.2%
Southwest	Chicago Midway	MDW	723	953	923	979	964	967	961	974	966	944	-22	-2.3%	99,090	130,541	126,412	133,267	133,533	146,270	142,513	147,672	148,701	139,257	-9,444	-6.4%
Southwest	Denver	DEN			306	365	366	365	374	374	374	404	30	8.0%			41,922	50,005	50,982	54,860	58,570	61,917	60,234	67,673	7,439	12.4%
Southwest	Fort Lauderdale/Hollywood	FLL			70	365	366	348	369	387	387	387	-	0.0%			9,551	50,005	50,272	49,521	53,381	57,309	56,240	59,892	3,652	6.5%
Southwest	Fort Myers	RSW					147	203	216	212	212	276	64	30.2%					20,413	28,917	30,949	30,586	30,586	42,698	12,112	39.6%
Southwest	Las Vegas	LAS	52	365	361	365	270	245	245	306	306	245	-61	-19.9%	7,163	50,005	49,398	50,005	40,466	34,876	35,035	44,037	46,551	40,640	-5,911	-12.7%
Southwest	Nashville	BNA	672	365	361	304							-	-	92,064	50,005	49,398	41,648							-	-
Southwest	Orlando	MCO	375	1,108	1,016	1,003	997	944	975	1,003	999	1,056	57	5.7%	51,336	151,816	139,212	137,411	137,843	136,115	140,866	151,806	156,562	157,068	506	0.3%
Southwest	Philadelphia	PHL		1,590									-	-		217,850									-	-
Southwest	Tampa	TPA		695	570	656	623	629	656	651	642	712	70	10.9%		95,156	78,129	89,852	85,873	90,219	93,662	93,905	93,646	108,758	15,112	16.1%
Southwest	West Palm Beach	PBI				61				4	4	9	5	125.0%				8,357				633	633	1,246	613	96.8%
Spirit	Fort Lauderdale/Hollywood	FLL										184	184	-										26,680	26,680	-
Spirit	Fort Myers	RSW										61	61	-										11,102	11,102	-
Spirit	Myrtle Beach	MYR										140	140	-										25,558	25,558	-
Spirit	Orlando	MCO										245	245	-										37,782	37,782	-

Table F-3 Scheduled Passenger Operations by Market and Carrier for Bradley International Airport (Continued)

Columns 2000 through '16-'17 Pct. Change are listed first for Departures, then for Departing Seats.

Carrier	Market	Code	Departures 2000	2005	2010	2011	2012	2013	2014	2015	2016	2017	'16-'17 Change	'16-'17 Pct. Change	Departing Seats 2000	2005	2010	2011	2012	2013	2014	2015	2016	2017	'16-'17 Change	'16-'17 Pct. Change
Jet Carriers																										
Spirit	Tampa	TPA										61	61	-										11,102	11,102	-
Sunworld International	Philadelphia	PHL											-	-											-	-
Trans World Airlines	Portland (ME)	PWM	305										-	-	43,310										-	-
Trans World Airlines	St. Louis	STL	1,460										-	-	206,109										-	-
United	Chicago O'Hare	ORD	2,034	1,812	1,296	1,077	697	593	800	554	605	727	122	20.2%	299,522	259,437	198,709	159,738	104,725	86,911	112,864	72,529	84,972	100,094	15,122	17.8%
United	Denver	DEN	366								275	365	90	32.7%	46,901								36,838	53,945	17,107	46.4%
United	New York Newark	EWR						18				190	190	-						2,126				27,237	27,237	-
United	San Francisco	SFO	366									75	75	-	45,384									8,983	8,983	-
United	Washington Dulles	IAD	1,455	726	1,192	812	514	180	222	82	472	430	-42	-8.9%	173,869	81,631	155,750	108,500	66,780	25,418	32,132	11,182	73,998	64,261	-9,737	-13.2%
US Airways	Baltimore	BWI	488										-	-	41,760										-	-
US Airways	Charlotte	CLT	1,464	2,188	1,588	1,664	1,665	1,734					-	-	214,719	350,776	228,119	238,508	241,320	255,885					-	-
US Airways	Fort Lauderdale/ Hollywood	FLL	366	123									-	-	39,232	15,161									-	-
US Airways	Orlando	MCO	1,098	30									-	-	117,696	3,842									-	-
US Airways	Philadelphia	PHL	2,148	2,102	361	317	340	365					-	-	310,118	301,242	49,914	44,595	46,989	49,083					-	-
US Airways	Phoenix	PHX											-	-											-	-
US Airways	Pittsburgh	PIT	1,800	27									-	-	278,575	3,189									-	-
US Airways	Washington Dulles	IAD	732										-	-	86,376										-	-
US Airways	Washington National	DCA	1,329	1,064	361	365	335	208					-	-	171,891	141,068	51,434	52,210	46,511	25,610					-	-
US Airways	West Palm Beach	PBI	366										-	-	39,232										-	-
USA 3000 Airlines	Cancun	CUN		26									-	-		4,336									-	-
USA 3000 Airlines	Punta Cana	PUJ		13									-	-		2,128									-	-
Subtotal			**38,171**	**30,507**	**18,695**	**18,841**	**16,686**	**16,845**	**19,331**	**18,175**	**19,530**	**22,030**	**2,500**	**12.8%**	**5,179,671**	**4,486,236**	**2,622,086**	**2,693,666**	**2,404,036**	**2,484,577**	**2,765,786**	**2,604,342**	**2,846,211**	**3,237,541**	**391,330**	**13.7%**

Table F-3 Scheduled Passenger Operations by Market and Carrier for Bradley International Airport (Continued)

			Departures												Departing Seats											
Carrier	**Market**	**Code**	**2000**	**2005**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**'16-'17 Change**	**'16-'17 Pct. Change**	**2000**	**2005**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**'16-'17 Change**	**'16-'17 Pct. Change**
Regional/ Commuter Carriers																										
Air Canada Express	Montreal Dorval	YUL	1,385	1,038	1,021	986	976	952	996	1,008	1,038	1,021	30	3.0%	19,392	19,475	19,399	18,739	18,549	17,144	17,925	18,141	18,692	18,381	551	3.0%
Air Canada Express	Toronto	YYZ	1,589	1,342	1,287	1,308	1,294	1,295	1,313	1,395	1,399	1,391	4	0.3%	61,991	38,242	36,960	38,342	33,044	28,103	25,102	25,118	35,328	40,045	10,210	40.6%
America West Express	Columbus	CMH	450										-	-	22,493										-	-
American Connection	St. Louis	STL		947									-	-		44,356									-	-
American Eagle	Charlotte	CLT							366	290	156	127	-134	-46.1%							28,940	22,265	11,774	10,062	-10,491	-47.1%
American Eagle	Chicago O'Hare	ORD			1,501	1,630	1,613	1,630	1,622	1,604	1,421	685	-183	-11.4%			79,594	95,985	80,413	90,663	115,856	115,366	93,468	43,137	-21,898	-19.0%
American Eagle	New York J F Kennedy	JFK	1,460										-	-	48,166										-	-
American Eagle	Philadelphia	PHL							2,234	2,502	2,133	1,684	-369	-14.8%							136,683	146,222	123,285	103,743	-22,937	-15.7%
American Eagle	Pittsburgh	PIT							939	782			-782	-100.0%							67,549	39,086			-39,086	-100.0%
American Eagle	Raleigh/Durham	RDU		1,364	257								-	-		54,521	10,774								-	-
American Eagle	St. Louis	STL											-	-											-	-
American Eagle	Washington National	DCA							2,119	2,125	2,251	2,476	126	5.9%							141,783	130,975	142,309	147,169	11,334	8.7%
Continental Connection	Albany	ALB		51									-	-		961									-	-
Continental Connection	Binghamton	BGM											-	-											-	-
Continental Connection	Boston	BOS											-	-											-	-
Continental Connection	Buffalo	BUF	89										-	-	1,683										-	-
Continental Connection	Burlington	BTV	4										-	-	84										-	-
Continental Connection	New York J F Kennedy	JFK											-	-											-	-

Table F-3 Scheduled Passenger Operations by Market and Carrier for Bradley International Airport (Continued)

			Departures												Departing Seats											
Carrier	Market	Code	2000	2005	2010	2011	2012	2013	2014	2015	2016	2017	'16-'17 Change	'16-'17 Pct. Change	2000	2005	2010	2011	2012	2013	2014	2015	2016	2017	'16-'17 Change	'16-'17 Pct. Change
Regional/ Commuter Carriers																										
Continental Connection	New York Newark	EWR			608								-	-			22,485								-	-
Continental Connection	Philadelphia	PHL											-	-											-	-
Continental Connection	Rochester	ROC	93										-	-	1,767										-	-
Continental Connection	Syracuse	SYR	97										-	-	1,851										-	-
Continental Express	Cleveland	CLE	803	1,102	1,208								-	-	39,357	54,951	60,400								-	-
Continental Express	New York Newark	EWR	1,747	1,351	465								-	-	82,365	67,455	23,264								-	-
Delta Connection	Atlanta	ATL				48	9	4	4	4			-4	-100.0%				3,396	647	279	288	326			-326	-100.0%
Delta Connection	Cincinnati	CVG			1,218	1,251	902	895	839	475	300	308	-175	-36.8%			61,642	66,559	45,181	44,757	43,557	25,537	22,800	22,353	-2,737	-10.7%
Delta Connection	Cleveland	CLE							170	243	266	300	23	9.5%							11,898	15,450	19,798	22,800	4,348	28.1%
Delta Connection	Columbus	CMH		994									-	-		49,196									-	-
Delta Connection	Detroit	DTW			1,004	1,323	1,429	1,195	659	313	264	271	-49	-15.7%			54,265	82,915	100,525	80,351	45,421	20,860	18,905	20,193	-1,955	-9.4%
Delta Connection	Fort Lauderdale/Hollywood	FLL											-	-											-	-
Delta Connection	Fort Myers	RSW		612									-	-		42,840									-	-
Delta Connection	Indianapolis	IND											-	-											-	-
Delta Connection	Minneapolis	MSP			481	814	858	812	738	342	539	467	197	57.6%			36,567	61,731	64,643	61,035	55,233	25,556	40,845	34,547	15,289	59.8%
Delta Connection	Myrtle Beach	MYR	61										-	-	3,057										-	-
Delta Connection	New York J F Kennedy	JFK			365	304	183						-	-			18,250	15,200	9,216						-	-
Delta Connection	Orlando	MCO							43	35	8	9	-27	-77.1%							3,156	2,354	641	662	-1,713	-72.8%
Delta Connection	Raleigh/Durham	RDU			100	569	454	270	257	261	253	308	-8	-3.1%			6,136	28,436	22,686	13,500	12,850	17,611	18,054	23,441	443	2.5%

Table F-3 Scheduled Passenger Operations by Market and Carrier for Bradley International Airport (Continued)

			Departures												Departing Seats											
Carrier	**Market**	**Code**	**2000**	**2005**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**'16-'17 Change**	**'16-'17 Pct. Change**	**2000**	**2005**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**'16-'17 Change**	**'16-'17 Pct. Change**
Regional/ Commuter Carriers																										
Delta Connection	Tampa	TPA											-	-											-	-
Delta Connection	Washington National	DCA			166	929	360						-	-			11,324	51,524	18,074						-	-
Delta Connection	West Palm Beach	PBI											-	-											-	-
Frontier Express	Milwaukee	MKE			140	417							-	-			6,313	18,746							-	-
Independence Air	Washington Dulles	IAD		1,966									-	-		98,307									-	-
Midway Airlines	Raleigh/Durham	RDU	1,348										-	-	67,393										-	-
Midwest Connect	Milwaukee	MKE	4	965									-	-	142	30,871									-	-
Northwest Airlink	Detroit	DTW											-	-											-	-
Northwest Airlink	Indianapolis	IND		638									-	-		31,907									-	-
Northwest Airlink	Memphis	MEM											-	-											-	-
Northwest Airlink	Minneapolis	MSP		31									-	-		1,550									-	-
OneJet	Pittsburgh	PIT									289	521	289	-									2,597	4,344	2,597	-
Shuttle America	Albany	ALB	66										-	-	3,286										-	-
Shuttle America	Bedford	BED	233										-	-	11,671										-	-
Shuttle America	Buffalo	BUF	337										-	-	16,857										-	-
Shuttle America	Islip	ISP	27										-	-	1,329										-	-
Shuttle America	Wilmington	ILG	159										-	-	7,936										-	-
Swissair	New York J F Kennedy	JFK	31										-	-	1,023										-	-
Trans World Airlines	New York J F Kennedy	JFK	1,098										-	-	31,842										-	-
United Express	Chicago O'Hare	ORD		691	548	685	1,038	1,045	877	904	696	509	-208	-23.0%		48,370	36,797	43,701	63,807	59,896	47,419	60,980	45,255	34,256	-15,725	-25.8%
United Express	Cleveland	CLE				1,200	1,125	1,127	235				-	-				59,979	55,744	56,436	11,750				-	-
United Express	Houston	IAH							96	365	361	293	-4	-1.1%							7,521	26,998	25,240	20,583	-1,758	-6.5%
United Express	New York Newark	EWR				1,159	1,347	1,269	853	1,335	1,357	866	22	1.6%				46,231	56,787	61,339	38,317	65,086	69,442	39,881	4,356	6.7%

Table F-3 Scheduled Passenger Operations by Market and Carrier for Bradley International Airport (Continued)

			Departures												Departing Seats											
Carrier	**Market**	**Code**	**2000**	**2005**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**'16-'17 Change**	**'16-'17 Pct. Change**	**2000**	**2005**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**'16-'17 Change**	**'16-'17 Pct. Change**
Regional/ Commuter Carriers																										
United Express	Washington Dulles	IAD		1,519	494	889	928	1,280	1,224	1,243	870	965	-373	-30.0%		84,484	30,270	54,707	59,507	72,861	68,684	77,783	56,035	61,327	-21,748	-28.0%
US Airways Express	Baltimore	BWI	1,185										-	-	43,850										-	-
US Airways Express	Buffalo	BUF	1,032	839									-	-	38,200	28,607									-	-
US Airways Express	Charlotte	CLT		4	537	452	462	364					-	-		221	45,043	37,510	39,235	28,392					-	-
US Airways Express	New York La Guardia	LGA			139	1,057	364						-	-			5,159	39,098	13,468						-	-
US Airways Express	New York Newark	EWR											-	-											-	-
US Airways Express	Philadelphia	PHL		439	2,404	2,430	2,356	2,260					-	-		27,685	183,838	163,675	151,526	133,663					-	-
US Airways Express	Pittsburgh	PIT		1,646	939	939	941	939					-	-		84,598	46,929	46,929	47,057	77,901					-	-
US Airways Express	Rochester	ROC	937	574	478								-	-	34,658	19,555	16,242								-	-
US Airways Express	Syracuse	SYR	732	478									-	-	27,084	9,077									-	-
US Airways Express	Washington National	DCA		551	1,334	1,411	1,574	1,825					-	-		34,454	89,629	89,940	109,321	115,989					-	-
Subtotal			**14,968**	**19,143**	**16,694**	**19,799**	**18,212**	**17,164**	**15,584**	**15,226**	**13,601**	**12,201**	**-1,625**	**-10.7%**	**567,477**	**871,682**	**901,282**	**1,063,342**	**989,430**	**942,310**	**879,932**	**835,714**	**744,468**	**646,924**	**-91,246**	**-10.9%**
													-	-											-	-
Total			**53,139**	**49,651**	**35,389**	**38,640**	**34,898**	**34,009**	**34,915**	**33,402**	**33,131**	**34,231**	**-271**	**-0.8%**	**5,747,148**	**5,357,918**	**3,523,368**	**3,757,008**	**3,393,466**	**3,426,886**	**3,645,718**	**3,440,056**	**3,590,679**	**3,884,465**	**150,624**	**4.4%**

Source: OAG Schedules.

Notes: All Northwest Airlines operations included in Delta Air Lines from 2009 onwards (following 2008 merger).
All Continental Airlines operations included in United Airlines from 2011 onwards (following 2010 merger).
All AirTran Airways operations included in Southwest Airlines from 2012 onwards (following 2011 merger).
All US Airways operations included in American Airlines from 2014 onwards (following 2013 merger).

Table F-4 Scheduled Passenger Operations by Market and Carrier for T.F Green Airport

			Departures												Departing Seats											
Carrier	Market	Code	2000	2005	2010	2011	2012	2013	2014	2015	2016	2017	'16-'17 Change	'16-'17 Pct. Change	2000	2005	2010	2011	2012	2013	2014	2015	2016	2017	'16-'17 Change	'16-'17 Pct. Change
Jet Carriers																										
Allegiant Airways	Punta Gorda	PGD										27	27	-										4,779	4,779	-
Allegiant Airways	St. Petersburg/ Clearwater	PIE										19	19	-										3,363	3,363	-
Allegiant Airways	Cincinnati	CVG										13	13	-										2,028	2,028	-
American	Charlotte	CLT							1,275	1,176	1,274	1,392	118	9.3%							196,644	170,310	189,856	213,892	24,036	12.7%
American	Chicago O'Hare	ORD	1,464	1,113									-	-	203,104	143,522									-	-
American	Dallas/Fort Worth	DFW		365									-	-		47,085									-	-
American	Philadelphia	PHL							347	366	520	995	475	91.3%							34,381	36,514	50,988	97,768	46,780	91.7%
American	Washington National	DCA							77	52			-	-							9,566	6,483			-	-
Continental	Cleveland	CLE	569	13									-	-	69,771	1,630									-	-
Continental	Houston Intercontinental	IAH	366										-	-	45,946										-	-
Continental	New York Newark	EWR	738	282									-	-	96,448	34,808									-	-
Condor	Frankfurt	FRA								22	18		-18	-100.0%								5,940	4,783		-4,783	-100.0%
Delta	Atlanta	ATL	1,464	1,976	510	1,043	990	978	993	997	1,060	1,047	-13	-1.2%	207,888	290,915	72,461	150,526	147,729	145,241	148,012	148,078	156,507	155,384	-1,123	-0.7%
Delta	Cincinnati	CVG	732	695									-	-	103,944	89,235									-	-
Delta	Detroit	DTW			414	58		218	476	707	719	715	-4	-0.6%			50,065	7,139		30,414	62,046	87,078	91,281	90,875	-406	-0.4%
Delta	Fort Lauderdale/ Hollywood	FLL											-	-											-	-
Delta	Minneapolis	MSP			74								-	-			9,211								-	-
Delta	Orlando	MCO	732										-	-	87,108										-	-
Frontier	Denver	DEN										144	144	-										25,946	25,946	-
Frontier	Fort Myers	RSW										53	53	-										12,091	12,091	-
Frontier	Miami	MIA										92	92	-										16,560	16,560	-
Frontier	New Orleans	MSY										39	39	-										5,914	5,914	-
Frontier	Orlando	MCO										153	153	-										32,140	32,140	-
Frontier	Tampa	TPA										39	39	-										9,069	9,069	-
jetBlue	Fort Lauderdale/ Hollywood	FLL					31	365	365	365	365	365	-	0.0%					4,650	54,750	54,750	54,750	54,750	54,750	-	0.0%
jetBlue	Orlando	MCO					62	713	713	713	713	713	-	0.0%					9,300	103,786	106,886	106,886	106,886	106,886	-	0.0%
Laker Airways (Bahamas)	Freeport	FPO											-	-											-	-
Northwest	Detroit	DTW	1,682	1,550									-	-	200,509	202,255									-	-
Northwest	Minneapolis	MSP		539									-	-		68,977									-	-
Norwegian	Belfast	BFS										35	35	-										6,642	6,642	-

Table F-4 Scheduled Passenger Operations by Market and Carrier for T.F Green Airport (Continued)

			Departures												Departing Seats											
Carrier	Market	Code	2000	2005	2010	2011	2012	2013	2014	2015	2016	2017	'16-'17 Change	'16-'17 Pct. Change	2000	2005	2010	2011	2012	2013	2014	2015	2016	2017	'16-'17 Change	'16-'17 Pct. Change
Norwegian	Bergen	BGO										35	35	-										6,642	6,642	-
Norwegian	Cork	ORK										70	70	-										13,257	13,257	-
Norwegian	Dublin	DUB										114	114	-										21,546	21,546	-
Norwegian	Edinburgh	EDI										88	88	-										16,578	16,578	-
Norwegian	Fort De France	FDF										17	17	-										3,259	3,259	-
Norwegian	Pointe-A-Pitre	PTP										17	17	-										3,259	3,259	-
Norwegian	Shannon	SNN										53	53	-										9,936	9,936	-
Sata Internacional	Ponta Delgada	PDL									9	22	13	144.4%									1,966	4,852	2,886	146.8%
Southwest	Baltimore	BWI	3,913	4,180	3,260	3,043	3,128	3,004	2,820	2,793	2,793	2,719	-74	-2.6%	535,911	572,699	442,637	415,554	433,081	429,658	411,154	407,651	414,057	401,718	-12,339	-3.0%
Southwest	Chicago Midway	MDW	1,072	1,349	1,135	1,095	1,094	992	975	988	996	953	-43	-4.3%	146,844	184,813	153,121	149,877	150,303	154,633	156,543	158,640	153,783	147,916	-5,867	-3.8%
Southwest	Denver	DEN					366	304	9				-	-					51,110	44,281	1,246				-	-
Southwest	Fort Lauderdale/ Hollywood	FLL	9		594	590	500	479	474	477	485	507	22	4.5%	1,194		81,378	80,791	68,347	70,413	68,401	70,778	74,477	78,412	3,935	5.3%
Southwest	Fort Myers	RSW					86	40	44	48	52	82	30	57.7%					11,743	5,520	6,292	7,305	7,918	12,046	4,128	52.1%
Southwest	Houston	HOU	152										-	-	20,824										-	-
Southwest	Islip	ISP	608										-	-	83,237										-	-
Southwest	Kansas City	MCI	366	365									-	-	50,142	50,005									-	-
Southwest	Las Vegas	LAS		31	365	365	362						-	-		4,247	50,005	50,005	49,932						-	-
Southwest	Nashville	BNA	706	721	296	123							-	-	96,702	98,816	39,578	16,067							-	-
Southwest	Orlando	MCO	955	1,821	1,799	1,659	1,585	1,423	1,419	1,464	1,469	1,390	-79	-5.4%	130,855	249,418	245,156	225,244	216,998	210,082	204,947	215,253	219,994	209,238	-10,756	-4.9%
Southwest	Philadelphia	PHL		1,773	1,402	1,298							-	-		238,366	192,054	177,001							-	-
Southwest	Phoenix	PHX	366	726	361	365							-	-	50,142	99,403	49,398	50,005							-	-
Southwest	Tampa	TPA	745	1,086	813	808	763	753	748	735	713	673	-40	-5.6%	102,065	148,821	111,231	109,572	104,140	107,959	107,481	108,451	107,723	100,790	-6,933	-6.4%
Southwest	West Palm Beach	PBI						31	35	31	31	22	-9	-29.0%						4,433	5,046	4,433	4,433	3,105	-1,328	-30.0%
Southwest	Washington National	DCA									122	730	608	498.4%									19,119	104,390	85,271	446.0%
Spirit Airlines	Detroit	DTW		120									-	-		18,000									-	-
Spirit Airlines	Fort Lauderdale/ Hollywood	FLL		568									-	-		84,117									-	-
Spirit Airlines	Fort Myers	RSW		365									-	-		54,750									-	-
TACV	Praia	RAI								39	74	65	-9	-12.2%								7,739	14,578	13,003	-1,575	-10.8%
United	Chicago O'Hare	ORD	1,477	1,460	644	626	388	334	320	144	236		-236	-100.0%	239,076	200,677	82,802	78,487	48,697	46,258	42,658	17,570	31,940		-31,940	-100.0%
US Airways	Baltimore	BWI	2,462										-	-	263,921										-	-
US Airways	Charlotte	CLT	977	1,858	1,643	1,599	1,726	1,608					-	-	128,984	274,039	233,886	226,854	238,503	225,454					-	-

Table F-4 Scheduled Passenger Operations by Market and Carrier for T.F Green Airport (Continued)

			Departures												Departing Seats											
Carrier	**Market**	**Code**	**2000**	**2005**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**'16-'17 Change**	**'16-'17 Pct. Change**	**2000**	**2005**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**'16-'17 Change**	**'16-'17 Pct. Change**
US Airways	Fort Lauderdale/ Hollywood	FLL		17									-	-		2,186									-	-
US Airways	Orlando	MCO	52	43									-	-	5,605	5,831									-	-
US Airways	Philadelphia	PHL	1,830	2,182	1,299	1,012	399	313					-	-	253,015	312,890	130,008	101,987	39,529	30,973					-	-
US Airways	Pittsburgh	PIT	1,339	31									-	-	185,109	4,446									-	-
US Airways	Washington National	DCA	1,333	1,270	365	313	182	124					-	-	167,278	170,009	49,501	44,006	24,350	14,997					-	-
Subtotal			26,108	26,499	14,974	13,998	11,661	11,677	11,090	11,116	11,649	13,399	1,750	15.0%	3,475,622	3,651,961	1,992,492	1,883,114	1,598,412	1,678,851	1,616,053	1,613,859	1,705,039	1,988,034	282,995	16.6%
Regional/Commuter Carriers																										
Air Canada Express	Toronto	YYZ	989	734	625	591	593	84					-	-	37,482	13,783	11,880	11,232	11,262	1,517					-	-
American Eagle	Charlotte	CLT							175	341	301	187	-114	-37.9%							13,971	26,810	25,452	15,629	-9,823	-38.6%
American Eagle	Chicago O'Hare	ORD									550	717	167	30.4%									34,650	45,162	10,512	30.3%
American Eagle	Detroit	DTW					12						-	-					808						-	-
American Eagle	New York J F Kennedy	JFK	1,291										-	-	42,589										-	-
American Eagle	New York La Guardia	LGA	2,756										-	-	90,957										-	-
American Eagle	Raleigh/Durham	RDU		343									-	-		13,081									-	-
American Eagle	Philadelphia	PHL							2,213	2,163	1,982	1,035	-947	-47.8%							150,139	142,721	127,895	77,726	-50,169	-39.2%
American Eagle	Washington National	DCA							1,609	1,755	2,112	2,252	140	6.6%							111,183	111,865	138,655	148,758	10,103	7.3%
Cape Air	Block Island	BID							538	418			-	-							4,846	3,765			-	-
Cape Air	Hyannis	HYA											-	-											-	-
Cape Air	Martha's Vineyard	MVY	1,762	1,015	747	672	659	501	285	192			-	-	15,861	9,132	6,722	6,048	5,930	4,513	2,561	1,725			-	-
Cape Air	Nantucket	ACK	2,453	1,199	681	668	576	501	271	244			-	-	22,073	10,787	6,128	6,012	5,181	4,510	2,438	2,196			-	-
Continental Connection	Albany	ALB		51									-	-		961									-	-
Continental Connection	Boston	BOS											-	-											-	-
Continental Connection	New York Newark	EWR			427								-	-			31,630								-	-
Continental Connection	Plattsburgh	PLB											-	-											-	-
Continental Connection	Washington Dulles	IAD											-	-											-	-
Continental Express	Cleveland	CLE	699	1,238	1,217								-	-	34,936	61,900	60,836								-	-
Continental Express	New York Newark	EWR	1,482	1,455	1,028								-	-	86,552	71,185	51,407								-	-

Table F-4 Scheduled Passenger Operations by Market and Carrier for T.F Green Airport (Continued)

			Departures												Departing Seats											
Carrier	Market	Code	2000	2005	2010	2011	2012	2013	2014	2015	2016	2017	'16-'17 Change	'16-'17 Pct. Change	2000	2005	2010	2011	2012	2013	2014	2015	2016	2017	'16-'17 Change	'16-'17 Pct. Change
Delta Connection	Atlanta	ATL		31	724	9	43	70	51	43			-	-		1,550	52,959	662	3,279	4,522	3,380	3,001			-	-
Delta Connection	Cincinnati	CVG		373	43								-	-		19,109	2,150								-	-
Delta Connection	Detroit	DTW			1,324	1,995	2,054	1,748	871	289	324	279	-45	-13.9%			78,701	111,901	113,630	90,191	45,809	18,671	22,103	20,162	-1,941	-8.8%
Delta Connection	Minneapolis	MSP			347	392	266	240	170				-	-			26,192	29,553	20,189	17,380	12,878				-	-
Delta Connection	New York J F Kennedy	JFK											-	-											-	-
Delta Connection	New York La Guardia	LGA	610										-	-	19,520										-	-
Delta Connection	Raleigh/Durham	RDU				131							-	-				6,557							-	-
Delta Connection	Washington National	DCA				685	225						-	-				34,243	11,271						-	-
Independence Air	Washington Dulles	IAD		1,509									-	-		75,429									-	-
Midway Airlines	Raleigh/Durham	RDU											-	-											-	-
Northwest Airlink	Detroit	DTW											-	-											-	-
Northwest Airlink	Minneapolis	MSP		31									-	-		1,550									-	-
Onejet	Pittsburgh	PIT										87	87	-										610	610	-
United Express	Chicago O'Hare	ORD		262	455	375	309	306	325	605	464	673	209	45.0%		18,330	29,820	24,079	19,900	19,896	19,443	34,473	24,750	42,292	17,542	70.9%
United Express	Cleveland	CLE				1,079	886	875	102				-	-				53,943	42,991	43,757	5,100				-	-
United Express	New York Newark	EWR				1,439	1,346	1,213	994	1,356	1,355	1,382	27	2.0%				69,724	61,168	65,636	57,558	73,682	64,804	71,607	6,803	10.5%
United Express	Washington Dulles	IAD	1,468	1,716	1,569	1,421	1,157	1,035	1,031	837	886	782	-104	-11.7%	52,832	85,821	99,719	89,593	73,470	65,632	67,077	52,139	55,328	46,877	-8,451	-15.3%
US Airways Express	Albany	ALB	679										-	-	12,898										-	-
US Airways Express	Boston	BOS	48										-	-	909										-	-
US Airways Express	Charlotte	CLT		18	126	147	65	166					-	-		879	10,047	12,035	5,423	12,857					-	-
US Airways Express	Hyannis	HYA											-	-											-	-
US Airways Express	Nantucket	ACK											-	-											-	-
US Airways Express	New York La Guardia	LGA	2,298	1,669	1,222	957	286						-	-	84,116	55,077	45,225	33,141	10,582						-	-
US Airways Express	New York Newark	EWR	1,569										-	-	31,176										-	-
US Airways Express	Philadelphia	PHL	366	716	1,526	1,713	2,206	2,347					-	-	13,542	45,199	107,790	122,386	152,816	154,401					-	-
US Airways Express	Pittsburgh	PIT		1,360									-	-		72,808									-	-
US Airways Express	Plattsburgh	PLB	26										-	-	497										-	-
US Airways Express	Washington National	DCA		482	1,373	1,304	1,479	1,492					-	-		30,996	92,151	95,527	110,451	107,775					-	-
Subtotal			18,527	14,200	13,436	13,577	12,161	10,577	8,635	8,243	7,974	7,394	-580	-7.3%	546,963	587,576	713,356	706,634	648,351	592,587	496,383	471,048	493,637	468,823	-24,814	-5.0%
Total			44,635	40,699	28,409	27,575	23,822	22,255	19,725	19,359	19,623	20,793	1,170	6.0%	4,022,585	4,239,537	2,705,848	2,589,748	2,246,763	2,271,438	2,112,436	2,084,907	2,198,676	2,456,857	258,181	11.7%

Source: OAG Schedules.

Notes: Allegiant stopped reporting to the OAG in 2009, so Allegiant 2009-2015 statistics from the T100 database; 2016-2017 statistics from Innovata SRS.
All Northwest Airlines operations included in Delta Air Lines from 2009 onwards (following 2008 merger).
All Continental Airlines operations included in United Airlines from 2011 onwards (following 2010 merger).
All AirTran Airways operations included in Southwest Airlines from 2012 onwards (following 2011 merger).
All US Airways operations included in American Airlines from 2014 onwards (following 2013 merger).

Table F-5 Scheduled Passenger Operations by Market and Carrier for Manchester-Boston Regional Airport

			Departures												Departing Seats											
Carrier	Market	Code	2000	2005	2010	2011	2012	2013	2014	2015	2016	2017	'16-'17 Change	'16-'17 Pct. Change	2000	2005	2010	2011	2012	2013	2014	2015	2016	2017	'16-'17 Change	'16-'17 Pct. Change
Jet Carriers																										
American	Charlotte	CLT										52	52	-										6,674	6,674	-
Boston-Maine Airways	Myrtle Beach	MYR											-	-											-	-
Boston-Maine Airways	Portsmouth	PSM											-	-											-	-
Boston-Maine Airways	Sanford	SFB											-	-											-	-
Continental	Cleveland	CLE	130										-	-	16,151										-	-
Continental	New York Newark	EWR	462	286									-	-	62,358	30,953									-	-
Delta	Atlanta	ATL	244	668	275	565	514	463	459	365	365	365	-	0.0%	34,648	94,856	39,050	81,600	76,629	69,307	68,468	53,545	54,212	55,172	960	1.8%
Delta	Cincinnati	CVG		664									-	-		86,583									-	-
Delta	Detroit	DTW			796					122	87	26	-61	-70.1%			89,289					14,414	9,881	2,829	-7,052	-71.4%
Delta	New York - LGA	LGA								4			-	-								596			-	-
Northwest	Detroit	DTW	1,609	1,399									-	-	194,058	180,879									-	-
Northwest	Minneapolis	MSP		365									-	-		46,933									-	-
Southwest	Baltimore	BWI	2,828	3,850	2,891	2,761	2,775	2,726	2,494	2,476	2,576	2,393	-183	-7.1%	387,397	527,405	393,093	376,945	385,044	387,879	364,979	363,524	383,914	353,543	-30,371	-7.9%
Southwest	Chicago Midway	MDW	706	1,355	1,144	1,244	1,168	1,010	984	948	996	922	-74	-7.4%	96,702	185,481	155,466	169,440	161,822	158,820	157,501	148,825	153,459	143,869	-9,590	-6.2%
Southwest	Denver	DEN				92	366	304					-	-				12,604	50,379	43,211					-	-
Southwest	Fort Lauderdale/ Hollywood	FLL			9	9	152	90		4			-	-			1,194	1,194	21,190	12,793		633			-	-
Southwest	Kansas City	MCI	366										-	-	50,142										-	-
Southwest	Las Vegas	LAS		365	365	365	122	61	9	9			-	-		50,005	50,005	50,005	16,766	8,723	1,246	1,246			-	-
Southwest	Nashville	BNA	397	730									-	-	54,389	99,879									-	-
Southwest	Orlando	MCO	410	1,468	1,125	977	906	831	752	743	765	764	-1	-0.1%	56,111	201,175	154,145	133,829	125,620	123,873	109,202	113,888	118,422	115,387	-3,035	-2.6%
Southwest	Philadelphia	PHL		1,786	1,411	1,325							-	-		244,356	192,456	180,871							-	-
Southwest	Phoenix	PHX			322	273							-	-			44,114	37,401							-	-
Southwest	Tampa	TPA		1,099	782	629	579	466	470	479	487	461	-26	-5.3%		150,165	107,173	86,212	79,639	68,120	67,509	70,529	71,922	67,276	-4,646	-6.5%
United	Chicago O'Hare	ORD	1,403	1,339									-	-	221,523	179,151									-	-
United	Portland (ME)	PWM	57										-	-	7,241										-	-
US Airways	Baltimore	BWI	1,782										-	-	191,078										-	-
US Airways	Charlotte	CLT		1,308	365	51							-	-		178,836	52,560	7,406							-	-
US Airways	Orlando	MCO	52										-	-	5,605										-	-
US Airways	Philadelphia	PHL	1,821	2,021	365	313	187	351					-	-	222,331	274,215	33,132	30,973	18,499	34,791					-	-
US Airways	Pittsburgh	PIT	1,085										-	-	139,837										-	-
US Airways	Washington National	DCA	675	575									-	-	82,085	77,461									-	-
Subtotal			**14,026**	**19,279**	**9,850**	**8,604**	**6,769**	**6,302**	**5,168**	**5,150**	**5,276**	**4,983**	**-293**	**-5.6%**	**1,821,657**	**2,608,335**	**1,311,677**	**1,168,481**	**935,588**	**907,518**	**768,905**	**767,200**	**791,810**	**744,750**	**-47,060**	**-5.9%**

Table F-5 Scheduled Passenger Operations by Market and Carrier for Manchester-Boston Regional Airport (Continued)

			Departures												Departing Seats											
Carrier	Market	Code	2000	2005	2010	2011	2012	2013	2014	2015	2016	2017	'16-'17 Change	'16-'17 Pct. Change	2000	2005	2010	2011	2012	2013	2014	2015	2016	2017	'16-'17 Change	'16-'17 Pct. Change
Regional/ Commuter Carriers																										
Air Canada Express	Montreal Dorval	YUL											-	-											-	-
Air Canada Express	Toronto	YYZ	339	930	707	403							-	-	5,616	17,439	13,441	7,652							-	-
American Eagle	Charlotte	CLT							496	730	734	809	75	10.2%							37,761	54,688	60,890	67,927	7,037	11.6%
American Eagle	New York La Guardia	LGA	1,833										-	-	60,480										-	-
American Eagle	Philadelphia	PHL							2,295	2,237	2,090	2,066	-24	-1.1%							149,598	152,206	136,795	129,174	-7,621	-5.6%
American Eagle	Washington National	DCA							1,198	1,152	1,304	1,316	12	0.9%							77,065	74,008	85,620	84,908	-712	-0.8%
Boston-Maine Airways	Bangor	BGR											-	-											-	-
Boston-Maine Airways	Martha's Vineyard	MVY											-	-											-	-
Boston-Maine Airways	Nantucket	ACK											-	-											-	-
Boston-Maine Airways	New London/Groton	GON											-	-											-	-
Boston-Maine Airways	Portsmouth	PSM											-	-											-	-
Boston-Maine Airways	Saint John	YSJ											-	-											-	-
Continental Connection	Albany	ALB	80	313									-	-	1,515	5,944									-	-
Continental Connection	New York J F Kennedy	JFK											-	-											-	-
Continental Connection	New York Newark	EWR			141								-	-			9,483								-	-
Continental Connection	Plattsburgh	PLB											-	-											-	-
Continental Connection	Rochester	ROC	44										-	-	841										-	-
Continental Connection	Syracuse	SYR	22										-	-	421										-	-
Continental Connection	Westchester County	HPN											-	-											-	-
Continental Express	Cleveland	CLE	593	1,186	1,178								-	-	29,614	58,991	58,921								-	-
Continental Express	New York Newark	EWR	1,028	1,165	1,267								-	-	64,944	58,140	63,336								-	-
Delta Connection	Atlanta	ATL	488	485	90			51	59				-	-	24,400	26,620	6,300			3,843	4,484				-	-

Table F-5 Scheduled Passenger Operations by Market and Carrier for Manchester-Boston Regional Airport (Continued)

			Departures												Departing Seats											
Carrier	Market	Code	2000	2005	2010	2011	2012	2013	2014	2015	2016	2017	'16-'17 Change	'16-'17 Pct. Change	2000	2005	2010	2011	2012	2013	2014	2015	2016	2017	'16-'17 Change	'16-'17 Pct. Change
Delta Connection	Bangor	BGR	244											- -		12,200								-		-
Delta Connection	Cincinnati	CVG	1,673	735										- -		83,657	38,426							-		-
Delta Connection	Detroit	DTW			499	1,858	1,609	1,510	1,296	912	935	961	26	2.8%			32,795	95,802	80,786	75,507	69,261	51,960	60,782	69,124	8,342	13.7%
Delta Connection	New York J F Kennedy	JFK											-	-											-	-
Delta Connection	New York La Guardia	LGA	727	486			586	1,165	1,140	970	804	789	-15	-1.9%	36,357	24,300			31,216	66,132	63,202	55,968	49,250	48,605	-645	-1.3%
Delta Connection	Minneapolis	MSP											-	-											-	-
Independence Air	Washington Dulles	IAD		1,568									-	-		78,379									-	-
Northwest Airlink	Detroit	DTW											-	-											-	-
Northwest Airlink	Minneapolis	MSP		233									-	-		11,664									-	-
United Express	Chicago O'Hare	ORD		31	1,040	983	867	695	857	779	718	750	32	4.5%		2,170	67,675	62,096	45,929	39,114	49,854	42,976	39,887	39,041	-846	-2.1%
United Express	Cleveland	CLE				935	759	740	111				-	-				46,736	36,046	36,986	5,564				-	-
United Express	New York Newark	EWR				1,391	1,298	1,120	965	1,304	1,284	982	-302	-23.5%				67,250	60,049	54,604	44,824	60,052	59,682	49,324	-10,358	-17.4%
United Express	Washington Dulles	IAD		1,760	1,104	658	427	90					-	-		90,419	55,951	33,514	20,788	5,444					-	-
US Airways Express	Boston	BOS											-	-											-	-
US Airways Express	Charlotte	CLT		307	153	318	366	417					-	-		21,863	13,146	27,181	31,476	32,885					-	-
US Airways Express	New York La Guardia	LGA	2,583	2,499	1,381	1,269	594						-	-	96,936	86,492	49,420	43,737	21,962						-	-
US Airways Express	Philadelphia	PHL		562	2,116	2,068	2,092	2,004					-	-		30,239	140,277	135,156	134,567	126,552					-	-
US Airways Express	Pittsburgh	PIT		1,022									-	-		51,107									-	-
US Airways Express	Washington National	DCA		508	1,039	1,043	1,002	1,252					-	-		25,379	81,095	81,683	78,512	84,499					-	-
Subtotal			**9,655**	**13,788**	**10,716**	**10,925**	**9,600**	**9,045**	**8,417**	**8,084**	**7,869**	**7,673**	**-196**	**-2.5%**	**416,980**	**627,572**	**591,840**	**600,808**	**541,331**	**525,567**	**501,613**	**491,858**	**492,906**	**488,103**	**-4,803**	**-1.0%**
													-	-											-	-
Total			**23,681**	**33,067**	**20,566**	**19,529**	**16,369**	**15,347**	**13,585**	**13,234**	**13,145**	**12,656**	**-489**	**-3.7%**	**2,238,636**	**3,235,907**	**1,903,517**	**1,769,288**	**1,476,919**	**1,433,085**	**1,270,518**	**1,259,058**	**1,284,716**	**1,232,853**	**-51,863**	**-4.0%**

Source: OAG Schedules.

Notes: All Northwest Airlines operations included in Delta Air Lines from 2009 onwards (following 2008 merger).
All Continental Airlines operations included in United Airlines from 2011 onwards (following 2010 merger).
All AirTran Airways operations included in Southwest Airlines from 2012 onwards (following 2011 merger).
All US Airways operations included in American Airlines from 2014 onwards (following 2013 merger).

Table F-6 Scheduled Passenger Operations by Market and Carrier for Portland International Jetport

			Departures												Departing Seats											
Carrier	Market	Code	2000	2005	2010	2011	2012	2013	2014	2015	2016	2017	'16-'17 Change	'16-'17 Pct. Change	2000	2005	2010	2011	2012	2013	2014	2015	2016	2017	'16-'17 Change	'16-'17 Pct. Change
Jet Carriers																										
American	Charlotte	CLT							374	365	487	730	243	49.9%							46,341	45,504	62,336	93,963	31,627	50.7%
American	Philadelphia	PHL							92				-	-							9,108				-	-
American	Washington National	DCA								30	4	22	18	450.0%								3,720	567	2,156	1,589	280.2%
AirTran	Atlanta	ATL			92	167							-	-			10,764	19,522							-	-
AirTran	Baltimore	BWI			944	927							-	-			112,951	109,024							-	-
AirTran	Orlando	MCO			52	52							-	-			6,503	6,355							-	-
Continental	Cleveland	CLE											-	-											-	-
Continental	New York Newark	EWR											-	-											-	-
Delta	Atlanta	ATL	732	486	424	793	751	737	693	714	710	655	-55	-7.7%	103,944	61,229	60,167	114,597	110,397	109,750	103,571	107,000	106,660	99,378	-7,282	-6.8%
Delta	Cincinnati	CVG	1,089	486									-	-	154,658	69,012									-	-
Delta	Detroit	DTW									74	113	39	52.7%									8,124	12,446	4,322	53.2%
Delta	New York La Guardia	LGA					184	239	79	30			-	-					24,256	35,374	11,750	3,300			-	-
Independence Air	Washington Dulles	IAD		307									-	-		40,524									-	-
jetBlue	New York J F Kennedy	JFK			1,201	1,323	1,239	1,307	1,332	1,295	1,198	1,223	25	2.1%			128,936	135,379	124,571	130,671	133,200	130,314	119,800	122,286	2,486	2.1%
jetBlue	Orlando	MCO			212	181							-	-			21,214	21,344							-	-
Northwest	Detroit	DTW	523	427									-	-	52,105	42,700									-	-
Southwest	Baltimore	BWI					1,016	1,005	1,084	1,106	1,175	1,226	51	4.3%					119,112	136,588	152,939	158,358	168,423	183,430	15,007	8.9%
Southwest	Orlando	MCO					13		4	4	4	9	5	125.0%					1,521		633	633	633	1,246	613	96.8%
Southwest	Chicago Midway	MDW							9	9	9	0	-9	-100.0%							1,246	1,246	1,246	0	-1,246	-100.0%
Trans World Airlines	Hartford	BDL	305										-	-	43,310										-	-
United	Chicago O'Hare	ORD	728								66		-66	-100.0%	88,996								8,066		-8,066	-100.0%
United	Manchester	MHT	366										-	-	53,802										-	-
United	New York Newark	EWR									9		-9	-100.0%									1,196		-1,196	-100.0%
United	Washington Dulles	IAD									18		-18	-100.0%									2,657		-2,657	-100.0%

Table F-6 Scheduled Passenger Operations by Market and Carrier for Portland International Jetport (Continued)

			Departures												Departing Seats											
Carrier	Market	Code	2000	2005	2010	2011	2012	2013	2014	2015	2016	2017	'16-'17 Change	'16-'17 Pct. Change	2000	2005	2010	2011	2012	2013	2014	2015	2016	2017	'16-'17 Change	'16-'17 Pct. Change
US Airways	Charlotte	CLT			395	352	366	365					-	-			48,688	47,130	49,044	45,260					-	-
US Airways	Philadelphia	PHL	1,312	154		217	18						-	-	163,051	19,404		21,525	1,895						-	-
US Airways	Pittsburgh	PIT	1,081										-	-	137,472										-	-
US Airways	Washington National	DCA		52									-	-		6,668									-	-
Subtotal			**6,135**	**1,912**	**3,320**	**4,013**	**3,587**	**3,653**	**3,667**	**3,553**	**3,754**	**3,978**	**224**	**6.0%**	**797,338**	**239,537**	**389,224**	**474,876**	**430,796**	**457,644**	**458,788**	**450,075**	**479,708**	**514,905**	**35,197**	**7.3%**
Regional/ Commuter Carriers																										
Air Canada Express	Montreal Dorval	YUL	344										-	-	4,734										-	-
Air Canada Express	Toronto	YYZ			481	783	671	97					-	-			9,142	14,872	12,749	1,741					-	-
America West	New York Newark	EWR	52										-	-	2,457										-	-
American Eagle	Boston	BOS	3,804										-	-	125,518										-	-
American Eagle	Charlotte	CLT							26	143	243	61	-182	-74.9%							2,065	11,666	20,898	4,233	-16,665	-79.7%
American Eagle	Chicago O'Hare	ORD											-	-											-	-
American Eagle	New York La Guardia	LGA	2,033										-	-	67,084										-	-
American Eagle	Philadelphia	PHL							1,986	2,148	2,066	2,066	-	0.0%							125,325	141,789	120,072	118,721	-1,351	-1.1%
American Eagle	Washington National	DCA							1,426	1,613	1,707	1,724	17	1.0%							99,757	107,469	113,463	120,501	7,038	6.2%
Continental Connection	Albany	ALB		291									-	-		5,537									-	-
Continental Connection	Boston	BOS	204	241									-	-	3,871	4,576									-	-
Continental Connection	New York Newark	EWR			1,426								-	-			105,503								-	-
Continental Connection	Presque Isle	PQI											-	-											-	-
Continental Express	Cleveland	CLE	425	223	188								-	-	20,378	11,021	9,400								-	-
Continental Express	New York Newark	EWR	1,429	1,394	4								-	-	70,393	69,605	200								-	-
Delta Connection	Atlanta	ATL		700	350								-	-		48,440	25,532								-	-
Delta Connection	Boston	BOS		1,153									-	-		57,650									-	-

Table F-6 Scheduled Passenger Operations by Market and Carrier for Portland International Jetport (Continued)

			Departures												Departing Seats											
Carrier	Market	Code	2000	2005	2010	2011	2012	2013	2014	2015	2016	2017	'16-'17 Change	'16-'17 Pct. Change	2000	2005	2010	2011	2012	2013	2014	2015	2016	2017	'16-'17 Change	'16-'17 Pct. Change
Delta Connection	Cincinnati	CVG		600									-	-		31,166									-	-
Delta Connection	Detroit	DTW			1,217	1,314	1,264	1,249	1,061	896	840	817	-23	-2.7%			62,320	65,686	64,758	62,436	60,448	59,315	60,354	59,080	-1,274	-2.1%
Delta Connection	New York J F Kennedy	JFK			270								-	-			13,500								-	-
Delta Connection	New York La Guardia	LGA	475	1,095	786	1,034	1,050	1,202	1,231	1,284	1,332	1,561	229	17.2%	15,191	54,750	41,440	57,437	67,453	80,898	80,103	76,325	80,582	100,527	19,945	24.8%
Delta Connection	Minneapolis	MSP											-	-											-	-
Independence Air	Washington Dulles	IAD		1,384									-	-		69,186									-	-
Lufthansa German Airlines	Washington Dulles	IAD	31										-	-	1,550										-	-
Northwest Airlink	Detroit	DTW	484	915									-	-	33,366	53,132									-	-
Northwest Airlink	Minneapolis	MSP		404									-	-		20,186									-	-
Starlink Aviation	Yarmouth	YQI			521	521	217						-	-			9,386	9,386	3,909						-	-
Swissair	Boston	BOS	31										-	-	1,023										-	-
Ulendo Airlink	Bar Harbor	BHB									18		-18	-100.0%									886		-886	-100.0%
Ulendo Airlink	Halifax	YHZ										40	40	-										2,156	2,156	-
Ulendo Airlink	Islip	ISP									18		-18	-100.0%									886		-886	-100.0%
Ulendo Airlink	Melbourne	MLB									83	104	21	25.3%									5,173	5,237	64	1.2%
Ulendo Airlink	Sarasota/ Bradenton	SRQ									17	104	87	511.8%									906	5,763	4,857	536.1%
United Express	Chicago O'Hare	ORD		1,095	1,249	1,176	1,125	1,045	1,038	1,029	964		-964	-100.0%		67,590	82,273	72,457	59,896	65,872	63,099	64,054	53,558		-53,558	-100.0%
United Express	Cleveland	CLE				188	249	298					-	-				9,400	11,906	14,886					-	-
United Express	New York Newark	EWR				1,426	1,596	1,630	1,470	1,779	2,035		-2,035	-100.0%				103,511	81,454	102,156	92,953	108,900	113,044		-113,044	-100.0%
United Express	Washington Dulles	IAD	996	1,456	1,078	1,066	885	750	689	560	572		-572	-100.0%	49,779	83,730	64,767	62,493	43,839	39,624	37,949	35,213	35,764		-35,764	-100.0%
US Airways Express	Bangor	BGR	231										-	-	8,558										-	-
US Airways Express	Boston	BOS	2,229										-	-	42,359										-	-
US Airways Express	Charlotte	CLT		365	88	18	31	35					-	-		23,710	5,323	1,364	2,542	2,777					-	-
US Airways Express	New York La Guardia	LGA	1,218	1,665	1,647	1,526	598						-	-	43,901	77,909	78,477	68,755	26,013						-	-

Table F-6 Scheduled Passenger Operations by Market and Carrier for Portland International Jetport (Continued)

Departures

Carrier	Market	Code	2000	2005	2010	2011	2012	2013	2014	2015	2016	2017	'16-'17 Change	'16-'17 Pct. Change
US Airways Express	Philadelphia	PHL		1,913	1,947	1,987	2,153	2,131					-	-
US Airways Express	Pittsburgh	PIT		219									-	-
US Airways Express	Plattsburgh	PLB	48										-	-
US Airways Express	Presque Isle	PQI											-	-
US Airways Express	Washington National	DCA	1,089	1,149	1,043	1,043	1,260	1,408					-	-
US Airways Express	Westchester County	HPN	65										-	-
Subtotal			15,187	16,261	12,296	12,081	11,098	9,843	8,927	9,452	9,895	6,477	-3,418	-34.5%
Total			21,322	18,174	15,615	16,094	14,684	13,496	12,594	13,005	13,649	10,455	-3,194	-23.4%

Departing Seats

Carrier	Market	Code	2000	2005	2010	2011	2012	2013	2014	2015	2016	2017	'16-'17 Change	'16-'17 Pct. Change
US Airways Express	Philadelphia	PHL		100,307	133,521	129,133	139,908	137,137					-	-
US Airways Express	Pittsburgh	PIT		10,971									-	-
US Airways Express	Plattsburgh	PLB	909										-	-
US Airways Express	Presque Isle	PQI											-	-
US Airways Express	Washington National	DCA	33,976	75,568	83,302	87,190	102,160	100,248					-	-
US Airways Express	Westchester County	HPN	1,235										-	-
Subtotal			526,282	865,033	724,086	681,682	616,586	607,775	561,699	604,731	605,586	416,218	-189,368	-31.3%
Total			1,323,619	1,104,570	1,113,310	1,156,558	1,047,382	1,065,419	1,020,487	1,054,806	1,085,294	931,123	-154,171	-14.2%

Source: OAG Schedules.

Notes: All Northwest Airlines operations included in Delta Air Lines from 2009 onwards (following 2008 merger).
All Continental Airlines operations included in United Airlines from 2011 onwards (following 2010 merger).
All AirTran Airways operations included in Southwest Airlines from 2012 onwards (following 2011 merger).
All US Airways operations included in American Airlines from 2014 onwards (following 2013 merger).

Table F-7 Scheduled Passenger Operations by Market and Carrier for Burlington International Airport

			Departures												Departing Seats											
Carrier	Market	Code	2000	2005	2010	2011	2012	2013	2014	2015	2016	2017	'16-'17 Change	'16-'17 Pct. Change	2000	2005	2010	2011	2012	2013	2014	2015	2016	2017	'16-'17 Change	'16-'17 Pct. Change
Jet Carriers																										
AirTran	Baltimore	BWI											-	-											-	-
Allegiant Air	Orlando/ Sanford	SFB							94	104	95	18	-77	-81.1%							15,873	17,880	16,452	3,065	-13,387	-81.4%
American	Philadelphia	PHL							116				-	-							11,470				-	-
Continental	New York Newark	EWR											-	-											-	-
Delta	Atlanta	ATL						153	92	92	110	341	231	210.0%						21,394	13,708	13,708	15,202	38,852	23,650	155.6%
jetBlue	New York J F Kennedy	JFK	244	1,126	1,434	1,405	1,363	1,365	1,244	1,156	1,182	1,189	7	0.6%	39,528	173,920	180,286	163,839	163,821	143,907	124,357	115,600	118,157	118,871	714	0.6%
jetBlue	Orlando	MCO			330	339	326						-	-			33,014	33,871	32,643						-	-
Northwest	Detroit	DTW		174									-	-		17,429									-	-
United	Chicago O'Hare	ORD	815	365						113	345	202	-143	-41.4%	105,509	42,379						13,777	45,877	27,228	-18,649	-40.6%
United	Portland (ME)	PWM											-	-											-	-
US Airways	Philadelphia	PHL	1,098	365				26					-	-	150,338	46,170				2,546					-	-
US Airways	Pittsburgh	PIT	732										-	-	103,568										-	-
US Airways	Washington National	DCA		4									-	-		558									-	-
Subtotal			2,889	2,035	1,764	1,744	1,690	1,543	1,546	1,465	1,732	1,750	18	1.0%	398,943	280,456	213,300	197,710	196,464	167,847	165,408	160,965	195,688	188,016	-7,672	-3.9%
Regional/ Commuter Carriers																										
America West	New York Newark	EWR	166										-	-	7,889										-	-
American Eagle	Boston	BOS	3,094										-	-	102,111										-	-
American Eagle	Charlotte	CLT								122	378	627	249	65.9%								9,516	29,858	48,996	19,138	64.1%
American Eagle	Chicago O'Hare	ORD											-	-											-	-
American Eagle	New York La Guardia	LGA									18	21	3	16.7%									886	1,064	178	20.1%
American Eagle	Philadelphia	PHL							1,823	1,921	1,933	1,734	-199	-10.3%							110,129	126,772	103,725	103,662	-63	-0.1%
American Eagle	Washington National	DCA							1,276	1,339	1,394	1,386	-8	-0.6%							89,462	86,015	96,228	97,867	1,639	1.7%
Continental Connection	Albany	ALB											-	-											-	-
Continental Connection	Boston	BOS	244	634									-	-	4,628	12,054									-	-
Continental Connection	Buffalo	BUF	4										-	-	84										-	-

Table F-7 Scheduled Passenger Operations by Market and Carrier for Burlington International Airport (Continued)

			Departures												Departing Seats											
Carrier	Market	Code	2000	2005	2010	2011	2012	2013	2014	2015	2016	2017	'16-'17 Change	'16-'17 Pct. Change	2000	2005	2010	2011	2012	2013	2014	2015	2016	2017	'16-'17 Change	'16-'17 Pct. Change
Continental Connection	Hartford	BDL											-	-											-	-
Continental Connection	New York Newark	EWR			405								-	-			30,002								-	-
Continental Connection	Plattsburgh	PLB	213	367									-	-	4,039	6,970									-	-
Continental Connection	Plattsburgh International	PBG											-	-											-	-
Continental Connection	Poughkeepsie	POU	66										-	-	1,262										-	-
Continental Connection	Washington Dulles	IAD											-	-											-	-
Continental Connection	Westchester County	HPN											-	-											-	-
Continental Express	Cleveland	CLE	322	509	366								-	-	16,064	25,351	18,286								-	-
Continental Express	New York Newark	EWR	1,458	1,455	1,020								-	-	70,203	72,707	51,000								-	-
Continental Express	Westchester County	HPN											-	-											-	-
Delta Connection	Atlanta	ATL		62				61	273	273	255	59	-196	-76.9%		3,100				4,636	20,701	20,748	19,369	4,484	-14,885	-76.8%
Delta Connection	Boston	BOS		1,002									-	-		50,100									-	-
Delta Connection	Cincinnati	CVG		1,060									-	-		52,979									-	-
Delta Connection	Detroit	DTW			1,227	1,309	1,282	1,223	1,201	1,004	1,005	1,000	-5	-0.5%			61,417	65,443	64,114	61,224	60,043	57,053	55,842	51,402	-4,440	-8.0%
Delta Connection	New York J F Kennedy	JFK			1,336	1,338	221						-	-			67,071	81,259	14,884						-	-
Delta Connection	New York La Guardia	LGA	355				781	1,279	1,248	1,257	1,151	1,073	-78	-6.8%	11,351				50,144	83,899	82,592	76,339	69,396	60,573	-8,823	-12.7%
Independence Air	Washington Dulles	IAD		1,903									-	-		95,136									-	-
Lufthansa German Airlines	Washington Dulles	IAD	31										-	-	1,550										-	-
Northwest Airlink	Detroit	DTW		1,159									-	-		61,983									-	-
Northwest Airlink	Minneapolis	MSP		61									-	-		3,050									-	-
Porter Airlines	Toronto Island Apt	YTZ				9	31	56	47	39	22	26	4	18.2%				620	2,150	3,910	3,308	2,886	1,607	1,903	296	18.4%
Swissair	Boston	BOS	31										-	-	1,023										-	-
United Express	Chicago O'Hare	ORD		1,003	1,353	1,565	1,391	1,396	1,402	1,144	794	895	101	12.7%		59,930	84,431	88,435	81,204	84,669	85,350	63,845	42,348	50,322	7,974	18.8%
United Express	Cleveland	CLE				348	331	409	73				-	-				17,421	15,376	20,464	3,636				-	-
United Express	New York Newark	EWR				1,425	1,425	1,456	1,281	1,569	1,705	1,710	5	0.3%				94,675	80,261	85,373	82,670	96,340	94,246	89,273	-4,973	-5.3%

Table F-7 Scheduled Passenger Operations by Market and Carrier for Burlington International Airport (Continued)

Departures

Carrier	Market	Code	2000	2005	2010	2011	2012	2013	2014	2015	2016	2017	'16-'17 Change	'16-'17 Pct. Change
United Express	Washington Dulles	IAD	1,477	1,456	1,130	1,112	1,000	910	892	738	795	815	20	2.5%
US Airways Express	Boston	BOS	2,404										-	-
US Airways Express	Charlotte	CLT											-	-
US Airways Express	New York La Guardia	LGA	2,074	2,175	1,680	1,487	650						-	-
US Airways Express	Philadelphia	PHL		1,980	1,903	1,956	1,873	1,803					-	-
US Airways Express	Pittsburgh	PIT											-	-
US Airways Express	Plattsburgh	PLB	2,427										-	-
US Airways Express	Poughkeepsie	POU	718										-	-
US Airways Express	Saranac Lake	SLK	44										-	-
US Airways Express	Washington National	DCA	988	990	1,043	1,043	1,072	1,347					-	-
US Airways Express	Wilkes-Barre Scranton	AVP	22										-	-
Subtotal			**16,138**	**15,816**	**11,461**	**11,593**	**10,058**	**9,941**	**9,516**	**9,405**	**9,450**	**9,346**	**-104**	**- 1.1%**
Total			**19,028**	**17,851**	**13,225**	**13,336**	**11,748**	**11,484**	**11,062**	**10,870**	**11,182**	**11,096**	**-86**	**- 0.8%**

Departing Seats

Carrier	Market	Code	2000	2005	2010	2011	2012	2013	2014	2015	2016	2017	'16-'17 Change	'16-'17 Pct. Change
United Express	Washington Dulles	IAD	73,843	72,786	61,988	69,793	58,665	48,930	50,633	41,127	48,150	47,274	-876	- 1.8%
US Airways Express	Boston	BOS	48,139										-	-
US Airways Express	Charlotte	CLT											-	-
US Airways Express	New York La Guardia	LGA	76,749	80,491	62,144	55,008	24,050						-	-
US Airways Express	Philadelphia	PHL		97,288	128,140	131,727	121,653	111,615					-	-
US Airways Express	Pittsburgh	PIT											-	-
US Airways Express	Plattsburgh	PLB	46,116										-	-
US Airways Express	Poughkeepsie	POU	13,639										-	-
US Airways Express	Saranac Lake	SLK	841										-	-
US Airways Express	Washington National	DCA	31,574	61,458	77,625	82,974	85,623	100,348					-	-
US Airways Express	Wilkes-Barre Scranton	AVP	415										-	-
Subtotal			**511,521**	**755,382**	**642,104**	**687,357**	**598,123**	**605,069**	**588,524**	**580,640**	**561,655**	**556,820**	**- 4,835**	**- 0.9%**
Total			**910,464**	**1,035,838**	**855,404**	**885,067**	**794,588**	**772,916**	**753,932**	**741,605**	**757,343**	**744,836**	**- 12,507**	**- 1.7%**

Source: OAG Schedules.

Notes: Allegiant stopped reporting to the OAG in 2009, so Allegiant 2009-2015 statistics from the T100 database; 2016-2017 statistics from Innovata SRS.
All Northwest Airlines operations included in Delta Air Lines from 2009 onwards (following 2008 merger).
All Continental Airlines operations included in United Airlines from 2011 onwards (following 2010 merger).
All AirTran Airways operations included in Southwest Airlines from 2012 onwards (following 2011 merger).
All US Airways operations included in American Airlines from 2014 onwards (following 2013 merger).

Table F-8 Scheduled Passenger Operations by Market and Carrier for Bangor International Airport

			Departures												Departing Seats											
Carrier	Market	Code	2000	2005	2010	2011	2012	2013	2014	2015	2016	2017	'16-17 Change	'16-'17 Pct. Change	2000	2005	2010	2011	2012	2013	2014	2015	2016	2017	'16-'17 Change	'16-'17 Pct. Change
Jet Carriers																										
Allegiant Air	Orlando/Sanford	SFB			181	150	156	165	153	180	182	184	2	1.1%			27,150	22,500	23,912	27,335	26,536	31,156	31,730	31,221	-509	-1.6%
Allegiant Air	Punta Gorda	PGD							33	0			-	-							5,478	0			-	-
Allegiant Air	St. Petersburg/ Clearwater	PIE			107	93	112	115	119	134	143	136	-7	-4.9%			16,050	13,950	16,944	19,090	20,501	23,531	25,201	23,926	-1,275	-5.1%
Delta	Detroit	DTW								175	180		-180	-100.0%								19,334	19,769		-19,769	-100.0%
Delta	New York J F Kennedy	JFK										74	74	-										8,171	8,171	-
Pan American Airways	Allentown/ Bethlehem	ABE											-	-											-	-
Pan American Airways	Baltimore	BWI											-	-											-	-
Pan American Airways	Pittsburgh	PIT	285										-	-	42,729										-	-
Pan American Airways	Portsmouth	PSM	389										-	-	58,414										-	-
Pan American Airways	Sanford	SFB											-	-											-	-
Subtotal			674	0	288	243	268	280	305	489	505	394	-111	-22.0%	101,143	0	43,200	36,450	40,856	46,425	52,515	74,021	76,700	63,318	-13,382	-17.4%
Regional/Commuter Carriers																										
American Eagle	Boston	BOS	4,670	1,530									-	-	154,115	56,594									-	-
American Eagle	Charlotte	CLT										13	13	-										828	828	-
American Eagle	New York La Guardia	LGA	382	518							35	44	9	25.7%	12,606	19,166							1,757	3,322	1,565	89.1%
American Eagle	Philadelphia	PHL							1,496	1,452	1,447	1,551	104	7.2%							94,849	91,163	85,549	84,057	-1,492	-1.7%
American Eagle	Washington National	DCA							791	771	900	952	52	5.8%							41,033	40,260	47,737	60,581	12,844	26.9%
Boston-Maine Airways	Halifax	YHZ											-	-											-	-
Boston-Maine Airways	Manchester	MHT											-	-											-	-
Boston-Maine Airways	Portsmouth	PSM											-	-											-	-
Boston-Maine Airways	Saint John	YSJ											-	-											-	-
Continental Connection	Albany	ALB		189									-	-		3,583									-	-
Continental Express	New York Newark	EWR		481									-	-		22,698									-	-
Delta Connection	Atlanta	ATL											-	-											-	-
Delta Connection	Boston	BOS		1,416									-	-		70,800									-	-
Delta Connection	Cincinnati	CVG	1,342	1,394									-	-	67,100	82,439									-	-

Table F-8 Scheduled Passenger Operations by Market and Carrier for Bangor International Airport (Continued)

			Departures												Departing Seats											
Carrier	**Market**	**Code**	**2000**	**2005**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**'16-17 Change**	**'16-'17 Pct. Change**	**2000**	**2005**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**'16-'17 Change**	**'16-'17 Pct. Change**
Delta Connection	Detroit	DTW			975	871	703	706	711	279	204		-204	-100.0%			50,540	54,640	46,260	46,371	47,269	19,614	14,863		-14,863	-100.0%
Delta Connection	New York J F Kennedy	JFK			180							354	354	-			9,000							26,882	26,882	-
Delta Connection	New York La Guardia	LGA			537	844	1,043	1,153	975	976	1,007	1,008	1	0.1%			26,958	49,368	62,868	71,955	59,239	57,025	58,761	60,323	1,562	2.7%
Delta Connection	Minneapolis	MSP											-	-											-	-
Northwest Airlink	Boston	BOS	27										-	-	797										-	-
Northwest Airlink	Detroit	DTW		1,012									-	-		55,222									-	-
Northwest Airlink	Minneapolis	MSP		61									-	-		3,050									-	-
Pan American Airways	Portsmouth	PSM											-	-											-	-
Pan American Airways	Saint John	YSJ											-	-											-	-
United Express	Chicago O'Hare	ORD							245	215	206	280	74	35.9%							16,170	14,190	13,624	19,682	6,058	44.5%
United Express	New York Newark										123	490	367	298.4%									6,150	26,444	20,294	330.0%
US Airways Express	Boston	BOS	1,942										-	-	36,906										-	-
US Airways Express	New York La Guardia	LGA	35	158	1,017	1,230	299						-	-	1,295	7,914	44,051	53,371	14,950						-	-
US Airways Express	Philadelphia	PHL	428	1,179	1,156	1,405	1,543	1,564					-	-	15,836	58,943	68,510	89,548	99,457	101,167					-	-
US Airways Express	Pittsburgh	PIT											-	-											-	-
US Airways Express	Portland (ME)	PWM	231										-	-	8,558										-	-
US Airways Express	Presque Isle	PQI	299										-	-	6,224										-	-
US Airways Express	Washington National	DCA			31	52	589	883					-	-			1,529	2,607	29,464	47,981					-	-
Subtotal			**9,357**	**7,937**	**3,896**	**4,402**	**4,178**	**4,307**	**4,218**	**3,693**	**3,922**	**4,692**	**770**	**19.6%**	**303,436**	**380,408**	**200,587**	**249,535**	**253,000**	**267,474**	**258,560**	**222,252**	**228,441**	**282,119**	**53,678**	**23.5%**
Total			**10,031**	**7,937**	**4,184**	**4,645**	**4,446**	**4,587**	**4,523**	**4,182**	**4,427**	**5,086**	**659**	**14.9%**	**404,579**	**380,408**	**243,787**	**285,985**	**293,856**	**313,899**	**311,075**	**296,273**	**305,141**	**345,437**	**40,296**	**13.2%**

Source: OAG Schedules.

Notes: Allegiant stopped reporting to the OAG in 2009, so Allegiant 2009-2015 statistics from the T100 database; 2016-2017 statistics from Innovata SRS.
All Northwest Airlines operations included in Delta Air Lines from 2009 onwards (following 2008 merger).
All Continental Airlines operations included in United Airlines from 2011 onwards (following 2010 merger).
All AirTran Airways operations included in Southwest Airlines from 2012 onwards (following 2011 merger).
All US Airways operations included in American Airlines from 2014 onwards (following 2013 merger).

Table F-9 Scheduled Passenger Operations by Market and Carrier for Tweed-New Haven Airport

			Departures												Departing Seats											
Carrier	**Market**	**Code**	**2000**	**2005**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**'16-17 Change**	**'16-'17 Pct. Change**	**2000**	**2005**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**'16-17 Change**	**'16-'17 Pct. Change**
Regional/Commuter Carriers																										
American Eagle	Philadelphia	PHL							1,356	1,222	1,121	1,021	-100	-8.9%							50,161	49,657	63,913	53,712	-10,201	-16.0%
Delta Connection	Cincinnati	CVG		1,025									-	-		51,236									-	-
Boston-Maine Airways	Baltimore	BWI											-	-											-	-
Boston-Maine Airways	Bedford	BED											-	-											-	-
Boston-Maine Airways	Elmira/Corning	ELM											-	-											-	-
Boston-Maine Airways	Portsmouth	PSM											-	-											-	-
US Airways Express	Philadelphia	PHL	1,773	1,904	1,608	1,535	1,381	1,399					-	-	65,612	76,208	59,491	56,806	52,972	51,768					-	-
US Airways Express	Washington National	DCA	937										-	-	34,658										-	-
Total			**2,710**	**2,929**	**1,608**	**1,535**	**1,381**	**1,399**	**1,356**	**1,222**	**1,121**	**1,021**	**-100**	**-8.9%**	**100,270**	**127,444**	**59,491**	**56,806**	**52,972**	**51,768**	**50,161**	**49,657**	**63,913**	**53,712**	**-10,201**	**-16.0%**

Source: OAG Schedules.

Notes: All Northwest Airlines operations included in Delta Air Lines from 2009 onwards (following 2008 merger).
All Continental Airlines operations included in United Airlines from 2011 onwards (following 2010 merger).
All AirTran Airways operations included in Southwest Airlines from 2012 onwards (following 2011 merger).
All US Airways operations included in American Airlines from 2014 onwards (following 2013 merger).

Table F-10 Scheduled Passenger Operations by Market and Carrier for Worcester Regional Airport

			Departures												Departing Seats											
Carrier	**Market**	**Code**	**2000**	**2005**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**'16-'17 Change**	**'16-'17 Pct. Change**	**2000**	**2005**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**'16-'17 Change**	**'16-'17 Pct. Change**
Jet Carriers																										
Allegiant Air	Sanford	SFB											-	-											-	-
Boston-Maine Airways	Allentown/Bethlehem	ABE											-	-											-	-
Boston-Maine Airways	Portsmouth	PSM											-	-											-	-
Boston-Maine Airways	Sanford	SFB											-	-											-	-
Direct Air	Myrtle Beach	MYR			73	96							-	-			9,782	14,120							-	-
Direct Air	Orlando/Sanford	SFB			144	148							-	-			21,937	24,339							-	-
Direct Air	Punta Gorda	PGD			94	105							-	-			14,541	17,287							-	-
Direct Air	West Palm Beach	PBI			13	51							-	-			1,872	7,444							-	-
jetBlue	Fort Lauderdale/Hollywood	FLL						61	365	365	365	365	-	0.0%						6,100	36,500	36,500	36,500	36,500	-	0.0%
jetBlue	Orlando	MCO						61	365	365	365	365	-	0.0%						6,100	36,500	36,500	36,500	36,500	-	0.0%
Subtotal			0	0	324	400	0	122	730	730	730	730	-	0.0%	0	0	48,132	63,190	0	12,200	73,000	73,000	73,000	73,000	-	0.0%
Regional/Commuter Carriers																										
American Eagle	Chicago O'Hare	ORD											-	-											-	-
American Eagle	New York J F Kennedy	JFK	552										-	-	18,216										-	-
Delta Connection	Atlanta	ATL	670										-	-	33,500										-	-
US Airways Express	Philadelphia	PHL	1,464										-	-	54,168										-	-
Subtotal			**2,686**	**0**	**0**	**0**	**0**	**0**	**0**	**0**			**-**	**-**	**105,884**	**0**	**0**	**0**	**0**	**0**	**0**				**-**	**-**
Total			**2,686**	**0**	**324**	**400**	**0**	**122**	**730**	**730**	**730**	**730**	**-**	**0.0%**	**105,884**	**0**	**48,132**	**63,190**	**0**	**12,200**	**73,000**	**73,000**	**73,000**	**73,000**	**-**	**0.0%**

Source: OAG Schedules.
Notes: All Northwest Airlines operations included in Delta Air Lines from 2009 onwards (following 2008 merger).
All Continental Airlines operations included in United Airlines from 2011 onwards (following 2010 merger).
All AirTran Airways operations included in Southwest Airlines from 2012 onwards (following 2011 merger).
All US Airways operations included in American Airlines from 2014 onwards (following 2013 merger).

Table F-11 Scheduled Passenger Operations by Market and Carrier for Hanscom Field

			Departures												Departing Seats											
Carrier	Market	Code	2000	2005	2010	2011	2012	2013	2014	2015	2016	2017	'16-'17 Change	'16-'17 Pct. Change	2000	2005	2010	2011	2012	2013	2014	2015	2016	2017	'16-'17 Change	'16-'17 Pct. Change
Regional/Commuter Carriers																										
Boston-Maine Airways	Elmira/Corning	ELM											-	-											-	-
Boston-Maine Airways	Hyannis	HYA											-	-											-	-
Boston-Maine Airways	Manchester	MHT											-	-											-	-
Boston-Maine Airways	Martha's Vineyard	MVY											-	-											-	-
Boston-Maine Airways	Nantucket	ACK											-	-											-	-
Boston-Maine Airways	New Haven	HVN											-	-											-	-
Boston-Maine Airways	New London/Groton	GON		9									-	-		159									-	-
Boston-Maine Airways	Portsmouth	PSM		193									-	-		3,482									-	-
Boston-Maine Airways	Trenton	TTN		867									-	-		15,606									-	-
Pan American Airways	Atlantic City Pomona Field	ACY											-	-											-	-
Pan American Airways	Martha's Vineyard	MVY											-	-											-	-
Pan American Airways	New York Newark	EWR											-	-											-	-
Pan American Airways	Portsmouth	PSM											-	-											-	-
Pan American Airways	Westchester County	HPN											-	-											-	-
Shuttle America	Buffalo	BUF	1,119										-	-	55,950										-	-
Shuttle America	Hartford	BDL	173										-	-	8,636										-	-
Shuttle America	New York La Guardia	LGA	523										-	-	26,143										-	-
Shuttle America	Trenton	TTN	2,062										-	-	103,093										-	-
Streamline	Trenton	TTN				155							-	-				4,650							-	-
US Airways	Martha's Vineyard	MVY											-	-											-	-
US Airways	Nantucket	ACK											-	-											-	-
US Airways	New York La Guardia	LGA											-	-											-	-
US Airways	Philadelphia	PHL											-	-											-	-
US Airways	Trenton	TTN											-	-											-	-
US Airways	Westchester County	HPN											-	-											-	-
Total			**3,876**	**1,069**	**0**	**155**	**0**	**0**	**0**	**0**	**0**	**0**	**-**	**-**	**193,821**	**19,247**	**0**	**4,650**	**0**	**0**	**0**	**0**	**0**	**0**	**-**	**-**

Source: OAG Schedules.
Notes: All Northwest Airlines operations included in Delta Air Lines from 2009 onwards (following 2008 merger).
All Continental Airlines operations included in United Airlines from 2011 onwards (following 2010 merger).
All AirTran Airways operations included in Southwest Airlines from 2012 onwards (following 2011 merger).
All US Airways operations included in American Airlines from 2014 onwards (following 2013 merger).

Table F-12 Scheduled Passenger Operations by Market and Carrier for Portsmouth International Airport

			Departures												Departing Seats											
Carrier	Market	Code	2000	2005	2010	2011	2012	2013	2014	2015	2016	2017	'16-'17 Change	'16-'17 Pct. Change	2000	2005	2010	2011	2012	2013	2014	2015	2016	2017	'16-'17 Change	'16-'17 Pct. Change
Jet Carriers																										
Allegiant Airways	Orlando/Sanford	SFB		35				16	83	95	100	135	35	35.0%		5,229				2,656	14,242	16,111	17,062	22,498	5,436	31.9%
Allegiant Airways	Punta Gorda	PGD							22	35	48	99	51	106.3%							3,652	5,909	8,496	17,496	9,000	105.9%
Allegiant Airways	Fort Lauderdale/Hollywood	FLL								27	43	35	-8	-18.6%								4,779	7,611	6,177	-1,434	-18.8%
Allegiant Airways	St. Petersburg/Clearwater	PIE									13	39	26	200.0%									2,158	6,474	4,316	200.0%
Allegiant Airways	Myrtle Beach	MYR										34	34	-										5,644	5,644	-
Boston-Maine Airways	Fort Lauderdale/Hollywood	FLL		13									-	-		1,993									-	-
Boston-Maine Airways	Hartford	BDL		13									-	-		1,993									-	-
Boston-Maine Airways	Newburgh	SWF		48									-	-		7,179									-	-
Boston-Maine Airways	Sanford	SFB		57									-	-		8,593									-	-
Pan American Airways	Allentown/Bethlehem	ABE	93										-	-	13,950										-	-
Pan American Airways	Bangor	BGR	389										-	-	58,414										-	-
Pan American Airways	Gary	GYY	51										-	-	7,714										-	-
Pan American Airways	Manchester	MHT											-	-											-	-
Pan American Airways	New York Newark	EWR											-	-											-	-
Pan American Airways	Pittsburgh	PIT	261										-	-	39,171										-	-
Pan American Airways	Sanford	SFB	296										-	-	44,400										-	-
Pan American Airways	Santo Domingo	SDQ											-	-											-	-
Pan American Airways	St. Petersburg/Clearwater	PIE											-	-											-	-
Pan American Airways	Worcester	ORH											-	-											-	-
Skybus	Columbus	CMH											-	-											-	-
Skybus	Greensboro	GSO											-	-											-	-
Skybus	Punta Gorda	PGD											-	-											-	-
Skybus	Saint Augustine	UST											-	-											-	-
Subtotal			**1,091**	**167**	**0**	**0**	**0**	**16**	**105**	**157**	**204**		**-204**	**-100.0%**	**163,650**	**24,986**	**0**	**0**	**0**	**2,656**	**17,894**	**26,799**	**35,327**	**58,289**	**22,962**	**65.0%**
Regional/Commuter Carriers																										
Boston-Maine Airways	Baltimore	BWI											-	-											-	-
Boston-Maine Airways	Bangor	BGR											-	-											-	-
Boston-Maine Airways	Bedford	BED		171									-	-		3,083									-	-
Boston-Maine Airways	Hyannis	HYA											-	-											-	-
Boston-Maine Airways	Manchester	MHT											-	-											-	-
Boston-Maine Airways	Martha's Vineyard	MVY											-	-											-	-

Table F-12 Scheduled Passenger Operations by Market and Carrier for Portsmouth International Airport (Continued)

			Departures												Departing Seats											
Carrier	Market	Code	2000	2005	2010	2011	2012	2013	2014	2015	2016	2017	'16-'17 Change	'16-'17 Pct. Change	2000	2005	2010	2011	2012	2013	2014	2015	2016	2017	'16-'17 Change	'16-'17 Pct. Change
Boston-Maine Airways	Nantucket	ACK											-	-											-	-
Boston-Maine Airways	New Haven	HVN											-	-											-	-
Boston-Maine Airways	New London/Groton	GON											-	-											-	-
Boston-Maine Airways	Saint John	YSJ											-	-											-	-
Boston-Maine Airways	Trenton	TTN		22									-	-		399									-	-
Boston-Maine Airways	Westchester County	HPN											-	-											-	-
Pan American Airways	Atlantic City Pomona Field	ACY											-	-											-	-
Pan American Airways	Baltimore	BWI											-	-											-	-
Pan American Airways	Bangor	BGR											-	-											-	-
Pan American Airways	Bedford	BED											-	-											-	-
Pan American Airways	Martha's Vineyard	MVY											-	-											-	-
Pan American Airways	Saint John	YSJ											-	-											-	-
Subtotal			**0**	**193**	**0**	**0**	**0**	**0**	**0**	**0**	**0**		**-**	**-**	**0**	**3,482**	**0**	**0**	**0**	**0**	**0**	**0**			**-**	**-**
Total			**1,091**	**360**	**0**	**0**	**0**	**16**	**105**	**157**	**204**		**-204**	**-100.0%**	**163,650**	**28,467**	**0**	**0**	**0**	**2,656**	**17,894**	**26,799**	**35,327**	**58,289**	**22,962**	**65.0%**

Source: OAG Schedules.

Notes: Allegiant stopped reporting to the OAG in 2009, so Allegiant 2009-2015 statistics from the T100 database; 2016-2017 statistics from Innovata SRS.

All Northwest Airlines operations included in Delta Air Lines from 2009 onwards (following 2008 merger).

All Continental Airlines operations included in United Airlines from 2011 onwards (following 2010 merger).

All AirTran Airways operations included in Southwest Airlines from 2012 onwards (following 2011 merger).

All US Airways operations included in American Airlines from 2014 onwards (following 2013 merger).

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G

Ground Access to and from Logan Airport

This appendix provides information in support of Chapter 5, *Ground Access to and from Logan Airport*:

- Table G-1A Logan Express Bus Service Ridership (Annual)
- Table G-1B Logan Express Back Bay Service Ridership (Annual)
- Table G-2 Water Transportation Services Ridership to and from Logan Airport (Annual)
- Table G-3 Massachusetts Bay Transportation Authority (MBTA) Airport Station Passengers
- Table G-4 Annual Taxi Dispatches (Tickets Sold)
- Table G-5 On-Airport Commercial Parking Rates, 2010-2017
- Table G-6 Logan Airport Employee Parking Supply
- Table G-7 Logan Airport Commercial Parking Supply
- Table G-8 2017 Existing Conditions – Airport-Related Traffic, On-Airport Link Attributes, Traffic Assignment, and Vehicle Miles Traveled (VMT) Summary
- Table G-9 Future Conditions – Airport-Related Traffic, On-Airport Link Attributes, Traffic Assignment, and Vehicle Miles Traveled (VMT) Summary
- VISSIM Existing Traffic Roadway Network
- VISSIM Future Traffic Roadway Network
- March 2017 Logan Airport Parking Space Inventory, submitted to Massachusetts Department of Environmental Protection (also known as the *Parking Freeze Report*)
- September 2017 Logan Airport Parking Space Inventory, submitted to Massachusetts Department of Environmental Protection (also known as the *Parking Freeze Report*)
- October 2017 Revised Logan Airport Parking Space Inventory, submitted to Massachusetts Department of Environmental Protection (also known as the *Parking Freeze Report*)

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Table G-1A Logan Express Bus Service Ridership

	Ridership			Percent Change		
Service Year	**Air Passengers**	**Employees**	**Total**	**Air Passengers**	**Employees**	**Total**
Framingham						
1992	207,847	7,573	215,420	4.3%	21.3%	4.8%
1993	229,064	12,307	241,371	10.2%	62.5%	12.0%
1994	250,342	17,352	267,694	9.3%	41.0%	10.9%
1995	274,754	21,129	295,883	9.8%	21.8%	10.5%
1996	325,665	22,932	348,597	18.5%	8.5%	17.8%
1997	316,306	29,871	346,175	(2.9%)	30.3%	(0.7%)
1998	337,007	33,971	370,978	6.5%	13.7%	7.2%
1999	345,715	31,946	380,661	3.5%	(6.0%)	2.6%
2000	371,560	34,508	406,068	6.6%	8.0%	6.7%
2001	354,521	38,740	393,261	(4.6%)	12.3%	(3.2%)
2002	342,746	42,441	385,187	(3.3%)	8.7%	(2.1%)
2003	310,024	55,979	366,003	(9.5%)	31.9%	(5.0%)
2004	323,931	54,763	378,694	4.5%	(2.2%)	3.5%
2005	318,125	57,569	375,694	(1.8%)	5.1%	(0.8%)
2006	349,022	60,764	409,789	9.7%	5.5%	9.1%
2007	311,299	57,252	368,551	(2.1%)[5]	(0.6%)[5]	(1.9%)[5]
2008	276,112	57,797	333,909	(11.3%)	1.0%	(9.4%)
2009	264,233	59,840	324,073	(4.3%)	3.5%	(2.9%)
2010	272,190	62,226	334,416	3.0%	4.0%	3.2%
2011[1]	272,301	68,228	340,529	0.0%	9.6%	1.8%
2012	279,603	82,951	362,554	2.7%	21.6%	6.5%
2013	295,654	84,008	379,662	5.7%	1.3%	4.7%
2014	303,646	87,488	391,134	2.7%	4.1%	3.0%
2015	345,680	82,943	428,623	13.8%	(5.2%)	9.6%
2016	406,253	92,642	498,895	17.5%	11.7%	16.4%
2017	**434,906**	**99,639**	**534,545**	**7.1%**	**7.6%**	**7.2%**

Table G-1A	Logan Express Bus Service Ridership (Continued)					
	Ridership			Percent Change		
Service Year	Air Passengers	Employees	Total	Air Passengers	Employees	Total
Braintree						
1992	186,217	9,694	195,911	10.6%	16.6%	10.8%
1993	205,209	22,768	227,977	10.2%	134.9%	16.4%
1994	247,636	37,489	285,125	20.7%	64.7%	25.1%
1995	264,579	70,723	335,302	6.8%	88.7%	17.6%
1996	335,232	103,519	438,751	26.7%	46.4%	30.1%
1997	300,006	135,340	435,346	(10.5%)	30.7%	(0.8%)
1998	300,005	156,105	456,110	0.0%	15.3%	4.8%
1999	328,818	125,286	454,105	9.6%	(19.7%)	(0.5%)
2000	355,932	149,687	505,619	8.2%	19.5%	11.3%
2001	345,249	156,240	501,489	(3.0%)	4.4%	(0.8%)
2002	323,115	190,360	513,475	(6.4%)	21.8%	2.4%
2003	301,013	216,765	517,778	(6.8%)	13.9%	0.8%
2004	318,100	208,566	526,666	5.7%	(3.8%)	1.7%
2005	307,659	189,531	497,190	(3.2%)	(9.1%)	(5.5%)
2006	333,413	202,983	536,396	8.4%	7.1%	7.9%
2007	300,715	196,955	497,670	(2.3%)5	3.9%[5]	0.1%[5]
2008	252,289	221,591	473,880	(16.1%)	12.5%	(4.8%)
2009	231,151	234,908	466,059	(8.4%)	6.0%	(1.7%)
2010	231,422	251,443	482,865	0.1%	7.0%	3.6%
2011[1]	233,521	285,515	519,036	0.9%	13.6%	7.5%
2012	247,346	314,542	561,888	5.9%	10.2%	8.3%
2013	268,154	320,329	588,483	8.4%	1.8%	4.7%
2014	296,975	313,334	610,309	10.7%	(2.2%)	3.7%
2015	313,576	311,695	625,271	5.6%	(0.5%)	2.5%
2016	329,043	326,115	655,158	4.9%	4.6%	4.8%
2017	**345,401**	**349,435**	**694,836**	**5.0%**	**7.2%**	**6.1%**

Table G-1A	Logan Express Bus Service Ridership (Continued)					
	Ridership			Percent Change		
Service Year	Air Passengers	Employees	Total	Air Passengers	Employees	Total
Woburn[2]						
1992[3]	3,052	91	3,143	NA	NA	-
1993	59,635	5,027	64,662	NA	NA	-
1994	119,567	9,082	128,649	100.5%	80.7%	99.0%
1995	150,147	13,376	163,523	25.6%	47.3%	27.1%
1996	190,566	17,322	207,888	26.9%	29.5%	27.1%
1997	199,715	20,018	219,733	4.8%	15.6%	5.7%
1998	208,286	22,876	231,162	4.3%	14.3%	5.2%
1999	191,454	23,495	214,949	(8.1%)	2.7%	(7.0%)
2000	195,744	27,522	223,266	2.2%	17.1%	3.9%
2001	177,375	38,318	215,530	(9.4%)	39.2%	(3.4%)
2002	161,145	73,277	234,422	(9.2%)	91.0%	8.7%
2003	164,980	103,963	268,943	(2.4%)	41.9%	14.7%
2004	172,110	111,326	283,436	4.3%	7.1%	5.4%
2005	163,227	110,961	274,188	(5.1%)	(0.3%)	(3.2%)
2006	167,341	121,672	289,013	2.5%	9.7%	5.4%
2007	149,149	123,066	272,215	(8.6%)[5]	10.9%[5]	(0.7%)[5]
2008	129,385	122,777	252,162	(13.3%)	(0.2%)	(7.4%)
2009	113,607	121,633	235,240	(12.2%)	(0.9%)	(6.7%)
2010	115,257	127,120	242,377	1.5%	4.5%	3.0%
2011[1]	118,232	151,029	269,261	2.6%	18.8%	11.1%
2012	126,549	188,747	315,296	7.0%	25.0%	17.1%
2013	140,407	192,289	332,696	11.0%	1.9%	5.5%
2014	156,045	194,341	350,386	11.1%	1.1%	5.3%
2015	163,469	191,242	354,711	4.8%	(1.6%)	1.2%
2016	170,704	197,568	368,272	4.4%	3.3%	3.8%
2017	**176,485**	**209,194**	**385,679**	**3.4%**	**5.9%**	**4.7%**

Table G-1A Logan Express Bus Service Ridership (Continued)

	Ridership			Percent Change		
Service Year	**Air Passengers**	**Employees**	**Total**	**Air Passengers**	**Employees**	**Total**
Peabody						
2001[4]	8,151	3,097	11,248	NA	NA	NA
2002	28,626	20,629	49,255	NA	NA	NA
2003	32,318	23,425	55,743	21.4%	13.6%	13.2%
2004	43,389	33,642	77,031	34.3%	43.6%	38.2%
2005	51,023	39,599	87,622	17.6%	17.7%	13.7%
2006	42,142	32,632	74,774	(17.4%)	(17.6%)	(14.7%)
2007	36,367	26,949	63,316	(28.7%)[5]	(31.9%)[5]	(27.7%)[5]
2008	30,887	30,596	61,483	(15.1%)	13.5%	(2.9%)
2009	27,856	32,220	60,076	(9.8%)	5.3%	(2.3%)
2010	25,543	26,231	51,744	(8.3%)	(18.6%)	(13.8%)
2011[1]	25,555	31,741	57,296	0.0%	21.0%	10.7%
2012	27,542	37,909	65,451	7.8%	19.4%	14.2%
2013	28,790	38,067	66,857	4.5%	0.4%	2.1%
2014	31,485	36,848	68,333	9.4%	(3.2%)	2.2%
2015	37,478	36,125	73,603	19.0%	(2.0%)	7.7%
2016	40,872	36,143	77,015	9.1%	0.0%	4.6%
2017	**46,117**	**37,233**	**83,350**	**12.8%**	**3.0%**	**8.2%**

Table G-1A Logan Express Bus Service Ridership (Continued)

	Ridership			Percent Change		
Service Year	Air Passengers	Employees	Total	Air Passengers	Employees	Total
Total System Ridership						
1992	397,116	17,358	414,474	8.0%	19.2%	8.5%
1993	493,908	39,832	533,740	24.4%	129.5%	28.8%
1994	617,545	63,923	681,468	25.0%	60.5%	27.7%
1995	689,480	105,228	794,708	11.6%	64.6%	16.6%
1996	851,463	143,773	995,236	23.4%	36.6%	25.2%
1997	816,015	185,229	1,001,254	(4.2%)	28.8%	0.6%
1998	845,598	212,952	1,058,550	3.6%	15.0%	5.7%
1999	868,987	180,727	1,049,714	2.7%	(15.2%)	(0.8%)
2000	923,236	211,717	1,134,953	6.2%	17.1%	8.1%
2001	885,296	236,395	1,121,691	(4.1%)	11.7%	(1.2%)
2002	855,632	326,707	1,182,339	(3.4%)	38.2%	5.4%
2003	808,335	400,132	1,208,467	(5.5%)	22.5%	2.2%
2004	857,530	408,297	1,265,827	6.1%	2.0%	2.2%
2005	837,034	397,660	1,234,694	(2.4%)	(2.6%)	(2.4%)
2006	891,918	418,051	1,309,969	6.6%	5.1%	6.1%
2007	797,530	404,222	1,201,752	(4.7%)[5]	1.7%[5]	(2.7%)[5]
2008	688,673	432,761	1,121,434	(13.6%)	7.1%	(6.7%)
2009	636,847	448,601	1,085,448	(7.5%)	3.7%	(3.2%)
2010	644,412	467,020	1,111,432	1.2%	4.1%	2.4%
2011[1]	649,609	536,513	1,186,122	0.8%	14.9%	6.7%
2012	681,040	624,149	1,305,189	4.8%	16.3%	10.0%
2013	733,005	634,693	1,367,698	8.0%	2.0%	5.0%
2014	788,151	632,011	1,420,162	7.5%	(0.4%)	3.8%
2015	860,203	622,005	1,482,208	9.1%	-1.6%	4.4%
2016	946,872	652,468	1,599,340	10.1%	4.9%	7.9%
2017	**1,002,909**	**695,504**	**1,698,410**	**5.9%**	**6.6%**	**6.2%**

Source: Massport.
Notes: January 23, 2008: I-90/Ted Williams Tunnel opens to all traffic.
NA Not applicable.
1 Changes to employee parking and bus fares were implemented in October 2011.
2 Woburn Express moved from Mishawum Station to the Anderson Regional Transportation Center (ARTC) in Woburn in May 2001.
3 Reflects a partial year of operation. Woburn Logan Express service was implemented in November 1992.
4 Reflects a partial year of operation. The Peabody Logan Express service commenced in September 2001.
5 Percent comparison between 2007 and 2005. The I-90 Ted Williams Tunnel closures in 2006 resulted in atypical ridership.

Table G-1B Logan Express Back Bay Service Ridership[1]

	Ridership	Percent Change
Service Year		
2014	152,892	NA
2015	290,796	NA
2016	216,329	(25.6%)
2017	**137,326**	**(36.5%)**

Source: Massport.

1 Back Bay Logan Express service commenced in April 2014. Only total ridership available.

Table G-2 Water Transportation Services Ridership to and from Logan Airport

	Rowes Wharf/Fan Pier Water Shuttle	Private Water Taxi (on-demand)	Harbor Express (Hingham-Hull-Boston Logan)[1]	Boston Logan Water Shuttle (Long Wharf)	Total
1990	181,530	NS	NS	NS	181,530
1991	142,500	NS	NS	NS	142,500
1992	133,297	NS	NS	NS	133,297
1993	159,525	NS	NS	NS	159,525
1994	209,057	NS	NS	NS	209,057
1995	203,829	NS	NS	NS	203,829
1996	159,992	3,364	11,781	NS	175,137
1997	132,542	6,299	71,309	NS	210,150
1998	124,836	9,243	101,174	NS	235,253
1999	122,211	17,252	98,539	NS	238,002
2000	128,097	26,335	83,243	NS	237,675
2001	107,400	29,642	82,704	NS	219,746
2002	75,304	36,736	66,471	NS	178,511
2003	26,480[2]	35,724[3]	61,849	5,722[4]	129,775
2004	NS	54,540	58,788	3,202[5]	116,530
2005	NS	44,975	51,960	NS	96,935
2006	NS	63,639	70,998	NS	134,637
2007	NS	50,737	59,460	NS	110,197
2008	NS	48,630	48,003	NS	96,633
2009	NS	50,734	37,861	NS	88,595
2010	NS	54,382	34,794	NS	89,176
2011	NS	58,879	33,403	NS	92,282
2012	NS	60,840	30,337	NS	91,177
2013	NS	70,378	21,952	NS	92,303
2014	NS	67,479	19,340	NS	86,819
2015	NS	70,798	7,748	NS	78,546
2016	NS	74,788	7,757	NS	82,545
2017	**NS**	**83,689**	**7,424**	**NS**	**91,113**

Source: Massport.
Notes: Figures from 2003 – 2007 have been revised from previous documents.
NS Operation not in service.
1 Service to Quincy was discontinued in 2013 and now operates between Hingham/Hull/Boston (Long Wharf)/Logan.
2 Rowes Wharf Water Shuttle operated from January to June only in 2003.
3 Operated from May to October only in 2003.
4 Long Wharf Boston Logan Water Shuttle operated from August to December in 2003.
5 Joint operation with City Water Taxi began on August 16, 2003.

Table G-3 Massachusetts Bay Transportation Authority (MBTA) Airport Station Passengers

Year	Entrances	Exits	Total Turnstile Count[1]	Percent Change
1990	NA	NA	2,854,317	-
1991	NA	NA	2,515,293	(11.9%)
1992	NA	NA	2,626,572	4.2%
1993	NA	NA	2,604,980	(0.8%)
1994	NA	NA	3,108,734	19.3%
1995	NA	NA	3,040,868	(2.2%)
1996	NA	NA	2,974,850	(2.2%)
1997[2]	NA	NA	2,774,268	(6.7%)
1998	NA	NA	2,850,367	2.7%
1999	NA	NA	2,974,045	4.3%
2000	NA	NA	3,019,086	1.5%
2001	NA	NA	2,896,638	(4.1%)
2002	NA	NA	2,670,594	(7.8%)
2003[3]	1,300,272	1,275,627	2,575,899	(3.6%)
2004	1,373,861	1,366,511	2,740,372	6.4%
2005	NA	NA	NA	NA
2006	NA	NA	NA	NA
2007[4]	1,412,055	--	2,524,079	--
2008[5]	2,212,111	--	3,647,394	56.7%
2009[5]	2,329,370	--	3,750,549	5.3%
2010[5]	2,270,241	--	3,629,193	(2.5%)
2011	2,277,311	NA	NA	0.3%
2012	2,442,085	NA	NA	7.2%
2013	2,597,306	NA	NA	6.3%
2014	2,378,965	NA	NA	(8.4%)[6]
2015	2,122,597	NA	NA	(10.8%)[6]
2016	2,240,744	NA	NA	5.6%
2017	**2,197,783**	**N/A**	**N/A**	**(1.9%)**

Source: MBTA.

Notes: Total Turnstile count figures include both Logan Airport bound (turnstile exits) and non-Logan Airport bound (turnstile entrances) passengers.

NA Data not available

1 As stated in the *Logan Airport 1999 ESPR*, Massport believes that ridership estimates through 2005 from the old Airport Station were understated because many travelers that were destined for the Airport with baggage had been observed to avoid the turnstiles and exit the old Airport Station via the wide gate (designed for handicapped access) that did not have the capability to count passengers.

2 Airport Station was closed on six weekends during September and October 1997 due to construction.

3 Airport Station was closed on eight weekend days during 2003.

4 Automated fare collection and new fare gates implemented beginning January 2007. Station access to Bremen Street Park opened June 2007. Exits are undercounted.

5 Exits are undercounted, as some exits occur through exit doors rather than turnstiles.

6 Due to the closure of Government Center Station in 2014, it is possible that passengers who would normally take the Blue Line to the Green Line switched to alternate modes for their trips.

Table G-4 Annual Taxi Dispatches (Tickets Sold)

Year	Total (yearly tickets sold)	Percent Change
1990	1,330,418	-
1991	1,208,611	(9.2%)
1992	1,266,033	4.8%
1993	1,336,603	5.6%
1994	1,409,505	5.5%
1995	1,499,869	6.4%
1996	1,721,093	14.7%
1997	1,827,244	6.2%
1998	1,888,281	3.3%
1999	1,955,895	3.6%
2000	2,140,724	9.4%
2001	1,789,736	(16.4%)
2002	1,679,508	(6.2%)
2003	1,562,076	(7.0%)
2004	1,713,696	9.7%
2005	1,769,876	3.3%
2006	1,857,609	5.0%
2007	1,925,817	3.7%
2008	1,749,730	(9.1%)
2009	1,630,333	(6.8%)
2010	1,829,961	12.1%
2011	1,937,743	6.0%
2012	2,022,239	4.4%
2013	2,131,371	5.0%
2014	2,237,793	5.0%
2015	2,302,059	2.9%
2016	2,420,391	5.1%
2017	**1,975,174**	**(18.4%)**

Source: Massport.

Table G-5 On-Airport Commercial Parking Rates, 2010-2017

Terminal Area Facility	2010	2011	2012	2013	2014	2015	2016	2017	Economy Parking	2010	2011	2012	2013	2014	2015	2016	2017
Central/West Parking Garage, Terminal B Garage, Terminal E Lots									Economy Parking Garage								
0 to 30 minutes	$3	$3	$3	$3	$3	$3	$3	N/A	Daily Rate	$18	$18	$18	$18	$20	$20	$23	$26
31 minutes to 1 hour	$6	$6	$6	$6	$6	$6	$6	N/A	Additional days 0 to 6 hours	$9	$9	$9	$9	$10	$10	$12	$13
0 minutes to 1 hour							N/A	$7									
1 to 1.5 hours	$9	$9	$9	$9	$11	$10	$12	N/A	Additional days 6 to 24 hours	$18	$18	$18	$18	$20	$20	$23	$26
1.5 to 2 hours	$12	$12	$12	$12	$14	$14	$17	N/A	Weekly Rate (6-7 days)	$108	$108	$108	$108	$120	$120	$138	N/A
1 to 2 hours							N/A	$19									
2 to 3 hours	$15	$15	$17	$17	$19	$19	$22	$24									
3 to 4 hours	$18	$18	$21	$21	$23	$23	$26	$28									
4 to 7 hours	$22	$22	$25	$25	$27	$27	$30	$32									
7 to 24 hours (Daily)	$24	$24	$27	$27	$29	$29	$32	$35									
Additional days 0 to 6 hours	$12	$12	$14	$14	$15	$15	$16	$18									
Additional day(s) 6 to 24 hours	$24	$24	$27	$27	$29	$29	$32	$35									

Source: Massport.

Table G-6 Logan Airport Employee Parking Supply

	Number of Spaces							
Location	**March 2014**	**September 2014**	**March 2015**	**September 2015**	**March 2016**	**September 2016**	**March 2017**	**October 2017**
Terminal Area	857	868	868	865	865	865	**865**	**865**
North Service Area	883	883	881	876	876	876	**876**	**876**
Southwest Service Area	4	4	14	16	16	16	**16**	**16**
South Service Area	681	681	674	665	665	665	**665**	**665**
Airside (Fire/Rescue)	0	0	0	0	0	0	**0**	**0**
Total spaces in service	2,425	2,436	2,437	2,422	2,422	2,422	**2,422**	**2,422**
Total spaces out of service	248	237	236	251	26	26	**26**	**26**
Total employee spaces	2,673	2,673	2,673	2,673	2,448	2,448	**2,448**	**2,448**

Source: Logan Airport Parking Space Inventory submitted to Massachusetts Department of Environmental Protection (MassDEP), March and September 2014, 2015, 2016, and 2017 (September 2017 was revised in October 2017).

Table G-7 Logan Airport Commercial Parking Supply

Location	Number of Spaces							
	March 2014	**September 2014**	**March 2015**	**September 2015**	**March 2016**	**September 2016**	**March 2017**	**October 2017**
Terminal Area								
Central Garage and West Garage	10,267	10,267	10,267	10,340	11,954	11,954	**11,954**	**11,954**
Terminal B Garage	2,254	2,254	2,254	2,201	2,212	2,212	**2,212**	**2,212**
Terminal E Lot 1	275	275	243	237	237	237	**237**	**237**
Terminal E Lot 2	248	248	248	249	249	249	**249**	**249**
Terminal E Lot 3 (Gulf Lot)	219	219	219	217	217	217	**217**	**217**
Signature (General Aviation)	35	35	35	35	35	35	**35**	**35**
Logan Airport Hilton	235	235	35	35	235	235	**235**	**235**
North Service Area								
Economy Garage	2,809	2,809	2,809	2,864	2,864	2,864	**2,864**	**2,864**
Overflow Green Lot (Wood Island)	0	0	235	242	0	0	**0**	**0**
South Service Area								
Harborside Hyatt Conference Center and Hotel	270	270	270	270	270	270	**270**	**270**
Overflow Blue Lot (Harborside Dr.)	0	0	315	339	367	367	**367**	**367**
Southwest Service Area								
Overflow Red Lot (Tomahawk Dr.)	0	0	282	282	0	0	**0**	**0**
Massport In-Service Parking Supply (lined spaces)	16,072	16,072	16,872	16,971	**18,100**	**18,100**	**18,100**	**18,100**
Total spaces in service[1]	16,612	16,612	17,212	17,311	18,640	18,640	**18,640**	**18,640**
Total spaces out of service	1,803	1,803	1,203	1,104	-	-	**-**	**5,000**
Total commercial spaces	18,415	18,415	18,415	18,415	18,640	18,640	**18,640**	**23,640**

Source: Logan Airport Parking Space Inventory submitted to MassDEP, March and September 2014, 2015, 2016, and 2017 (September 2017 was revised in October 2017).

1 Total spaces in service includes Signature (General Aviation), Logan Airport Hilton, Harborside Hyatt Conference Center and Hotel, and overflow lots (Overflow Green Lot, Overflow Red Lot, etc.) from previous years.

Table G-8 2017 Existing Conditions – Airport-Related Traffic, On-Airport Link Attributes, Traffic Assignment and Vehicle Miles Traveled (VMT) Summary

Link Name	Link Distance (ft)	Link Speed (mph)	VOLUME				VMT			
			AM Peak	PM Peak	High 8-Hour	AWDT	AM Peak	PM Peak	High 8-Hour	AWDT
1	344	27	973	1187	8567	19422	63.40	77.35	558.24	1265.58
2	496	29	712	869	6270	14215	66.88	81.63	588.96	1335.26
3	1347	20	595	727	5244	11887	151.80	185.48	1337.88	3032.67
4	1166	27	1009	1232	8888	20150	222.81	272.05	1962.63	4449.49
5	378	24	1605	1958	14132	32038	114.98	140.27	1012.39	2295.13
6	441	31	469	572	4131	9364	39.18	47.79	345.14	782.34
7	896	23	1134	1384	9986	22638	192.52	234.97	1695.36	3843.33
8	644	27	1145	1397	10080	22851	139.76	170.52	1230.37	2789.22
9	1214	26	350	427	3080	6983	80.46	98.16	708.01	1605.21
10	1303	25	802	978	7062	16010	197.97	241.41	1743.19	3951.91
11	421	24	545	665	4797	10875	43.46	53.03	382.53	867.22
12	236	31	169	206	1489	3376	7.54	9.20	66.46	150.70
13	1311	31	181	220	1591	3607	44.93	54.61	394.93	895.35
14	750	26	1685	2056	14837	33637	239.35	292.05	2107.58	4778.09
15	441	23	1442	1759	12698	28786	120.40	146.87	1060.25	2403.57
16	1724	23	12	14	102	231	3.92	4.57	33.30	75.43
17	644	19	715	872	6294	14269	87.15	106.28	767.13	1739.14
18	354	26	793	968	6984	15832	53.18	64.92	468.35	1061.71
19	687	15	12	14	102	231	1.56	1.82	13.26	30.03
20	94	15	469	572	4131	9364	8.36	10.20	73.66	166.98
21	877	21	59	72	517	1173	9.80	11.96	85.91	194.92
22	79	32	59	72	517	1173	0.88	1.07	7.70	17.47
23	81	28	12	14	102	231	0.18	0.21	1.56	3.52
24	79	5	11	13	94	213	0.17	0.20	1.41	3.21
25	87	9	9	11	78	178	0.15	0.18	1.28	2.92
26	209	19	9	11	78	178	0.36	0.44	3.09	7.06
27	187	5	11	13	94	213	0.39	0.46	3.33	7.54
28	124	6	20	24	172	391	0.47	0.57	4.05	9.21
29	226	31	348	425	3065	6948	14.90	18.19	131.20	297.42
30	1070	5	522	636	4593	10413	105.74	128.83	930.38	2109.30
31	385	32	279	341	2461	5579	20.33	24.84	179.29	406.45
32	516	26	69	84	604	1368	6.74	8.21	59.04	133.71
34	181	23	410	501	3613	8192	14.03	17.14	123.62	280.30
35	248	26	479	584	4217	9560	22.48	27.41	197.94	448.74
36	89	21	410	501	3613	8192	6.90	8.43	60.82	137.91
37	102	26	69	84	604	1368	1.34	1.63	11.72	26.55

Table G-8 2017 Existing Conditions – Airport-Related Traffic, On-Airport Link Attributes, Traffic Assignment and Vehicle Miles Traveled (VMT) Summary (Continued)

Link Name	Link Distance (ft)	Link Speed (mph)	VOLUME				VMT			
			AM Peak	PM Peak	High 8-Hour	AWDT	AM Peak	PM Peak	High 8-Hour	AWDT
38	110	32	112	137	988	2239	2.33	2.85	20.57	46.61
39	219	31	28	35	251	569	1.16	1.45	10.40	23.58
40	232	9	36	43	314	711	1.58	1.89	13.79	31.24
41	177	26	8	10	71	160	0.27	0.34	2.38	5.36
42	205	29	11	13	94	213	0.43	0.50	3.64	8.26
43	597	26	29	36	259	586	3.28	4.07	29.31	66.31
44	587	32	69	84	604	1368	7.67	9.34	67.14	152.07
45	96	32	65	79	572	1297	1.18	1.44	10.41	23.60
46	112	17	4	4	31	71	0.09	0.09	0.66	1.51
47	859	27	7	9	63	142	1.14	1.46	10.24	23.09
48	94	15	281	343	2477	5615	4.99	6.09	43.95	99.62
49	420	26	289	353	2547	5775	23.01	28.11	202.82	459.87
50	353	33	28	35	251	569	1.87	2.34	16.76	38.00
51	717	26	320	390	2814	6379	43.44	52.95	382.02	866.00
52	403	33	287	350	2524	5722	21.91	26.72	192.71	436.87
53	321	34	5	7	47	107	0.30	0.43	2.85	6.50
54	612	32	292	356	2571	5828	33.84	41.25	297.93	675.35
55	194	26	977	1192	8606	19510	35.84	43.73	315.70	715.71
56	101	8	407	496	3582	8120	7.77	9.47	68.36	154.97
57	97	31	384	469	3386	7676	7.08	8.64	62.41	141.49
58	103	33	0	0	0	0	0.00	0.00	0.00	0.00
59	105	5	0	0	0	0	0.00	0.00	0.00	0.00
60	331	26	954	1164	8402	19048	59.72	72.86	525.92	1192.31
61	224	9	158	192	1387	3145	6.69	8.13	58.71	133.13
62	218	24	223	273	1967	4460	9.23	11.30	81.39	184.55
63	242	23	44	53	384	871	2.02	2.43	17.61	39.95
64	232	5	61	75	541	1226	2.69	3.30	23.81	53.97
65	593	26	1021	1246	8990	20381	114.73	140.01	1010.19	2290.17
66	465	25	17	21	149	338	1.50	1.85	13.11	29.74
67	483	21	4	5	39	89	0.37	0.46	3.57	8.15
68	487	5	0	0	0	0	0.00	0.00	0.00	0.00
69	361	15	9	11	78	178	0.62	0.75	5.33	12.17
90	582	6	948	1157	8347	18924	104.52	127.56	920.24	2086.34
103	85	33	13	16	118	267	0.21	0.26	1.89	4.29
104	85	5	0	0	0	0	0.00	0.00	0.00	0.00
105	95	5	0	0	0	0	0.00	0.00	0.00	0.00
106	95	5	0	0	0	0	0.00	0.00	0.00	0.00

Table G-8 2017 Existing Conditions – Airport-Related Traffic, On-Airport Link Attributes, Traffic Assignment and Vehicle Miles Traveled (VMT) Summary (Continued)

Link Name	Link Distance (ft)	Link Speed (mph)	VOLUME				VMT			
			AM Peak	PM Peak	High 8-Hour	AWDT	AM Peak	PM Peak	High 8-Hour	AWDT
107	260	20	121	148	1066	2417	5.96	7.30	52.54	119.14
108	389	24	76	92	666	1510	5.60	6.78	49.06	111.22
109	114	27	167	204	1474	3341	3.61	4.41	31.84	72.17
110	169	28	167	204	1474	3341	5.34	6.52	47.10	106.76
111	261	5	0	0	0	0	0.00	0.00	0.00	0.00
112	237	30	167	204	1474	3341	7.51	9.17	66.26	150.18
113	565	17	32	39	282	640	3.43	4.18	30.20	68.54
114	609	32	22	27	196	444	2.54	3.11	22.60	51.20
115	451	29	286	349	2516	5704	24.43	29.81	214.91	487.22
116	399	22	32	39	282	640	2.42	2.95	21.31	48.36
117	283	22	42	51	368	835	2.25	2.74	19.74	44.78
118	295	29	299	365	2634	5970	16.70	20.38	147.09	333.37
119	240	12	216	264	1905	4318	9.82	12.00	86.61	196.31
120	365	30	52	63	455	1031	3.60	4.36	31.47	71.30
121	356	17	92	112	807	1830	6.21	7.55	54.44	123.44
122	486	16	75	91	658	1493	6.90	8.37	60.55	137.39
123	486	18	84	102	737	1670	7.72	9.38	67.78	153.58
124	280	25	41	50	361	817	2.17	2.65	19.13	43.30
125	280	19	62	76	549	1244	3.29	4.03	29.09	65.93
126	631	20	123	150	1082	2452	14.70	17.93	129.33	293.08
127	652	24	76	92	666	1510	9.39	11.36	82.26	186.49
128	257	32	21	26	188	426	1.02	1.26	9.15	20.72
129	257	18	33	40	290	657	1.61	1.95	14.11	31.96
130	422	5	0	0	0	0	0.00	0.00	0.00	0.00
131	493	29	6	8	55	124	0.56	0.75	5.13	11.57
132	361	23	139	169	1223	2772	9.50	11.55	83.60	189.48
133	236	27	71	87	627	1422	3.17	3.89	28.01	63.53
134	1521	30	308	376	2712	6148	88.70	108.28	781.02	1770.53
135	1542	27	65	79	572	1297	18.99	23.08	167.09	378.86
136	384	5	0	0	0	0	0.00	0.00	0.00	0.00
137	354	18	4	5	39	89	0.27	0.34	2.62	5.97
138	225	23	13	16	118	267	0.55	0.68	5.02	11.35
139	96	14	13	16	118	267	0.24	0.29	2.15	4.87
140	295	27	65	79	572	1297	3.63	4.41	31.95	72.45
142	257	29	268	327	2359	5348	13.03	15.89	114.65	259.93
144	518	9	288	352	2540	5757	28.23	34.50	248.97	564.29
145	195	22	77	93	674	1528	2.85	3.44	24.94	56.54

Table G-8 2017 Existing Conditions – Airport-Related Traffic, On-Airport Link Attributes, Traffic Assignment and Vehicle Miles Traveled (VMT) Summary (Continued)

Link Name	Link Distance (ft)	Link Speed (mph)	VOLUME				VMT			
			AM Peak	PM Peak	High 8-Hour	AWDT	AM Peak	PM Peak	High 8-Hour	AWDT
146	463	22	77	93	674	1528	6.75	8.15	59.08	133.93
147	230	22	327	399	2877	6521	14.26	17.40	125.47	284.39
148	794	22	38	47	337	764	5.71	7.06	50.65	114.83
149	661	21	98	119	862	1955	12.27	14.90	107.91	244.73
150	281	21	100	122	878	1990	5.32	6.49	46.73	105.92
151	360	21	56	68	494	1119	3.82	4.63	33.66	76.24
152	88	32	0	0	0	0	0.00	0.00	0.00	0.00
153	66	31	44	53	384	871	0.55	0.66	4.79	10.88
154	173	33	44	53	384	871	1.44	1.74	12.59	28.56
155	258	30	310	378	2728	6184	15.17	18.50	133.54	302.71
156	645	26	214	261	1881	4265	26.12	31.86	229.62	520.65
157	218	22	96	117	847	1919	3.96	4.83	34.95	79.19
158	185	24	435	531	3833	8689	15.26	18.63	134.46	304.80
159	354	17	530	647	4671	10590	35.56	43.41	313.36	710.45
160	470	28	39	48	345	782	3.47	4.27	30.68	69.54
161	94	15	253	308	2226	5046	4.52	5.50	39.78	90.17
162	50	15	2	2	16	36	0.02	0.02	0.15	0.34
163	66	15	251	306	2210	5011	3.16	3.85	27.80	63.04
164	367	33	61	75	541	1226	4.24	5.22	37.63	85.27
165	124	26	116	141	1019	2310	2.72	3.30	23.87	54.10
166	84	26	100	122	878	1990	1.60	1.95	14.03	31.81
167	956	26	101	123	886	2008	18.29	22.27	160.42	363.57
168	380	15	36	45	321	729	2.59	3.24	23.08	52.43
169	293	12	137	167	1207	2736	7.61	9.28	67.05	151.98
170	205	33	16	20	141	320	0.62	0.78	5.47	12.41
171	158	5	0	0	0	0	0.00	0.00	0.00	0.00
172	180	5	0	0	0	0	0.00	0.00	0.00	0.00
173	48	5	0	0	0	0	0.00	0.00	0.00	0.00
174	502	10	468	571	4123	9346	44.47	54.25	391.75	888.02
175	640	9	452	552	3982	9027	54.79	66.91	482.68	1094.22
176	319	22	1509	1841	13285	30118	91.04	111.07	801.52	1817.10
177	286	22	1509	1841	13285	30118	81.76	99.75	719.83	1631.91
178	353	18	1040	1270	9163	20772	69.62	85.02	613.38	1390.51
179	348	32	719	877	6333	14357	47.34	57.75	417.00	945.35
180	366	18	961	1173	8465	19191	66.61	81.31	586.75	1330.23
181	453	8	54	66	478	1084	4.63	5.66	41.00	92.98
182	119	8	239	291	2101	4762	5.37	6.53	47.16	106.90

Table G-8 2017 Existing Conditions – Airport-Related Traffic, On-Airport Link Attributes, Traffic Assignment and Vehicle Miles Traveled (VMT) Summary (Continued)

Link Name	Link Distance (ft)	Link Speed (mph)	VOLUME				VMT			
			AM Peak	PM Peak	High 8-Hour	AWDT	AM Peak	PM Peak	High 8-Hour	AWDT
183	50	8	218	266	1920	4353	2.06	2.52	18.17	41.19
184	54	8	37	46	329	746	0.38	0.47	3.34	7.57
185	62	8	69	84	604	1368	0.81	0.98	7.07	16.01
186	39	8	117	143	1035	2346	0.87	1.06	7.69	17.42
187	338	5	184	225	1622	3678	11.77	14.39	103.76	235.27
188	92	12	5	7	47	107	0.09	0.12	0.82	1.87
189	171	5	0	0	0	0	0.00	0.00	0.00	0.00
190	193	13	14	17	125	284	0.51	0.62	4.56	10.37
191	169	5	0	0	0	0	0.00	0.00	0.00	0.00
192	540	5	49	60	431	977	5.02	6.14	44.11	100.00
193	138	9	444	542	3911	8867	11.59	14.15	102.08	231.43
194	932	21	434	530	3825	8671	76.58	93.52	674.95	1530.06
195	79	10	181	220	1591	3607	2.72	3.31	23.91	54.20
196	49	10	456	556	4013	9098	4.20	5.12	36.98	83.83
197	83	5	455	555	4005	9080	7.19	8.78	63.33	143.58
198	692	5	513	626	4515	10235	67.24	82.05	591.77	1341.47
199	70	27	457	558	4029	9133	6.08	7.43	53.63	121.56
200	158	5	0	0	0	0	0.00	0.00	0.00	0.00
201	160	5	64	78	564	1279	1.94	2.36	17.06	38.68
202	335	22	65	79	572	1297	4.12	5.01	36.28	82.26
203	30	5	0	0	0	0	0.00	0.00	0.00	0.00
204	2022	8	117	143	1035	2346	44.80	54.76	396.31	898.30
205	71	26	554	677	4883	11070	7.48	9.14	65.95	149.52
206	142	26	435	531	3833	8689	11.72	14.31	103.29	234.15
207	859	33	262	319	2304	5224	42.61	51.88	374.71	849.61
208	284	32	190	231	1669	3785	10.22	12.42	89.77	203.58
209	80	18	948	1157	8347	18924	14.43	17.61	127.05	288.05
210	71	11	962	1174	8473	19208	13.01	15.87	114.57	259.73
211	390	18	1137	1388	10017	22709	83.95	102.48	739.58	1676.66
212	117	18	624	761	5494	12456	13.86	16.90	121.99	276.57
213	1344	22	1444	1761	12713	28821	367.69	448.41	3237.14	7338.75
214	449	32	984	1201	8669	19653	83.63	102.08	736.80	1670.37
215	1110	32	124	151	1089	2470	26.06	31.73	228.85	519.06
216	905	32	345	421	3041	6894	59.16	72.20	521.49	1182.23
217	1050	32	360	439	3167	7179	71.58	87.29	629.75	1427.52
218	581	25	837	1022	7376	16721	92.06	112.40	811.25	1839.05
219	1063	32	282	344	2485	5633	56.80	69.28	500.49	1134.50

Table G-8 2017 Existing Conditions – Airport-Related Traffic, On-Airport Link Attributes, Traffic Assignment and Vehicle Miles Traveled (VMT) Summary (Continued)

Link Name	Link Distance (ft)	Link Speed (mph)	VOLUME				VMT			
			AM Peak	PM Peak	High 8-Hour	AWDT	AM Peak	PM Peak	High 8-Hour	AWDT
220	415	32	281	343	2477	5615	22.08	26.95	194.64	441.22
221	698	33	0	0	0	0	0.00	0.00	0.00	0.00
222	1920	29	25	30	219	498	9.09	10.91	79.65	181.13
223	1564	28	1118	1364	9845	22318	331.13	403.99	2915.90	6610.16
224	377	29	561	684	4938	11194	40.10	48.89	352.93	800.07
225	551	29	236	288	2077	4709	24.63	30.05	216.73	491.37
226	788	33	84	102	737	1670	12.54	15.22	109.99	249.23
227	1303	33	314	383	2767	6272	77.46	94.49	682.63	1547.32
228	580	30	968	1182	8528	19333	106.39	129.91	937.29	2124.84
229	1653	31	354	432	3120	7072	110.82	135.23	976.69	2213.84
230	2058	29	614	749	5408	12261	239.33	291.95	2107.93	4779.10
231	1300	20	1227	1498	10809	24503	302.01	368.72	2660.53	6031.18
232	736	26	668	816	5886	13345	93.08	113.71	820.18	1859.56
233	488	28	650	793	5722	12971	60.08	73.30	528.88	1198.90
234	449	28	373	455	3284	7445	31.71	38.69	279.22	633.00
235	310	14	333	406	2931	6646	19.55	23.83	172.06	390.14
236	310	11	40	49	353	800	2.35	2.88	20.76	47.04
237	105	5	359	438	3159	7161	7.15	8.73	62.96	142.71
238	697	31	122	149	1074	2434	16.10	19.66	141.69	321.11
239	186	22	59	72	517	1173	2.07	2.53	18.17	41.23
240	145	10	145	177	1278	2896	3.99	4.87	35.18	79.72
241	578	10	204	249	1795	4069	22.35	27.28	196.66	445.80
242	125	20	156	190	1372	3110	3.69	4.49	32.43	73.52
243	564	20	155	189	1364	3092	16.55	20.18	145.67	330.21
244	88	20	122	149	1074	2434	2.02	2.47	17.80	40.34
245	48	13	34	41	298	675	0.31	0.37	2.68	6.07
246	175	5	174	213	1536	3483	5.77	7.06	50.90	115.42
247	65	6	4	4	31	71	0.05	0.05	0.38	0.88
248	39	5	336	409	2955	6699	2.47	3.00	21.70	49.19
249	128	5	151	185	1332	3021	3.65	4.48	32.23	73.11
250	484	5	168	205	1481	3358	15.42	18.81	135.89	308.12
251	388	32	28	35	251	569	2.06	2.57	18.46	41.84
252	308	11	320	390	2814	6379	18.69	22.78	164.40	372.67
253	54	5	11	13	94	213	0.11	0.13	0.96	2.17
254	51	5	0	0	0	0	0.00	0.00	0.00	0.00
255	290	31	4	4	31	71	0.22	0.22	1.71	3.91
256	377	31	37	46	329	746	2.64	3.29	23.50	53.29

Table G-8 2017 Existing Conditions – Airport-Related Traffic, On-Airport Link Attributes, Traffic Assignment and Vehicle Miles Traveled (VMT) Summary (Continued)

Link Name	Link Distance (ft)	Link Speed (mph)	VOLUME				VMT			
			AM Peak	PM Peak	High 8-Hour	AWDT	AM Peak	PM Peak	High 8-Hour	AWDT
257	215	31	22	27	196	444	0.90	1.10	7.99	18.09
258	321	10	68	83	596	1350	4.13	5.04	36.22	82.04
259	203	10	27	33	235	533	1.04	1.27	9.02	20.45
260	362	10	26	31	227	515	1.78	2.12	15.54	35.27
261	219	31	23	28	204	462	0.96	1.16	8.47	19.19
262	218	11	6	8	55	124	0.25	0.33	2.27	5.11
263	177	16	60	73	525	1191	2.01	2.44	17.57	39.86
264	157	5	0	0	0	0	0.00	0.00	0.00	0.00
265	2458	28	85	103	745	1688	39.57	47.95	346.80	785.77
266	752	28	117	142	1027	2328	16.66	20.22	146.26	331.55
267	1323	28	191	233	1685	3820	47.84	58.37	422.09	956.89
268	1252	31	335	408	2947	6681	79.41	96.71	698.57	1583.69
269	302	29	20	24	172	391	1.15	1.37	9.85	22.40
270	1005	17	883	1077	7775	17627	168.06	204.99	1479.83	3354.99
271	954	15	470	573	4138	9382	84.90	103.50	747.46	1694.69
272	656	23	492	601	4334	9826	61.13	74.68	538.53	1220.94
273	485	7	512	624	4507	10217	47.04	57.33	414.07	938.67
274	1244	27	135	165	1191	2701	31.81	38.87	280.61	636.37
275	419	5	0	0	0	0	0.00	0.00	0.00	0.00
276	649	27	125	153	1105	2505	15.36	18.80	135.78	307.80
277	2473	25	91	111	799	1812	42.63	52.00	374.29	848.84
278	573	32	390	476	3433	7783	42.34	51.67	372.68	844.90
279	458	21	243	296	2140	4851	21.07	25.66	185.53	420.56
280	295	25	177	216	1560	3536	9.90	12.08	87.21	197.68
281	440	21	174	212	1528	3465	14.49	17.65	127.21	288.47
282	76	21	116	141	1019	2310	1.68	2.04	14.75	33.44
283	697	21	294	358	2587	5864	38.78	47.23	341.27	773.56
284	690	20	624	761	5494	12456	81.49	99.38	717.50	1626.73
285	91	20	701	856	6176	14002	12.08	14.75	106.39	241.21
286	464	20	1033	1261	9100	20630	90.79	110.83	799.84	1813.26
287	229	29	1029	1255	9061	20541	44.66	54.47	393.28	891.56
288	500	10	1030	1257	9069	20559	97.45	118.92	857.99	1945.03
289	738	26	2246	2741	19783	44849	313.95	383.14	2765.30	6269.06
290	190	27	1887	2302	16617	37670	67.81	82.73	597.17	1353.76
291	494	32	515	629	4538	10288	48.21	58.88	424.80	963.06
292	689	26	1371	1674	12078	27382	178.80	218.31	1575.12	3570.94
293	325	29	1454	1775	12807	29035	89.52	109.28	788.48	1787.57

Table G-8 2017 Existing Conditions – Airport-Related Traffic, On-Airport Link Attributes, Traffic Assignment and Vehicle Miles Traveled (VMT) Summary (Continued)

Link Name	Link Distance (ft)	Link Speed (mph)	VOLUME				VMT			
			AM Peak	PM Peak	High 8-Hour	AWDT	AM Peak	PM Peak	High 8-Hour	AWDT
294	396	25	327	399	2877	6521	24.55	29.95	215.96	489.49
295	1017	30	1128	1376	9931	22513	217.30	265.07	1913.11	4336.92
296	162	19	358	437	3151	7143	10.99	13.42	96.76	219.36
297	140	19	358	437	3151	7143	9.48	11.58	83.48	189.23
298	951	12	268	327	2359	5348	48.29	58.92	425.03	963.57
299	805	14	356	434	3135	7108	54.28	66.18	478.02	1083.82
300	518	16	66	80	580	1315	6.48	7.85	56.93	129.07
301	749	7	126	154	1113	2523	17.88	21.85	157.92	357.98
302	652	15	327	399	2877	6521	40.38	49.27	355.26	805.22
303	547	5	120	147	1058	2399	12.42	15.22	109.53	248.37
304	406	13	31	38	274	622	2.38	2.92	21.06	47.82
305	442	5	149	181	1309	2967	12.48	15.16	109.62	248.48
306	207	5	180	219	1583	3589	7.06	8.59	62.09	140.76
307	70	5	302	368	2657	6024	4.00	4.88	35.23	79.88
308	319	13	63	77	556	1262	3.81	4.65	33.60	76.26
309	281	7	71	87	627	1422	3.78	4.63	33.36	75.65
310	555	27	829	1011	7297	16543	87.07	106.18	766.39	1737.48
311	208	17	829	1011	7297	16543	32.66	39.83	287.46	651.69
312	125	17	1479	1805	13027	29532	35.01	42.73	308.40	699.15
313	332	27	808	986	7117	16134	50.85	62.06	447.93	1015.45
314	440	27	1177	1436	10362	23491	98.13	119.72	863.89	1958.47
315	215	16	773	943	6803	15423	31.48	38.41	277.07	628.13
316	543	17	103	126	909	2061	10.60	12.96	93.52	212.03
317	180	14	166	203	1466	3323	5.66	6.92	49.98	113.29
318	221	11	166	203	1466	3323	6.94	8.49	61.28	138.91
319	2544	9	246	300	2163	4904	118.52	144.54	1042.11	2362.68
320	552	12	73	89	643	1457	7.63	9.30	67.18	152.23
321	628	14	316	386	2782	6308	37.60	45.93	331.06	750.65
322	181	12	369	451	3253	7374	12.65	15.46	111.53	252.83
323	58	12	344	419	3025	6859	3.80	4.63	33.39	75.71
324	387	13	1	1	8	18	0.07	0.07	0.59	1.32
325	406	12	344	420	3033	6877	26.43	32.27	233.03	528.38
326	89	5	53	64	462	1048	0.89	1.08	7.76	17.60
327	463	13	488	595	4295	9737	42.79	52.18	376.64	853.87
328	79	16	538	656	4734	10732	8.06	9.82	70.89	160.71
329	103	16	538	656	4734	10732	10.45	12.75	91.99	208.55
330	323	13	28	34	243	551	1.71	2.08	14.86	33.69

Table G-8 2017 Existing Conditions – Airport-Related Traffic, On-Airport Link Attributes, Traffic Assignment and Vehicle Miles Traveled (VMT) Summary (Continued)

Link Name	Link Distance (ft)	Link Speed (mph)	VOLUME AM Peak	VOLUME PM Peak	VOLUME High 8-Hour	VOLUME AWDT	VMT AM Peak	VMT PM Peak	VMT High 8-Hour	VMT AWDT
331	179	11	239	291	2101	4762	8.10	9.86	71.20	161.38
332	993	5	396	483	3488	7907	74.46	90.82	655.85	1486.76
333	384	10	2	2	16	36	0.15	0.15	1.16	2.62
334	366	24	318	388	2798	6344	22.02	26.87	193.77	439.34
335	583	29	748	912	6584	14926	82.59	100.70	726.96	1648.02
336	428	27	1257	1533	11067	25090	101.96	124.34	897.65	2035.06
337	94	5	222	270	1952	4424	3.96	4.82	34.84	78.95
338	366	5	121	148	1066	2417	8.38	10.25	73.85	167.45
339	311	5	93	114	823	1866	5.47	6.71	48.41	109.75
340	273	20	4	5	39	89	0.21	0.26	2.01	4.60
341	66	16	4	4	31	71	0.05	0.05	0.39	0.88
342	48	29	1	1	8	18	0.01	0.01	0.07	0.16
343	52	22	53	64	462	1048	0.52	0.63	4.55	10.32
344	82	12	22	27	196	444	0.34	0.42	3.05	6.91
345	25	5	52	63	455	1031	0.25	0.30	2.15	4.88
346	121	5	53	65	470	1066	1.21	1.48	10.73	24.34
347	303	7	76	92	666	1510	4.36	5.28	38.21	86.63
348	146	22	428	522	3770	8547	11.85	14.45	104.36	236.59
349	67	22	239	291	2101	4762	3.02	3.68	26.56	60.20
350	446	5	239	292	2108	4780	20.18	24.65	177.96	403.54
351	335	5	34	41	298	675	2.16	2.61	18.93	42.89
352	430	5	137	167	1207	2736	11.15	13.59	98.22	222.63
353	360	5	51	62	447	1013	3.47	4.22	30.44	68.97
354	50	8	77	93	674	1528	0.73	0.88	6.38	14.47
355	88	13	239	291	2101	4762	3.99	4.86	35.09	79.52
356	113	13	428	522	3770	8547	9.16	11.18	80.71	182.98
358	463	5	0	0	0	0	0.00	0.00	0.00	0.00
359	229	12	3	3	24	53	0.13	0.13	1.04	2.30
360	245	13	2	2	16	36	0.09	0.09	0.74	1.67
361	248	17	37	46	329	746	1.74	2.16	15.44	35.01
362	199	9	35	42	306	693	1.32	1.58	11.54	26.14
363	230	22	40	49	353	800	1.74	2.13	15.36	34.82
364	256	19	36	45	321	729	1.75	2.18	15.57	35.37
365	201	23	16	20	141	320	0.61	0.76	5.36	12.17
366	201	10	78	96	690	1564	2.97	3.66	26.29	59.60
367	337	32	704	859	6200	14055	44.94	54.84	395.79	897.24
368	868	11	387	472	3410	7730	63.65	77.63	560.86	1271.38

Table G-8 2017 Existing Conditions – Airport-Related Traffic, On-Airport Link Attributes, Traffic Assignment and Vehicle Miles Traveled (VMT) Summary (Continued)

Link Name	Link Distance (ft)	Link Speed (mph)	VOLUME				VMT			
			AM Peak	PM Peak	High 8-Hour	AWDT	AM Peak	PM Peak	High 8-Hour	AWDT
369	167	15	369	451	3253	7374	11.70	14.30	103.12	233.76
370	96	15	250	305	2202	4993	4.53	5.53	39.89	90.46
371	141	20	668	816	5886	13345	17.83	21.78	157.09	356.16
372	283	29	431	526	3794	8600	23.09	28.18	203.24	460.70
373	283	27	209	255	1842	4176	11.20	13.66	98.68	223.71
			LOGAN AIRPORT VMT				**9,844**	**12,009**	**86,678**	**196,503**

Source: VHB.
Notes: AWDT = Average annual weekday daily traffic.

Table G-9 Future Conditions – Airport-Related Traffic, On-Airport Link Attributes, Traffic Assignment and Vehicle Miles Traveled (VMT) Summary

Link Name	Link Distance (ft)	Link Speed (mph)	VOLUME				VMT			
			AM Peak	PM Peak	High 8-Hour	AWDT	AM Peak	PM Peak	High 8-Hour	AWDT
1	344	24	1235	1508	10883	24671	80.48	98.26	709.16	1607.61
2	496	28	776	948	6841	15507	72.89	89.05	642.60	1456.62
3	1347	22	551	673	4857	11010	140.57	171.70	1239.14	2808.93
4	1166	28	867	1059	7640	17319	191.45	233.85	1687.05	3824.35
5	378	27	1418	1731	12490	28313	101.58	124.01	894.76	2028.28
6	441	31	400	488	3522	7984	33.42	40.77	294.26	667.05
7	896	25	1021	1247	8998	20397	173.34	211.71	1527.62	3462.87
8	644	30	1139	1391	10038	22756	139.03	169.79	1225.25	2777.62
9	1214	30	528	645	4653	10549	121.37	148.27	1069.60	2424.93
10	1303	25	693	846	6109	13849	171.06	208.83	1507.95	3418.49
11	421	24	883	1077	7776	17627	70.41	85.88	620.09	1405.65
12	236	22	67	82	588	1334	2.99	3.66	26.25	59.55
13	1311	26	67	82	588	1334	16.63	20.35	145.96	331.13
14	750	26	2012	2456	17724	40178	285.80	348.87	2517.67	5707.23
15	441	24	908	1109	8002	18140	75.82	92.60	668.15	1514.65
16	1724	5	0	0	0	0	0.00	0.00	0.00	0.00
17	644	13	954	1164	8402	19046	116.28	141.87	1024.06	2321.38
18	354	27	614	749	5408	12259	41.18	50.23	362.67	822.10
19	687	23	79	96	694	1573	10.27	12.48	90.23	204.52
20	94	15	1120	1367	9865	22363	19.97	24.38	175.91	398.78
21	877	5	0	0	0	0	0.00	0.00	0.00	0.00
22	79	5	0	0	0	0	0.00	0.00	0.00	0.00
23	81	5	0	0	0	0	0.00	0.00	0.00	0.00
24	79	5	0	0	0	0	0.00	0.00	0.00	0.00
25	87	5	0	0	0	0	0.00	0.00	0.00	0.00
26	209	5	0	0	0	0	0.00	0.00	0.00	0.00
27	187	5	0	0	0	0	0.00	0.00	0.00	0.00
28	No longer in service									
29	226	31	68	84	603	1368	2.91	3.60	25.81	58.56
30	1070	7	409	500	3605	8172	82.85	101.28	730.24	1655.35
31	385	5	0	0	0	0	0.00	0.00	0.00	0.00
32	516	31	68	84	603	1368	6.65	8.21	58.94	133.71
34	181	5	0	0	0	0	0.00	0.00	0.00	0.00
35	248	31	68	84	603	1368	3.19	3.94	28.30	64.21
36	89	5	0	0	0	0	0.00	0.00	0.00	0.00

Table G-9 Future Conditions – Airport-Related Traffic, On-Airport Link Attributes, Traffic Assignment and Vehicle Miles Traveled (VMT) Summary (Continued)

Link Name	Link Distance (ft)	Link Speed (mph)	VOLUME				VMT			
			AM Peak	PM Peak	High 8-Hour	AWDT	AM Peak	PM Peak	High 8-Hour	AWDT
37	102	31	68	84	603	1368	1.32	1.63	11.70	26.55
38	110	32	412	503	3628	8224	8.58	10.47	75.53	171.21
39	219	31	30	37	264	598	1.24	1.53	10.94	24.78
40	232	9	37	45	324	735	1.63	1.98	14.23	32.29
41	177	24	8	9	68	154	0.27	0.30	2.28	5.16
42	205	29	10	13	91	205	0.39	0.50	3.53	7.95
43	597	31	28	34	249	564	3.17	3.85	28.18	63.82
44	587	32	366	447	3228	7318	40.69	49.69	358.83	813.49
45	96	32	62	76	551	1248	1.13	1.38	10.02	22.70
46	112	17	3	4	30	68	0.06	0.09	0.64	1.45
47	859	32	307	375	2708	6138	49.92	60.97	440.32	998.03
48	94	15	268	327	2361	5351	4.75	5.80	41.89	94.93
49	420	26	575	702	5068	11489	45.79	55.90	403.57	914.88
50	353	33	27	33	241	547	1.80	2.20	16.09	36.53
51	717	26	601	734	5294	12002	81.59	99.65	718.70	1629.36
52	403	33	275	335	2421	5488	21.00	25.58	184.84	419.01
53	321	35	5	6	45	103	0.30	0.36	2.73	6.25
54	612	32	278	340	2451	5557	32.21	39.40	284.02	643.94
55	300	12	890	1087	7844	17781	50.57	61.76	445.68	1010.28
56	87	5	0	0	0	0	0.00	0.00	0.00	0.00
57	87	5	0	0	0	0	0.00	0.00	0.00	0.00
58	176	12	894	1091	7874	17849	29.80	36.37	262.49	595.02
59	135	26	618	754	5445	12344	15.81	19.28	139.26	315.70
60	112	5	0	0	0	0	0.00	0.00	0.00	0.00
61	112	5	0	0	0	0	0.00	0.00	0.00	0.00
62	64	30	117	143	1033	2342	1.42	1.73	12.52	28.39
63	62	33	123	150	1086	2462	1.44	1.76	12.75	28.90
64	103	5	0	0	0	0	0.00	0.00	0.00	0.00
65	105	5	0	0	0	0	0.00	0.00	0.00	0.00
66	465	25	15	18	128	291	1.32	1.58	11.26	25.61
67	483	21	4	5	38	85	0.37	0.46	3.48	7.78
68	312	31	0	0	0	0	0.00	0.00	0.00	0.00
69	361	5	0	0	0	0	0.00	0.00	0.00	0.00
70	77	19	884	1079	7791	17661	12.88	15.72	113.50	257.28
71	86	5	0	0	0	0	0.00	0.00	0.00	0.00
72	85	5	0	0	0	0	0.00	0.00	0.00	0.00
73	36	26	1224	1494	10785	24449	8.34	10.18	73.50	166.61

Table G-9 Future Conditions – Airport-Related Traffic, On-Airport Link Attributes, Traffic Assignment and Vehicle Miles Traveled (VMT) Summary (Continued)

Link Name	Link Distance (ft)	Link Speed (mph)	VOLUME AM Peak	VOLUME PM Peak	VOLUME High 8-Hour	VOLUME AWDT	VMT AM Peak	VMT PM Peak	VMT High 8-Hour	VMT AWDT
74	255	5	775	946	6826	15473	37.50	45.77	330.25	748.61
75	107	31	86	105	754	1710	1.75	2.13	15.32	34.75
76	95	5	15	19	136	308	0.27	0.34	2.45	5.54
77	180	26	450	550	3967	8993	15.36	18.78	135.42	307.00
78	127	22	255	311	2248	5095	6.16	7.51	54.28	123.02
79	114	26	704	860	6207	14071	15.17	18.53	133.75	303.21
80	395	5	0	0	0	0	0.00	0.00	0.00	0.00
81	419	26	704	860	6207	14071	55.93	68.33	493.14	1117.92
82	814	17	315	385	2775	6292	48.57	59.36	427.86	970.12
83	238	7	297	363	2617	5933	13.41	16.39	118.18	267.93
84	748	31	247	301	2172	4924	34.97	42.61	307.50	697.12
85	876	32	238	291	2097	4753	39.50	48.30	348.06	788.91
86	178	5	508	620	4472	10139	17.08	20.85	150.40	340.99
87					No longer in service					
88					No longer in service					
89					No longer in service					
90	582	12	894	1091	7874	17849	98.56	120.28	868.09	1967.82
103	85	32	14	17	121	274	0.22	0.27	1.94	4.40
104	85	5	0	0	0	0	0.00	0.00	0.00	0.00
105	95	5	0	0	0	0	0.00	0.00	0.00	0.00
106	95	5	0	0	0	0	0.00	0.00	0.00	0.00
107	260	21	137	167	1207	2736	6.75	8.23	59.49	134.86
108	389	21	56	69	498	1128	4.12	5.08	36.68	83.08
109	114	29	59	72	520	1180	1.27	1.56	11.23	25.49
110	169	29	58	71	513	1163	1.85	2.27	16.39	37.16
111	261	5	0	0	0	0	0.00	0.00	0.00	0.00
112	237	32	59	72	520	1180	2.65	3.24	23.37	53.04
113	565	15	31	38	272	615	3.32	4.07	29.13	65.86
114	609	32	21	26	189	427	2.42	3.00	21.79	49.24
115	451	29	274	334	2413	5471	23.40	28.53	206.11	467.31
116	399	22	34	42	302	684	2.57	3.17	22.82	51.68
117	283	22	44	53	385	872	2.36	2.84	20.65	46.76
118	295	29	283	346	2496	5659	15.80	19.32	139.38	316.01
119	240	12	209	255	1840	4172	9.50	11.59	83.65	189.68
120	365	30	55	67	483	1094	3.80	4.63	33.40	75.66
121	356	17	87	107	769	1744	5.87	7.22	51.87	117.64
122	486	16	53	65	468	1060	4.88	5.98	43.07	97.54
123	486	18	107	131	943	2137	9.84	12.05	86.72	196.53

Table G-9 Future Conditions – Airport-Related Traffic, On-Airport Link Attributes, Traffic Assignment and Vehicle Miles Traveled (VMT) Summary (Continued)

Link Name	Link Distance (ft)	Link Speed (mph)	VOLUME				VMT			
			AM Peak	PM Peak	High 8-Hour	AWDT	AM Peak	PM Peak	High 8-Hour	AWDT
124	280	25	40	49	354	804	2.12	2.60	18.76	42.61
125	280	19	59	72	520	1180	3.13	3.82	27.56	62.53
126	631	21	145	177	1275	2889	17.33	21.16	152.40	345.31
127	652	21	56	68	490	1111	6.92	8.40	60.52	137.22
128	257	32	48	59	422	957	2.34	2.87	20.53	46.55
129	257	20	14	17	121	274	0.68	0.83	5.89	13.33
130	422	5	0	0	0	0	0.00	0.00	0.00	0.00
131	493	32	0	0	0	0	0.00	0.00	0.00	0.00
132	361	27	149	182	1312	2975	10.18	12.44	89.68	203.35
133	236	31	49	60	430	975	2.19	2.68	19.21	43.56
134	1521	29	205	250	1803	4086	59.04	72.00	519.24	1176.71
135	1542	31	46	56	407	923	13.44	16.36	118.89	269.62
136	384	5	0	0	0	0	0.00	0.00	0.00	0.00
137	354	10	8	9	68	154	0.54	0.60	4.56	10.33
138	225	10	8	9	68	154	0.34	0.38	2.89	6.55
139	96	10	8	9	68	154	0.15	0.16	1.24	2.81
140	295	31	46	56	407	923	2.57	3.13	22.73	51.56
142	257	29	98	119	860	1949	4.76	5.78	41.80	94.73
147	230	29	66	80	581	1316	2.88	3.49	25.34	57.39
148	794	29	66	80	581	1316	9.92	12.02	87.33	197.80
149	335	29	66	80	581	1316	4.18	5.07	36.82	83.39
154	152	21	330	402	2904	6582	9.50	11.57	83.60	189.48
155	169	5	129	158	1139	2582	4.12	5.04	36.35	82.40
156	87	23	443	540	3899	8839	7.32	8.92	64.40	146.00
157	572	21	180	219	1584	3590	19.48	23.71	171.46	388.61
158	629	32	149	182	1312	2975	17.74	21.67	156.24	354.28
159	1072	32	111	136	980	2223	22.54	27.62	199.04	451.49
160	470	33	0	0	0	0	0.00	0.00	0.00	0.00
161	105	20	493	602	4344	9848	9.84	12.01	86.68	196.50
162	798	18	427	521	3763	8531	64.54	78.75	568.79	1289.50
163	658	29	66	80	581	1316	8.22	9.96	72.35	163.88
164	442	12	65	79	573	1299	5.44	6.62	47.99	108.80
165	139	33	0	0	0	0	0.00	0.00	0.00	0.00
166	538	33	6	7	53	120	0.61	0.71	5.41	12.24
167	418	33	6	7	53	120	0.48	0.55	4.20	9.51
168	433	11	158	192	1388	3146	12.97	15.76	113.94	258.25
169	293	19	443	541	3907	8856	24.61	30.05	217.02	491.93

Table G-9 Future Conditions – Airport-Related Traffic, On-Airport Link Attributes, Traffic Assignment and Vehicle Miles Traveled (VMT) Summary (Continued)

Link Name	Link Distance (ft)	Link Speed (mph)	VOLUME				VMT			
			AM Peak	PM Peak	High 8-Hour	AWDT	AM Peak	PM Peak	High 8-Hour	AWDT
170	262	11	217	264	1908	4326	10.76	13.10	94.65	214.60
171	326	5	18	22	158	359	1.11	1.36	9.77	22.19
172	No longer in service									
173	No longer in service									
174	284	19	443	541	3907	8856	23.80	29.07	209.94	475.86
175	624	14	453	553	3990	9044	53.51	65.33	471.34	1068.37
176	319	23	991	1210	8734	19798	59.79	73.00	526.94	1194.46
177	286	24	991	1210	8734	19798	53.70	65.56	473.24	1072.73
178	353	21	545	666	4804	10891	36.48	44.58	321.59	729.06
179	348	31	602	735	5302	12019	39.64	48.40	349.11	791.40
180	366	22	794	970	6999	15866	55.04	67.24	485.14	1099.76
181	453	8	64	78	566	1282	5.49	6.69	48.55	109.96
182	119	8	82	100	724	1641	1.84	2.24	16.25	36.84
183	50	8	81	99	716	1624	0.77	0.94	6.78	15.37
184	54	8	64	78	566	1282	0.65	0.79	5.74	13.00
185	62	8	23	28	204	462	0.27	0.33	2.39	5.41
186	39	8	64	78	566	1282	0.48	0.58	4.20	9.52
187	35	5	18	22	158	359	0.12	0.14	1.04	2.35
188	101	5	0	0	0	0	0.00	0.00	0.00	0.00
189	182	5	0	0	0	0	0.00	0.00	0.00	0.00
190	194	5	0	0	0	0	0.00	0.00	0.00	0.00
191	174	5	0	0	0	0	0.00	0.00	0.00	0.00
192	542	5	41	50	362	821	4.21	5.14	37.18	84.32
193	138	5	455	556	4012	9096	11.88	14.51	104.71	237.41
194	932	7	446	544	3929	8908	78.70	95.99	693.30	1571.88
195	79	12	17	21	151	342	0.26	0.32	2.27	5.14
196	49	19	203	248	1787	4052	1.87	2.29	16.47	37.34
197	83	19	443	541	3907	8856	7.01	8.55	61.78	140.04
198	692	5	217	265	1916	4343	28.44	34.73	251.12	569.22
200	245	33	0	0	0	0	0.00	0.00	0.00	0.00
201	160	11	159	194	1403	3180	4.81	5.87	42.43	96.17
202	335	5	0	0	0	0	0.00	0.00	0.00	0.00
204	2022	11	64	78	566	1282	24.51	29.87	216.72	490.88
207	859	33	73	89	641	1453	11.87	14.47	104.25	236.31
208	284	30	420	513	3703	8395	22.59	27.59	199.17	451.53
209	80	22	697	851	6139	13917	10.61	12.95	93.44	211.83
210	71	22	791	966	6969	15798	10.70	13.06	94.23	213.62

Table G-9 Future Conditions – Airport-Related Traffic, On-Airport Link Attributes, Traffic Assignment and Vehicle Miles Traveled (VMT) Summary (Continued)

Link Name	Link Distance (ft)	Link Speed (mph)	VOLUME				VMT			
			AM Peak	PM Peak	High 8-Hour	AWDT	AM Peak	PM Peak	High 8-Hour	AWDT
211	390	22	1116	1363	9835	22294	82.40	100.63	726.14	1646.02
212	117	22	306	373	2692	6104	6.79	8.28	59.77	135.53
213	1315	24	904	1104	7964	18054	225.15	274.96	1983.53	4496.57
214	446	31	674	822	5936	13455	56.91	69.41	501.22	1136.11
215	1110	32	148	181	1305	2958	31.10	38.04	274.24	621.62
216	905	32	252	307	2217	5027	43.21	52.65	380.19	862.06
217	1050	31	131	160	1154	2616	26.05	31.82	229.47	520.18
218	581	24	329	401	2896	6565	36.18	44.10	318.52	722.05
219	1063	32	205	250	1803	4086	41.29	50.35	363.13	822.93
220	415	31	288	352	2542	5762	22.63	27.66	199.75	452.77
221	698	29	84	102	739	1676	11.11	13.49	97.76	221.72
222	1920	28	62	75	543	1231	22.55	27.28	197.50	447.74
223	1564	28	639	780	5626	12754	189.26	231.02	1666.31	3777.49
224	377	28	440	537	3877	8788	31.45	38.38	277.10	628.10
225	551	28	102	124	897	2035	10.64	12.94	93.60	212.34
226	788	23	193	236	1704	3864	28.80	35.22	254.31	576.67
227	1303	23	338	413	2979	6753	83.39	101.89	734.93	1665.98
228	580	31	876	1069	7715	17490	96.28	117.49	847.93	1922.28
229	1653	32	407	497	3590	8138	127.41	155.58	1123.82	2547.54
230	2058	29	468	572	4125	9352	182.42	222.95	1607.84	3645.23
231	870	16	782	955	6893	15627	128.79	157.28	1135.24	2573.68
232	736	21	746	911	6577	14909	103.95	126.94	916.47	2077.49
233	488	27	532	649	4684	10617	49.17	59.99	432.94	981.32
234	449	25	660	806	5815	13182	56.12	68.53	494.41	1120.77
235	310	14	594	725	5234	11865	34.87	42.56	307.25	696.52
236	310	18	66	80	581	1316	3.88	4.70	34.17	77.39
237	105	9	138	168	1214	2753	2.75	3.35	24.19	54.86
238	697	31	36	44	317	718	4.75	5.80	41.82	94.72
239	186	26	79	96	694	1573	2.78	3.37	24.40	55.29
240	145	31	202	247	1780	4035	5.56	6.80	49.00	111.07
241	578	31	281	343	2474	5608	30.79	37.58	271.05	614.41
242	125	32	104	126	913	2069	2.46	2.98	21.58	48.91
243	564	32	104	126	913	2069	11.11	13.46	97.51	220.96
244	88	32	36	44	317	718	0.60	0.73	5.25	11.90
245	48	32	68	83	596	1351	0.61	0.75	5.36	12.16
246	175	17	242	296	2134	4838	8.02	9.81	70.72	160.32
247	65	5	0	0	0	0	0.00	0.00	0.00	0.00

Table G-9 Future Conditions – Airport-Related Traffic, On-Airport Link Attributes, Traffic Assignment and Vehicle Miles Traveled (VMT) Summary (Continued)

Link Name	Link Distance (ft)	Link Speed (mph)	VOLUME				VMT			
			AM Peak	PM Peak	High 8-Hour	AWDT	AM Peak	PM Peak	High 8-Hour	AWDT
248	39	17	345	421	3039	6890	2.53	3.09	22.31	50.59
249	128	17	193	235	1697	3847	4.67	5.69	41.07	93.10
250	484	17	198	241	1742	3949	18.17	22.11	159.84	362.35
251	388	33	49	60	430	975	3.60	4.41	31.62	71.70
252	308	14	299	365	2632	5967	17.47	21.32	153.77	348.60
253	54	15	3	3	23	51	0.03	0.03	0.23	0.52
254	51	5	0	0	0	0	0.00	0.00	0.00	0.00
255	290	31	0	0	0	0	0.00	0.00	0.00	0.00
256	377	31	23	28	204	462	1.64	2.00	14.57	33.01
257	215	31	9	11	83	188	0.37	0.45	3.38	7.66
258	321	31	104	127	920	2086	6.32	7.72	55.91	126.77
259	203	31	86	106	762	1727	3.30	4.07	29.23	66.25
260	362	31	83	101	732	1658	5.68	6.92	50.12	113.53
261	219	30	25	30	219	496	1.04	1.25	9.10	20.60
262	218	11	9	10	75	171	0.37	0.41	3.09	7.05
263	177	33	27	33	241	547	0.90	1.10	8.07	18.31
264	157	5	0	0	0	0	0.00	0.00	0.00	0.00
265	2458	28	80	97	701	1590	37.24	45.15	326.32	740.16
266	752	28	421	514	3711	8412	59.96	73.20	528.51	1198.01
267	1323	28	496	606	4374	9916	124.25	151.80	1095.67	2483.92
268	1252	23	381	465	3356	7608	90.31	110.23	795.52	1803.43
269	302	32	14	17	121	274	0.80	0.97	6.93	15.70
270	1005	22	692	844	6094	13814	131.71	160.64	1159.89	2629.25
271	954	15	1120	1367	9865	22363	202.31	246.92	1781.94	4039.48
272	656	19	884	1079	7791	17661	109.84	134.07	968.08	2194.49
273	485	5	508	620	4472	10139	46.67	56.96	410.86	931.51
274	1244	30	330	403	2911	6599	77.75	94.95	685.85	1554.76
275	419	33	200	245	1765	4001	15.88	19.45	140.11	317.61
276	649	30	323	394	2843	6446	39.69	48.41	349.33	792.05
277	2473	14	86	106	762	1727	40.29	49.66	356.96	809.02
278	573	32	804	981	7082	16054	87.28	106.49	768.80	1742.77
279	458	21	280	342	2466	5591	24.27	29.65	213.79	484.71
280	295	29	177	216	1561	3539	9.90	12.08	87.27	197.85
281	440	25	170	208	1501	3402	14.15	17.32	124.96	283.22
282	76	25	91	111	799	1812	1.32	1.61	11.57	26.23
283	697	25	256	312	2255	5112	33.77	41.16	297.47	674.36
284	690	22	448	547	3944	8942	58.51	71.44	515.08	1167.80

Table G-9 Future Conditions – Airport-Related Traffic, On-Airport Link Attributes, Traffic Assignment and Vehicle Miles Traveled (VMT) Summary (Continued)

Link Name	Link Distance (ft)	Link Speed (mph)	VOLUME				VMT			
			AM Peak	PM Peak	High 8-Hour	AWDT	AM Peak	PM Peak	High 8-Hour	AWDT
285	91	22	283	346	2496	5659	4.88	5.96	43.00	97.48
286	464	22	880	1074	7753	17576	77.35	94.40	681.44	1544.83
287	229	28	949	1159	8364	18961	41.19	50.30	363.03	822.98
288	500	9	700	855	6169	13985	66.22	80.89	583.63	1323.08
289	738	17	2045	2497	18018	40845	285.85	349.03	2518.58	5709.37
290	190	17	1911	2333	16841	38178	68.68	83.84	605.22	1372.01
291	494	18	805	982	7089	16071	75.36	91.93	663.60	1504.41
292	689	25	1107	1351	9752	22106	144.37	176.19	1271.78	2882.89
293	325	27	1228	1500	10823	24534	75.60	92.35	666.33	1510.46
294	396	24	152	185	1335	3026	11.41	13.89	100.21	227.14
295	1017	29	1079	1317	9503	21542	207.86	253.71	1830.66	4149.87
296	162	21	136	166	1199	2718	4.18	5.10	36.82	83.47
297	140	21	136	166	1199	2718	3.60	4.40	31.76	72.00
298	951	12	117	143	1033	2342	21.08	25.76	186.12	421.97
299	805	18	187	229	1652	3744	28.51	34.92	251.90	570.88
300	518	16	116	142	1026	2325	11.39	13.94	100.71	228.21
301	749	12	117	143	1033	2342	16.60	20.29	146.57	332.30
302	652	15	152	186	1342	3043	18.77	22.97	165.71	375.75
303	547	5	83	101	732	1658	8.59	10.46	75.78	171.65
304	406	5	25	30	219	496	1.92	2.31	16.84	38.13
305	442	5	28	34	249	564	2.34	2.85	20.85	47.23
306	207	8	53	65	468	1060	2.08	2.55	18.36	41.57
307	70	5	135	165	1192	2701	1.79	2.19	15.81	35.81
308	319	13	50	61	437	992	3.02	3.69	26.41	59.95
309	281	6	67	82	588	1334	3.56	4.36	31.28	70.97
310	880	29	592	723	5219	11831	98.69	120.53	870.07	1972.38
311	208	28	337	412	2972	6736	13.28	16.23	117.08	265.36
314	203	25	803	980	7074	16037	30.90	37.71	272.19	617.07
317	180	13	516	630	4548	10309	17.59	21.48	155.05	351.46
318	221	15	0	0	0	0	0.00	0.00	0.00	0.00
319	2544	14	64	78	566	1282	30.83	37.58	272.69	617.65
320	552	12	146	179	1290	2924	15.25	18.70	134.79	305.51
321	628	12	169	206	1486	3368	20.11	24.51	176.83	400.79
322	245	10	515	629	4540	10292	23.90	29.19	210.70	477.64
323	260	12	254	310	2240	5078	12.53	15.29	110.51	250.53
325	407	5	265	323	2330	5283	20.44	24.91	179.68	407.41
327	463	14	46	56	407	923	4.03	4.91	35.69	80.94

Table G-9 Future Conditions – Airport-Related Traffic, On-Airport Link Attributes, Traffic Assignment and Vehicle Miles Traveled (VMT) Summary (Continued)

Link Name	Link Distance (ft)	Link Speed (mph)	VOLUME				VMT			
			AM Peak	PM Peak	High 8-Hour	AWDT	AM Peak	PM Peak	High 8-Hour	AWDT
332	993	6	323	394	2843	6446	60.73	74.08	534.57	1212.04
334	366	14	46	56	407	923	3.19	3.88	28.19	63.92
338	407	5	43	52	377	855	3.32	4.01	29.09	65.98
339	442	13	114	139	1003	2274	9.53	11.63	83.89	190.20
347	351	12	120	146	1056	2394	7.97	9.70	70.14	159.02
348	146	18	404	493	3560	8070	11.18	13.65	98.55	223.39
349	67	18	404	493	3560	8070	5.11	6.23	45.00	102.02
350	329	5	57	70	505	1145	3.55	4.36	31.44	71.29
351	359	5	10	13	91	205	0.68	0.88	6.19	13.95
352	395	5	89	109	784	1778	6.67	8.16	58.72	133.16
353	351	5	45	54	392	889	2.99	3.59	26.07	59.12
354	50	8	120	146	1056	2394	1.14	1.38	10.00	22.67
355	88	12	57	70	505	1145	0.95	1.17	8.43	19.12
356	113	24	407	496	3582	8121	8.71	10.62	76.69	173.86
358	463	14	307	375	2708	6138	26.90	32.86	237.30	537.88
359	229	13	3	3	23	51	0.13	0.13	1.00	2.21
360	245	13	2	2	15	34	0.09	0.09	0.70	1.58
361	248	16	41	50	362	821	1.92	2.35	16.99	38.53
362	199	7	36	44	317	718	1.36	1.66	11.96	27.08
363	230	28	244	298	2149	4873	10.62	12.97	93.53	212.08
364	256	8	346	422	3047	6907	16.79	20.47	147.82	335.08
365	201	23	17	21	151	342	0.65	0.80	5.74	13.01
366	201	10	75	92	664	1505	2.86	3.51	25.30	57.35
367	337	32	386	471	3401	7711	24.64	30.07	217.11	492.25
368	868	12	327	399	2881	6531	53.78	65.63	473.85	1074.18
369	266	30	324	395	2851	6463	16.34	19.92	143.76	325.89
370	96	18	223	272	1961	4445	4.04	4.93	35.53	80.53
372	283	29	255	311	2248	5095	13.66	16.66	120.42	272.94
373	283	31	185	226	1629	3693	9.91	12.11	87.27	197.83
400	751	30	323	394	2843	6446	45.93	56.03	404.31	916.70
402	400	14	64	78	566	1282	4.85	5.91	42.91	97.19
403	192	5	0	0	0	0	0.00	0.00	0.00	0.00
404	669	21	337	412	2972	6736	42.72	52.22	376.70	853.79
406	90	26	436	532	3839	8702	7.41	9.04	65.21	147.82
407	484	25	771	942	6795	15404	70.70	86.38	623.08	1412.49
408	180	33	155	189	1365	3095	5.28	6.43	46.47	105.35
409	82	12	43	52	377	855	0.67	0.81	5.87	13.31

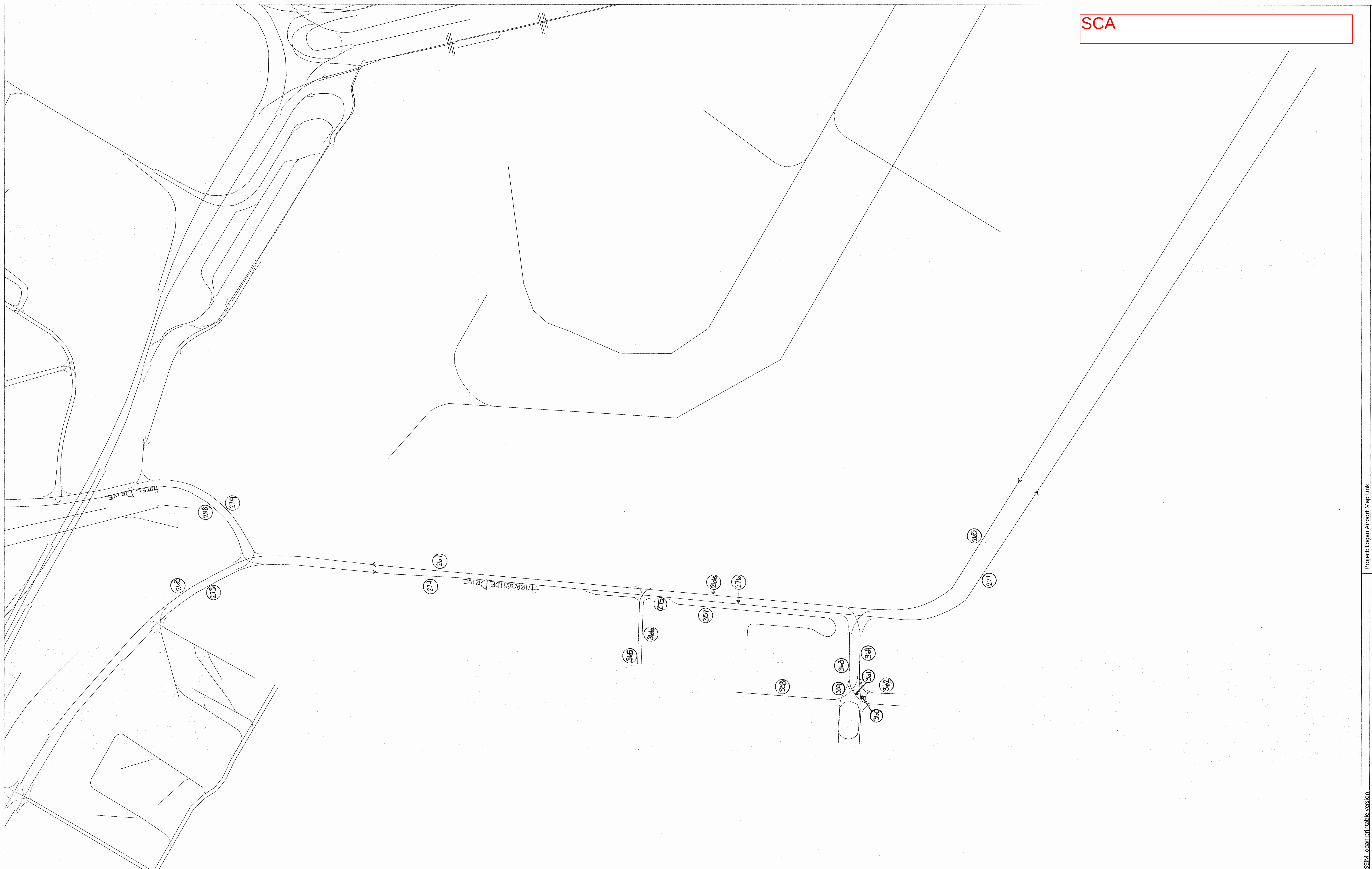
Table G-9 Future Conditions – Airport-Related Traffic, On-Airport Link Attributes, Traffic Assignment and Vehicle Miles Traveled (VMT) Summary (Continued)

Link Name	Link Distance (ft)	Link Speed (mph)	VOLUME				VMT			
			AM Peak	PM Peak	High 8-Hour	AWDT	AM Peak	PM Peak	High 8-Hour	AWDT
410	58	12	130	159	1146	2599	1.42	1.74	12.52	28.38
411	33	12	120	146	1056	2394	0.76	0.92	6.69	15.16
416	466	14	130	159	1146	2599	11.48	14.04	101.17	229.44
418	0	5	0	0	0	0	0.00	0.00	0.00	0.00
420	75	30	329	401	2896	6565	4.70	5.72	41.33	93.70
421	344	29	654	798	5762	13062	42.63	52.02	375.63	851.52
422	312	22	67	82	588	1334	3.95	4.84	34.70	78.72
423	396	5	221	270	1946	4411	16.55	20.23	145.77	330.42
424	440	25	734	896	6463	14652	61.15	74.65	538.46	1220.73
			LOGAN AIRPORT VMT				**8,950**	**10,927**	**78,863**	**178,774**

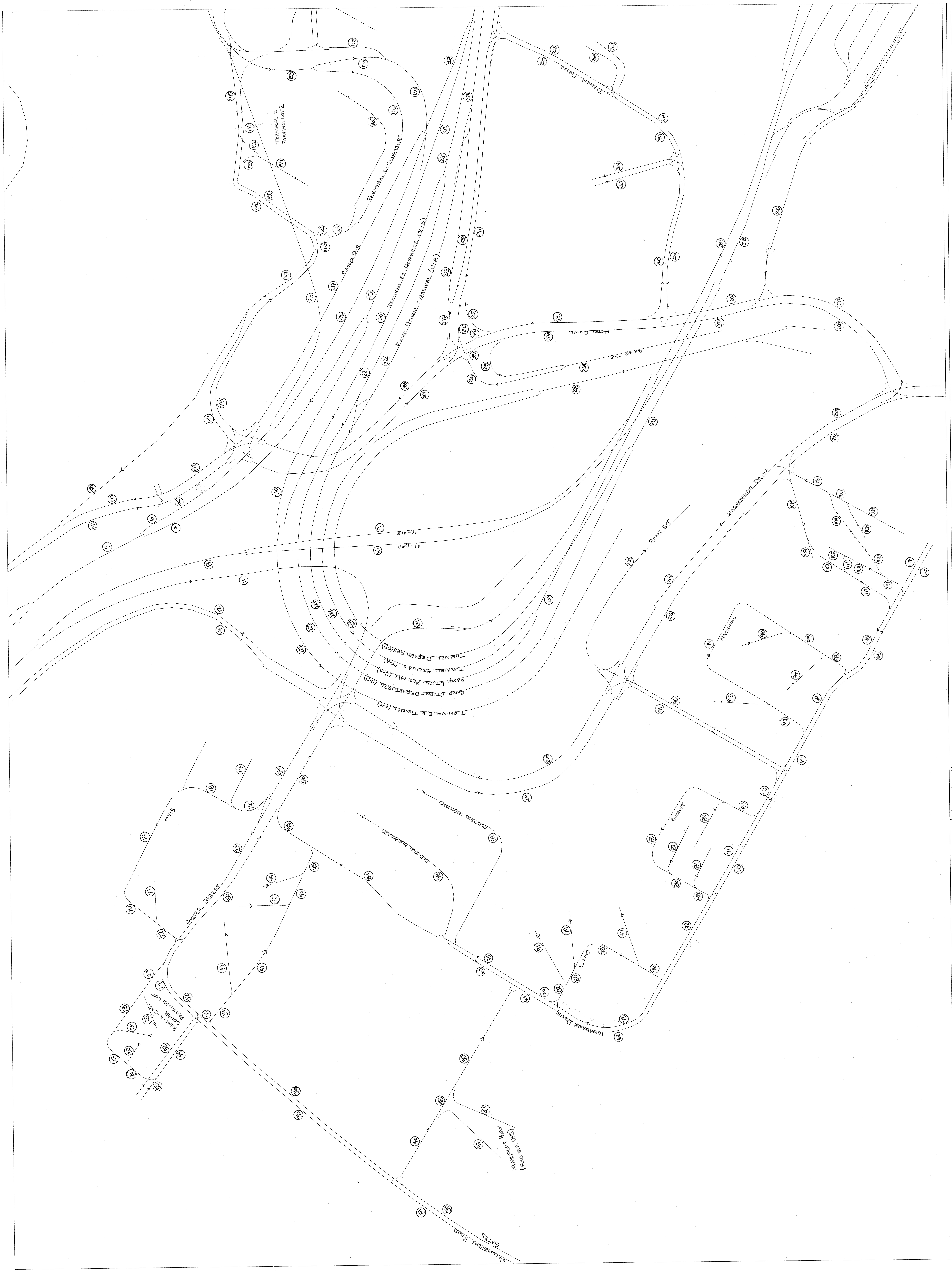
Source: VHB.
Notes: AWDT = Average annual weekday daily traffic.

VISSIM 2011 logan network map	Project: 2011 Logan Network
File: 2011 logan network map.inp	Scenario: Network Map
Simulation Time: 0.0	


VISSIM logan_printable version
File: logan_printable version.inp
Simulation Time: 0.0
Project: Logan Airport Link Map
Scenario: Logan North, Noth Cargo Area
NSA/NCA
SCT IB
RT 1A-IB
RT 1A-OB
SCT OB
COTTAGE STREET
ECONOMY BUS DRIVEWAY
SERVICE ROAD
ECONOMY PARKWAY DRIVE
PRESCOTT STREET
RAMP 1H-SB
FRANKFORT STREET
LOVALL


SCA
Hotel Drive
Harborside Drive
Project: Logan Airport Map Link
Scenario: Harborside Drive
VISSIM logan printable version
File: logan printable version.inp
Simulation Time: 0.0

SWSA/Service Roadways




Terminals
Terminal Drive
Project: Logan Airport Link Map
Scenario: Logan Tunnel Ramps, Rental Car Lots
VISSIM logan printable version
File: logan printable version.inp
Simulation Time: 0.0

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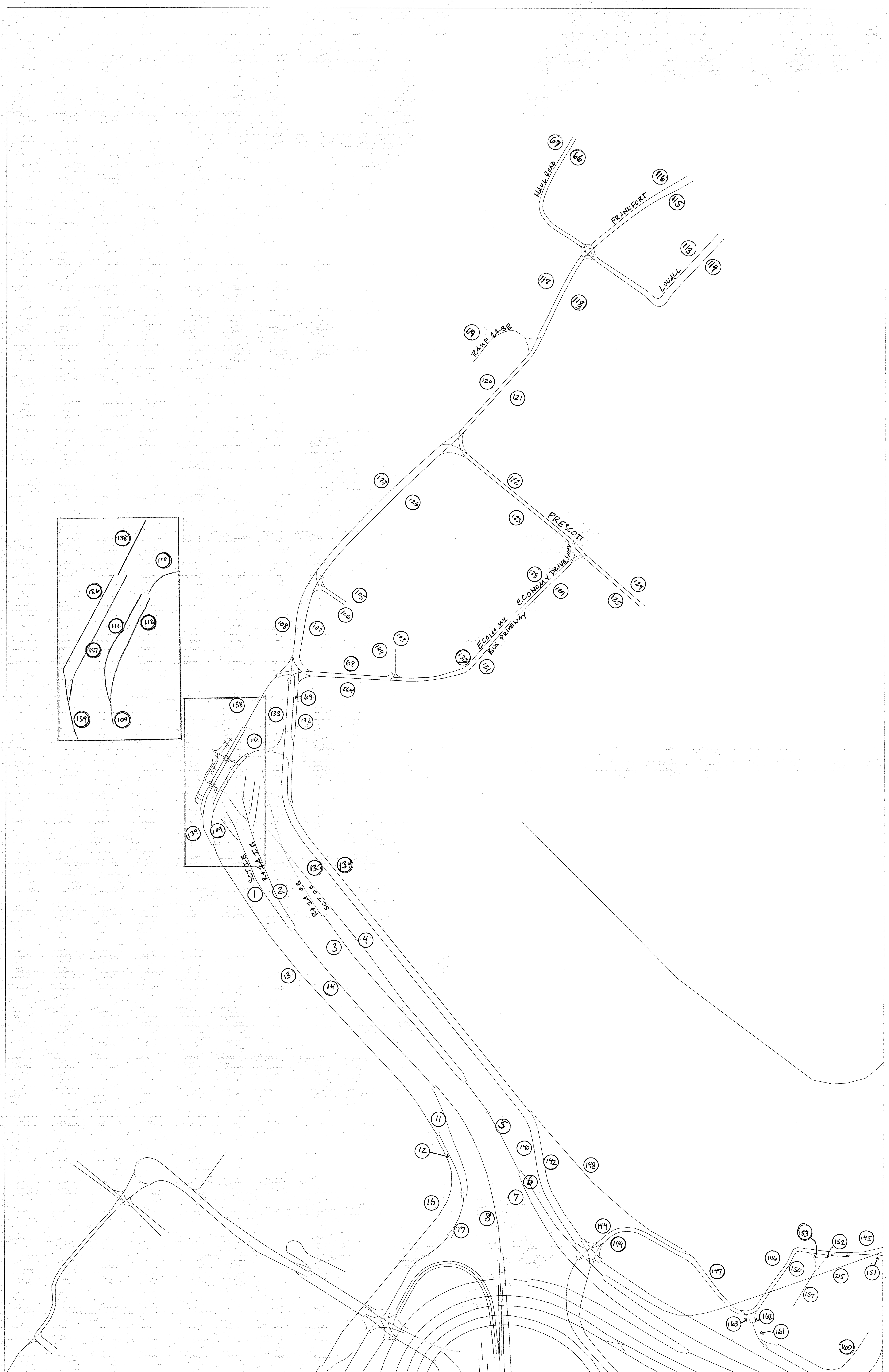
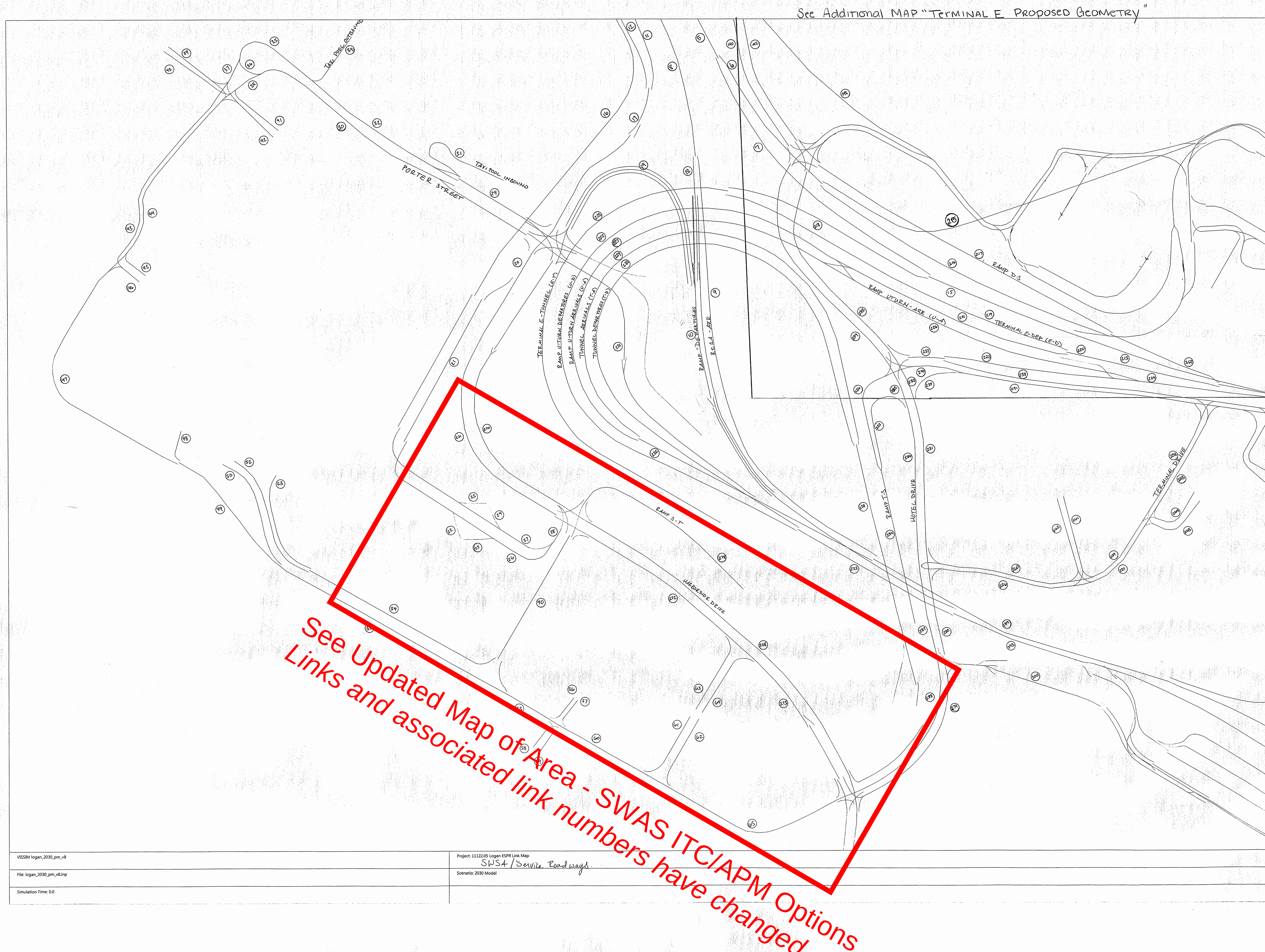
VISSIM 2011 logan network map	Project: 2011 Logan Network
File: 2011 logan network map.inp	Scenario: Network Map
Simulation Time: 0.0	

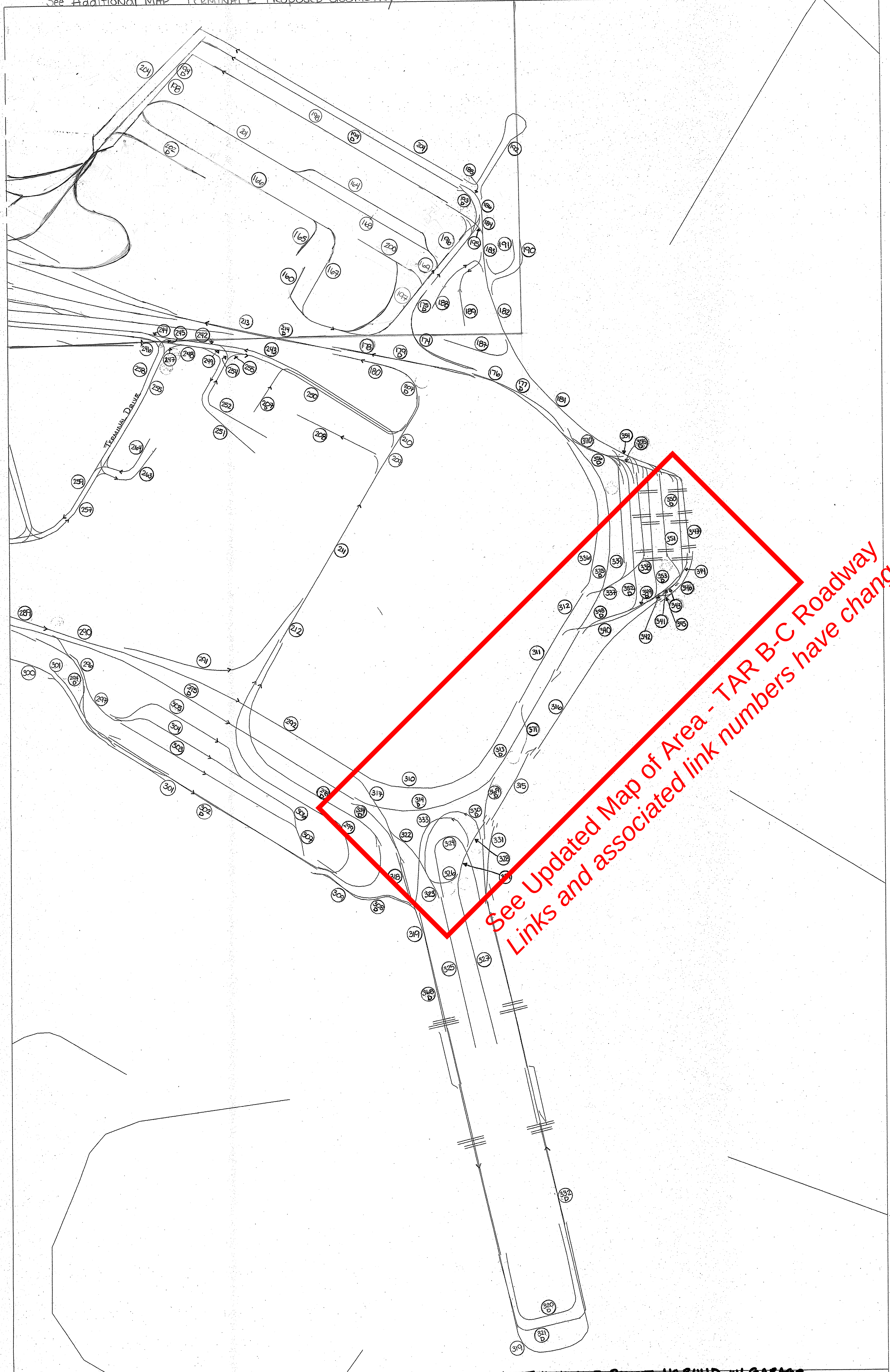


VISSIM logan_2030_pm_v8	Project: 11122.05 Logan ESPR Link Map NCA/NSA
File: logan_2030_pm_v8.inp	Scenario: 2030 Model
Simulation Time: 0.0	

VISSIM logan_2030_pm_v8	Project: 11122.05 Logan ESPR Link Map SCA
File: logan_2030_pm_v8.inp	Scenario: 2030 Model
Simulation Time: 0.0	


See Additional MAP "Terminal E Proposed Geometry"
Porter Street
Taxi Pool Inbound
Taxi Pool Outbound
Ramp D-S
Ramp U-Turn-Arr (U-A)
Terminal E-Dep (E-D)
Terminal E-Tunnel (E-T)
Ramp U-Turn Departures (U-D)
Tunnel Arrivals (T-A)
Tunnel Departures (T-D)
Ramp-Departures
Ramp S-T
Hotel Drive
Ramp I-S
Terminal Drive
Harborside Drive
VISSIM logan_2030_pm_v8
File: logan_2030_pm_v8.inp
Simulation Time: 0.0
Project: 11122.05 Logan ESPR Link Map
SWS4 / Service Roadways
Scenario: 2030 Model
See Updated Map of Area - SWAS ITC/APM Options
Links and associated link numbers have changed.

See Additional MAP "Terminal E Proposed Geometry"

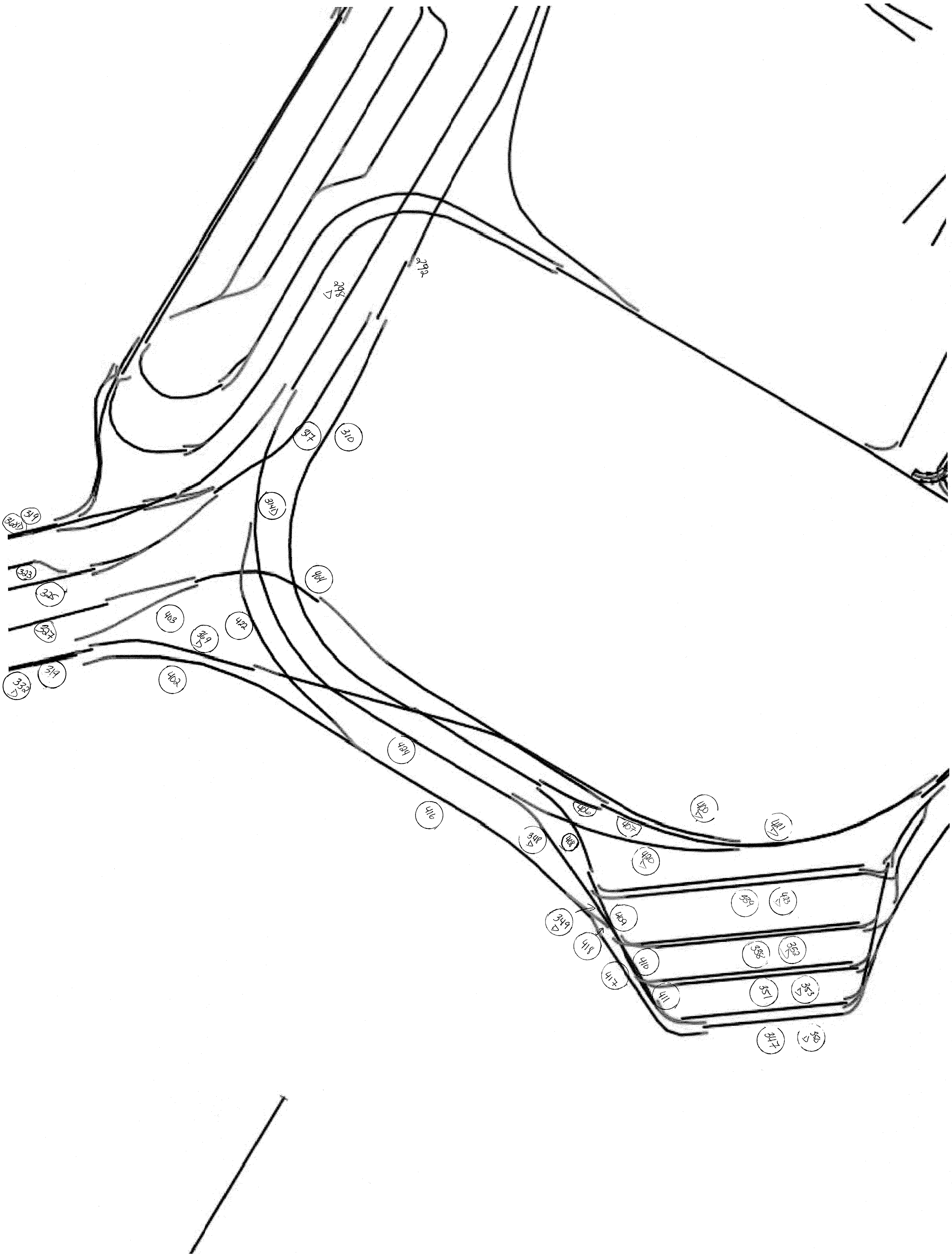


VISSIM logan printable version
File: logan printable version.inp
Simulation Time: 0.0

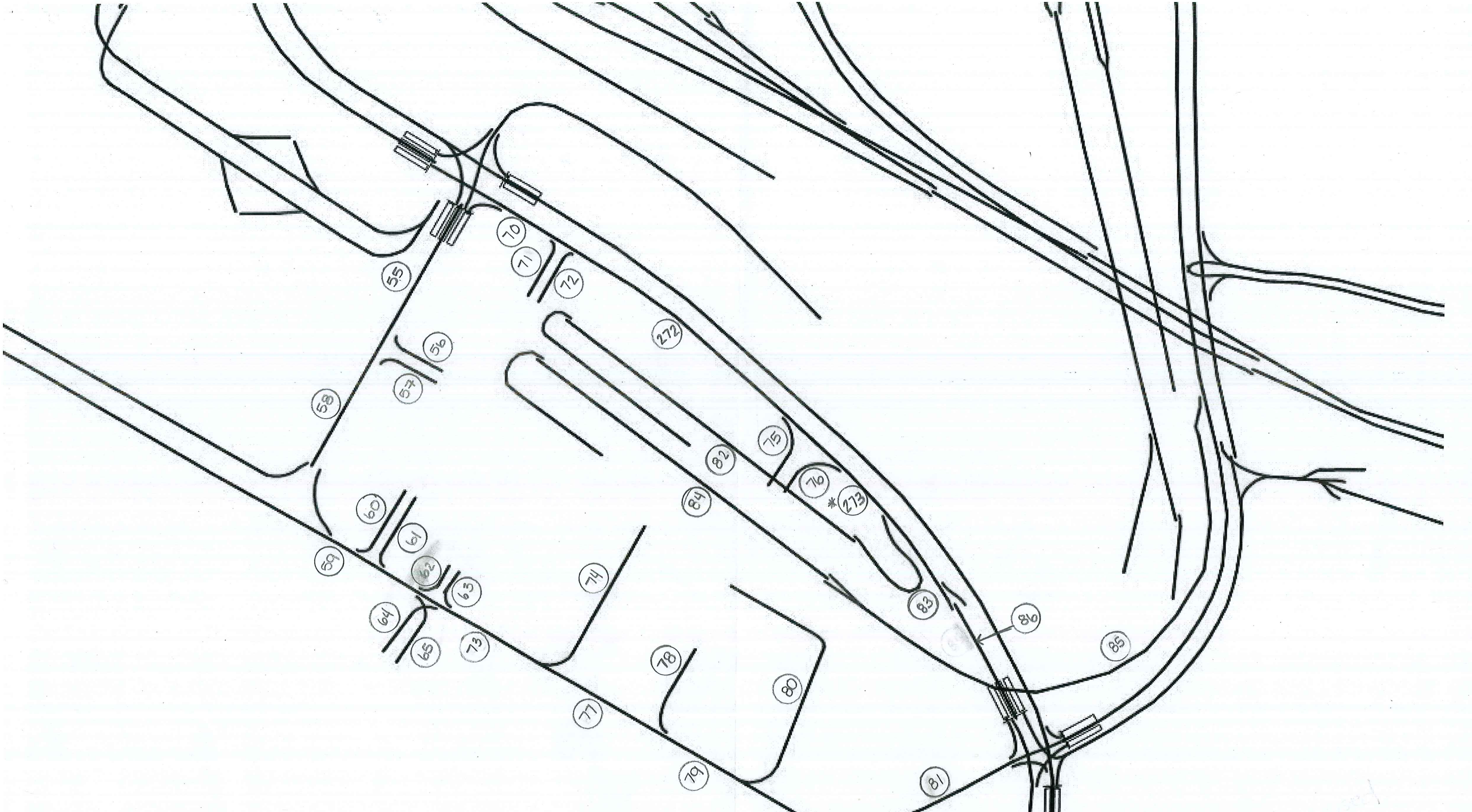
Project: Logan Airport Link Map - 2030 - Terminals TERMINAL E Project NO BUILD w/ GARAGE
Scenario: Logan Tunnel Ramps, Rental Car Lots

Map Area - Terminal E Proposed Geometry

Map Area - TAR B-C Roadway



50 MAP - Term B/C Connection



Map Area - SWAS ITC/APM Option 1

SWSA

Opt 1
at-grade

massport

Massachusetts Port Authority
One Harborside Drive, Suite 200-S
East Boston, MA 02128-2909
Telephone: 617-568-5000
www.massport.com

March 1 2017

Christine Kirby, Director, Air & Climate Division
Massachusetts Department of Environmental Protection
Bureau of Air & Waste
One Winter Street
Boston, MA 02108

Re: Logan Airport Parking Space Inventory

Dear Ms. Kirby:

In compliance with the reporting requirements of 310 CMR 7.30 (3)(d), enclosed are the following Massachusetts Port Authority (Massport) submissions for Logan Airport:

- Commercial Parking Space Inventory
- Employee Parking Space Inventory
- Location Map

The attachments provide the quantity, physical distribution, and allocation of commercial and employee parking spaces on the airport, as defined by 310 CMR 7.30, as amended. These inventory tables represent information provided by the Aviation Department and are supported by comprehensive field checks and counts conducted in late February 2017.

The Commercial Parking Space Inventory totals 18,640 spaces; the Employee Parking Space Inventory totals 2,448 parking spaces; the total inventory of spaces at Logan Airport is 21,088. For your information, we continue to provide information on rental car spaces.

The attached Logan Airport Parking Space Inventory reflects Massport's successful management of its parking program, within the requirements of 310 CMR 7.30, as amended. If you have any questions, please call me at 617-568-3689.

Sincerely,

Hayes Morrison
Deputy Director - Maritime, Land Use, and Transportation Planning
Strategic & Business Planning Department

cc:

D. Conroy, EPA
L. Gilmore, MPA
S. Dalzell, MPA
M. Kalowski, MPA

Commercial Parking Space Inventory
Logan International Airport
March 2017 Submission

Commercial Parking Spaces

Old Map ID#	Map ID#	Location of Commercial Parking Areas	Mar-17 Number of Spaces
	Terminal Area and Economy Spaces		
C1a	C1	Central Garage	7179
C1b	C2	West Garage	3076
		West Garage Expansion	1699
C2	C3	Terminal B Garage	2212
C8a	C5	Terminal E Lot 1	237
C8b	C6	Terminal E Lot 2	249
C9	C7	Terminal E Lot 3 (fka "Gulf Station" Lot)	217
	C12	Blue Lot	367
C6	C8	Economy Garage	2864
		subtotal	18100
	Overflow Commercial Spaces		
	C11	Red Lot (Tomahawk Dr.)	
	C13	Green Lot (Wood Island)	
		subtotal	0
	Hotel Spaces		
C4	C4a ~~& C4b~~	Logan Airport Hilton Hotel (one lot)	235
C7a	C10	Harborside Hyatt Conference Center	270
		subtotal	505
	General Aviation Spaces		
C5	C9	Signature (General Aviation Terminal)	35
		subtotal	35

Total In-Service Commercial Parking Spaces	**18,640**
Total Designated Commercial Parking Spaces	**0**
Total Commercial Parking Spaces	**18,640**
Total Employee Parking Spaces *(see table on next page)*	**2,448**
TOTAL PARKING FREEZE SPACES	**21,088**

Employee Parking Space Inventory
Logan International Airport
March 2017 Submission

Employee Parking Spaces

As of 2014: space count excludes

Area		Map ID#	Location of Employee Parking Areas	Mar-17 Number of Spaces
Terminal	Terminal Area	E81	West Garage	98
Terminal	Terminal Area	E26	Airport Tower/Administration (parking in Central Garage)	521
Terminal	Terminal Area	E20	Terminal C Pier A (Old Terminal D) (two lots)	122
Terminal	Terminal Area	E18	Massport Facilities 1 (Heating Plant)	92
Terminal	Terminal Area	E34	Hilton Hotel employee lot	28
Terminal	Terminal Area	E86	Gulf Gas Station	4
North	North Service Area	E68a	LSG Sky Chefs (Bldg. 68), main lot	25
North	North Service Area	E68b	LSG Sky Chefs (Bldg. 68), overflow lot	126
North	North Service Area	E1	Flight Kitchen Building 1 (and nearby lot)	80
North	North Service Area	E40	Lovell Street Lot (contractor trailer)	25
North	North Service Area	E53	Green Bus Depot (Bus Maintenance Facility)	12
North	North Service Area	E11a	North Cargo Building 11, TSA lot	93
North	North Service Area	E11b	North Cargo Building 11, State Police lot	136
North	North Service Area	E43	North Gate & EMS Trailer (EMS Station A7)	21
North	North Service Area	E8	North Cargo Building 8	114
North	North Service Area	E5	US Airways Administration/Hangar (Bldg. 5)	75
airside	North Service Area	*N/A*	Massport Facilities 2 (airside, Bldg. 3)	0
North	North Service Area	E4	Massport Facilities 3 (landside, Bldg. 4)	69
North	North Service Area	E13	UPS (Cargo Building 13)	44
North	North Service Area	E94	United Aircraft Maintenance (Buildings 93 & 94)	56
SW	SWSA	E59	Bus/Limo Pool Lot	4
SW	SWSA	E60	Rental Car Center (Customer Service Center)	4
SW	SWSA	E72	Taxi Pool Lot	8
South	South Service Area	E84	Bird Island Flats / Logan Office Center (LOC) Garage	416
South	South Service Area	E63	South Cargo Building 63	16
South	South Service Area	E62	South Cargo Building 62	43
South	South Service Area	E58	South Cargo Building 58	23
South	South Service Area	E57	South Cargo Building 57	44
South	South Service Area	E56	South Cargo Building 56	39
South	South Service Area	E78	Fire-Rescue HQ & Amelia Earhart Terminal/Hangar	84
airside		*N/A*	*ARFF Satellite Station* [1]	0

[1] This facility is located on the airfield and is not shown in the map. No employee parking spaces are provided.

Total In-Service Employee Parking Spaces	**2,422**
Total Designated Employee Parking Spaces	**26**
Total Employee Parking Spaces	**2,448**
Total Commercial Parking Spaces *(see table on previous page)*	**18,640**
TOTAL PARKING SPACES	**21,088**
TOTAL PARKING FREEZE SPACES	21,088

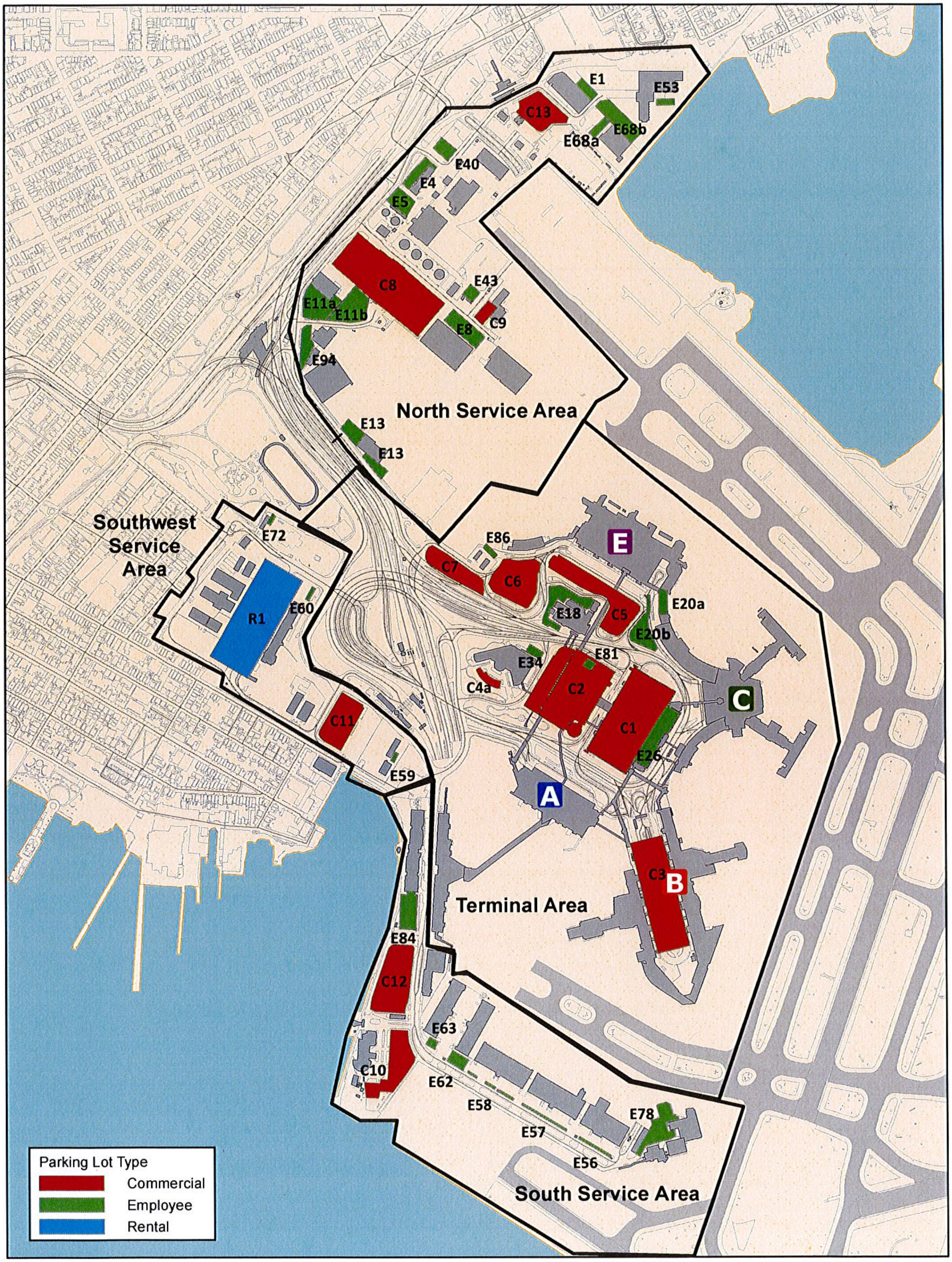
SUMMARY

TOTAL COMMERCIAL PARKING SPACES	***18,640***
TOTAL EMPLOYEE PARKING SPACES	***2,448***
TOTAL PARKING FREEZE SPACES	***21,088***

For Information Only:
Rental Car Spaces Inventory
Logan International Airport
March 2017 Submission

Rental Car Company Parking Spaces

Map ID#		Number of Spaces
R1	Rental Car Center (RCC)	5,020
Total Rental Car Spaces		**5,020**



Massachusetts Port Authority
Strategic and Business Planning
September 2016

Logan Airport Parking Space Inventory

N

0 0.075 0.15 0.3 Miles

Projection: Lambert Conformal Conic **Coordinate System:** NAD 1983 State Plane Massachusetts Mainland FIPS 2001 (Meter)

Massachusetts Port Authority
One Harborside Drive, Suite 200-S
East Boston, MA 02128-2909
Telephone: 617-568-5000
www.massport.com

September 25, 2017

Christine Kirby, Director, Air & Climate Division
Massachusetts Department of Environmental Protection
Bureau of Air & Waste
One Winter Street
Boston, MA 02108

Re: Logan Airport Parking Space Inventory

Dear Ms. Kirby:

In compliance with the reporting requirements of 310 CMR 7.30 (3)(d), enclosed are the following Massachusetts Port Authority (Massport) submissions for Logan Airport:

- Commercial Parking Space Inventory
- Employee Parking Space Inventory
- Location Map

The attachments provide the quantity, physical distribution, and allocation of commercial and employee parking spaces on the airport, as defined by 310 CMR 7.30, as amended. These inventory tables represent information provided by the Aviation Department and are supported by comprehensive field checks and counts conducted in September, 2017.

The Commercial Parking Space Inventory totals 18,640 spaces; the Employee Parking Space Inventory totals 2,448 parking spaces; the total inventory of spaces at Logan Airport is 21,088. For your information, we continue to provide information on rental car spaces.

The attached Logan Airport Parking Space Inventory reflects Massport's successful management of its parking program, within the requirements of 310 CMR 7.30, as amended. If you have any questions, please call me at 617-568-3689.

Sincerely,

Hayes Morrison
Deputy Director - Maritime, Land Use, and Transportation Planning
Strategic & Business Planning Department

cc:

D. Conroy, EPA
L. Gilmore, MPA
S. Dalzell, MPA
M. Kalowski, MPA

Commercial Parking Space Inventory
Logan International Airport
September 2017 Submission

Commercial Parking Spaces

Old Map ID#	Map ID#	Location of Commercial Parking Areas	Sep-17 Number of Spaces
	Terminal Area and Economy Spaces		
C1a	C1	Central Garage	7179
C1b	C2	West Garage	3076
		West Garage Expansion	1699
C2	C3	Terminal B Garage	2212
C8a	C5	Terminal E Lot 1	237
C8b	C6	Terminal E Lot 2	249
C9	C7	Terminal E Lot 3 (fka "Gulf Station" Lot)	217
	C12	Blue Lot	367
C6	C8	Economy Garage	2864
		subtotal	18100
	Overflow Commercial Spaces		
	C11	Red Lot (Tomahawk Dr.)	
	C13	Green Lot (Wood Island)	
		subtotal	0
	Hotel Spaces		
C4	C4a ~~& C4b~~	Logan Airport Hilton Hotel (one lot)	235
C7a	C10	Harborside Hyatt Conference Center	270
		subtotal	505
	General Aviation Spaces		
C5	C9	Signature (General Aviation Terminal)	35
		subtotal	35

Total In-Service Commercial Parking Spaces	**18,640**
Total Designated Commercial Parking Spaces	**0**
Total Commercial Parking Spaces	**18,640**
Total Employee Parking Spaces *(see table on next page)*	**2,448**
TOTAL PARKING FREEZE SPACES	**21,088**

Employee Parking Space Inventory
Logan International Airport
September 2017 Submission

Employee Parking Spaces

Area		Map ID#	Location of Employee Parking Areas	Sep-17 Number of Spaces
Terminal	Terminal Area	E81	West Garage	98
Terminal	Terminal Area	E26	Airport Tower/Administration (parking in Central Garage)	521
Terminal	Terminal Area	E20	Terminal C Pier A (Old Terminal D) (two lots)	122
Terminal	Terminal Area	E18	Massport Facilities 1 (Heating Plant)	92
Terminal	Terminal Area	E34	Hilton Hotel employee lot	28
Terminal	Terminal Area	E86	Gulf Gas Station	4
North	North Service Area	E68a	LSG Sky Chefs (Bldg. 68), main lot	25
North	North Service Area	E68b	LSG Sky Chefs (Bldg. 68), overflow lot	126
North	North Service Area	E1	Flight Kitchen Building 1 (and nearby lot)	80
North	North Service Area	E40	Lovell Street Lot (contractor trailer)	25
North	North Service Area	E53	Green Bus Depot (Bus Maintenance Facility)	12
North	North Service Area	E11a	North Cargo Building 11, TSA lot	93
North	North Service Area	E11b	North Cargo Building 11, State Police lot	136
North	North Service Area	E43	North Gate & EMS Trailer (EMS Station A7)	21
North	North Service Area	E8	North Cargo Building 8	114
North	North Service Area	E5	US Airways Administration/Hangar (Bldg. 5)	75
airside	North Service Area	*N/A*	Massport Facilities 2 (airside, Bldg. 3)	0
North	North Service Area	E4	Massport Facilities 3 (landside, Bldg. 4)	69
North	North Service Area	E13	UPS (Cargo Building 13)	44
North	North Service Area	E94	United Aircraft Maintenance (Buildings 93 & 94)	56
SW	SWSA	E59	Bus/Limo Pool Lot	4
SW	SWSA	E60	Rental Car Center (Customer Service Center)	4
SW	SWSA	E72	Taxi Pool Lot	8
South	South Service Area	E84	Bird Island Flats / Logan Office Center (LOC) Garage	416
South	South Service Area	E63	South Cargo Building 63	16
South	South Service Area	E62	South Cargo Building 62	43
South	South Service Area	E58	South Cargo Building 58	23
South	South Service Area	E57	South Cargo Building 57	44
South	South Service Area	E56	South Cargo Building 56	39
South	South Service Area	E78	Fire-Rescue HQ & Amelia Earhart Terminal/Hangar	84
airside		*N/A*	*ARFF Satellite Station* [1]	0

[1] This facility is located on the airfield and is not shown in the map. No employee parking spaces are provided.

Total In-Service Employee Parking Spaces	**2,422**
Total Designated Employee Parking Spaces	**26**
Total Employee Parking Spaces	**2,448**
Total Commercial Parking Spaces *(see table on previous page)*	**18,640**
TOTAL PARKING SPACES	**21,088**
TOTAL PARKING FREEZE SPACES	**21,088**

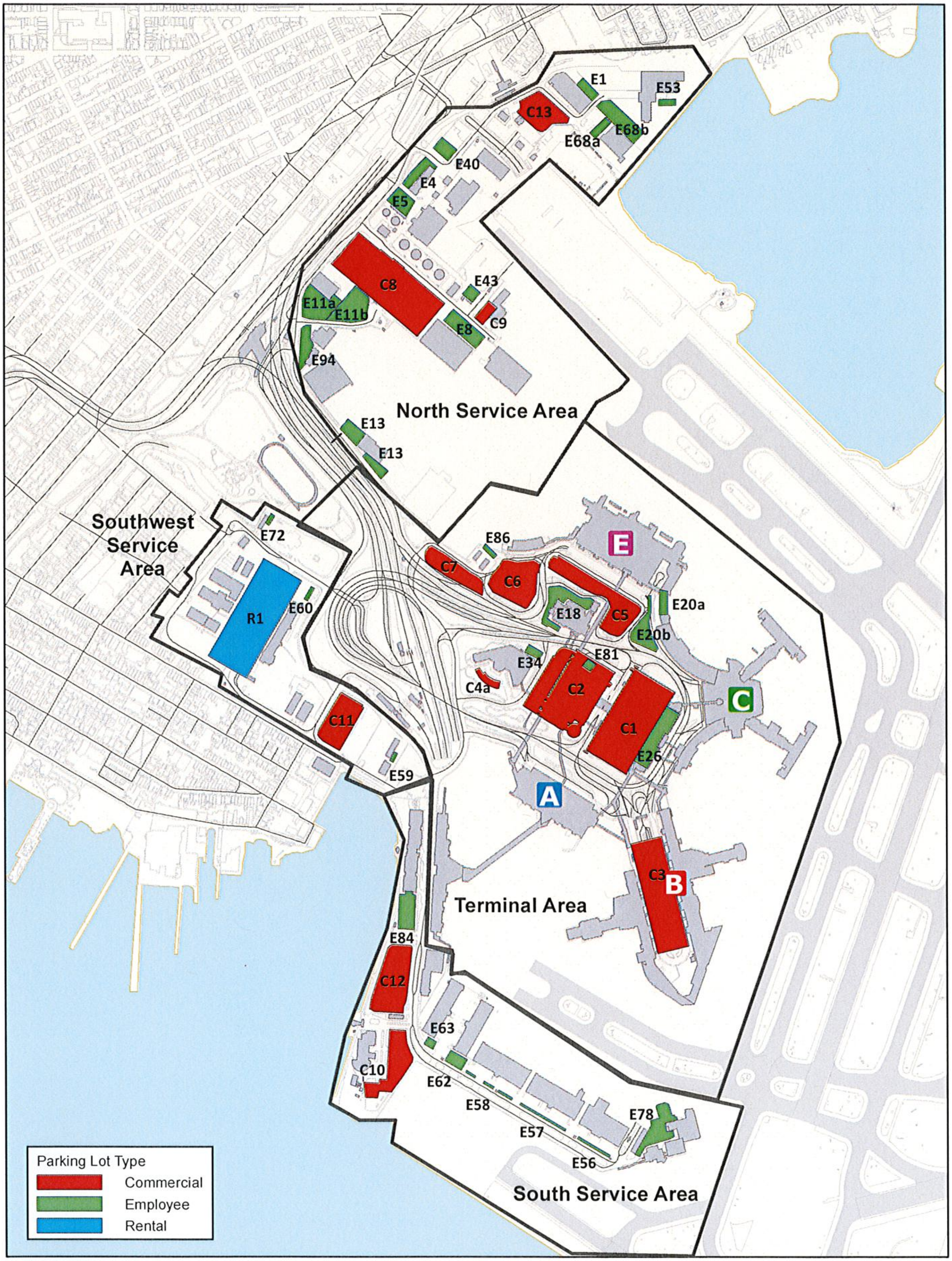
SUMMARY

TOTAL COMMERCIAL PARKING SPACES	*18,640*
TOTAL EMPLOYEE PARKING SPACES	*2,448*
TOTAL PARKING FREEZE SPACES	*21,088*

For Information Only:
Rental Car Spaces Inventory
Logan International Airport
September 2017 Submission

Rental Car Company Parking Spaces

Map ID#		Number of Spaces
R1	Rental Car Center (RCC)	5,020
Total Rental Car Spaces		**5,020**



Massachusetts Port Authority
Strategic and Business Planning
September 2016

Logan Airport Parking Space Inventory

N
0 0.075 0.15 0.3 Miles

Projection: Lambert Conformal Conic **Coordinate System:** NAD 1983 State Plane Massachusetts Mainland FIPS 2001 (Meter)

Massachusetts Port Authority
One Harborside Drive, Suite 200-S
East Boston, MA 02128-2909
Telephone: 617-568-5000
www.massport.com

October 13, 2017

Christine Kirby, Director, Air & Climate Division
Massachusetts Department of Environmental Protection
Bureau of Air & Waste
One Winter Street
Boston, MA 02108

Re: Revised Logan Airport Parking Space Inventory

Dear Ms. Kirby:

This letter hereby amends and replaces the Logan Airport Parking Space Inventory report dated September 25, 2017. In compliance with the reporting requirements of 310 CMR 7.30(3)(a), enclosed please find the following Massachusetts Port Authority (Massport) submissions for Logan Airport (the Airport):

- Commercial Parking Space Inventory;
- Employee Parking Space Inventory; and
- Location Map.

The attachments provide the quantity, physical distribution, and allocation of commercial and employee parking spaces on the Airport, as defined by 310 CMR 7.30, as amended, effective as of June 30, 2017. These inventory tables represent information provided by the Aviation Department and are supported by comprehensive field checks and counts conducted in September, 2017.

The Revised Logan Airport Parking Space Inventory reflects the 310 CMR 7.30, as amended, and effective on June 30, 2017. Accordingly, the Commercial Parking Space Inventory totals 23,640 parking spaces; the Employee Parking Space Inventory totals 2,448 parking spaces; and the total inventory of parking spaces at the Airport is 26,088. Additionally, for your information, we continue to provide information on rental car parking spaces, also attached.

The attached Logan Airport Parking Space Inventory reflects Massport's successful management of its parking program, within the requirements of 310 CMR 7.30, as amended.

If you have any questions, please call me at 617-568-3689.

Sincerely,

Hayes Morrison
Deputy Director - Maritime, Land Use, and Transportation Planning
Strategic & Business Planning Department

cc: D. Conroy, EPA
L. Gilmore, MPA
S. Dalzell, MPA
M. Kalowski, MPA

Commercial Parking Spaces

Old Map ID#	Map ID#	Location of Commercial Parking Areas	Number of Spaces (Oct-17)
	Terminal Area and Economy Spaces		
C1a	C1	Central Garage	7179
C1b	C2	West Garage	3076
		West Garage Expansion	1699
C2	C3	Terminal B Garage	2212
C8a	C5	Terminal E Lot 1	237
C8b	C6	Terminal E Lot 2	249
C9	C7	Terminal E Lot 3 (fka "Gulf Station" Lot)	217
	C12	Blue Lot	367
C6	C8	Economy Garage	2864
		subtotal	18100
	Overflow Commercial Spaces		
	C11	Red Lot (Tomahawk Dr.)	
	C13	Green Lot (Wood Island)	
		subtotal	0
	Hotel Spaces		
C4	C4a ~~& C4b~~	Logan Airport Hilton Hotel (one lot)	235
C7a	C10	Harborside Hyatt Conference Center	270
		subtotal	505
	General Aviation Spaces		
C5	C9	Signature (General Aviation Terminal)	35
		subtotal	35
	Total In-Service Commercial Parking Spaces		**18,640**
	Total Designated Commercial Parking Spaces		**23,640**
	Total Commercial Parking Spaces		**23,640**
	Total Employee Parking Spaces *(see table on next page)*		**2,448**
	TOTAL PARKING FREEZE SPACES		**26,088**

Employee Parking Spaces

Oct-17

Area		Map ID#	Location of Employee Parking Areas	Number of Spaces
Terminal	Terminal Area	E81	West Garage	98
Terminal	Terminal Area	E26	Airport Tower/Administration (parking in Central Garage)	521
Terminal	Terminal Area	E20	Terminal C Pier A (Old Terminal D) (two lots)	122
Terminal	Terminal Area	E18	Massport Facilities 1 (Heating Plant)	92
Terminal	Terminal Area	E34	Hilton Hotel employee lot	28
Terminal	Terminal Area	E86	Gulf Gas Station	4
North	North Service Area	E68a	LSG Sky Chefs (Bldg. 68), main lot	25
North	North Service Area	E68b	LSG Sky Chefs (Bldg. 68), overflow lot	126
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SUMMARY

TOTAL COMMERCIAL PARKING SPACES	***18,640***
TOTAL EMPLOYEE PARKING SPACES	***2,448***
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Rental Car Company Parking Spaces

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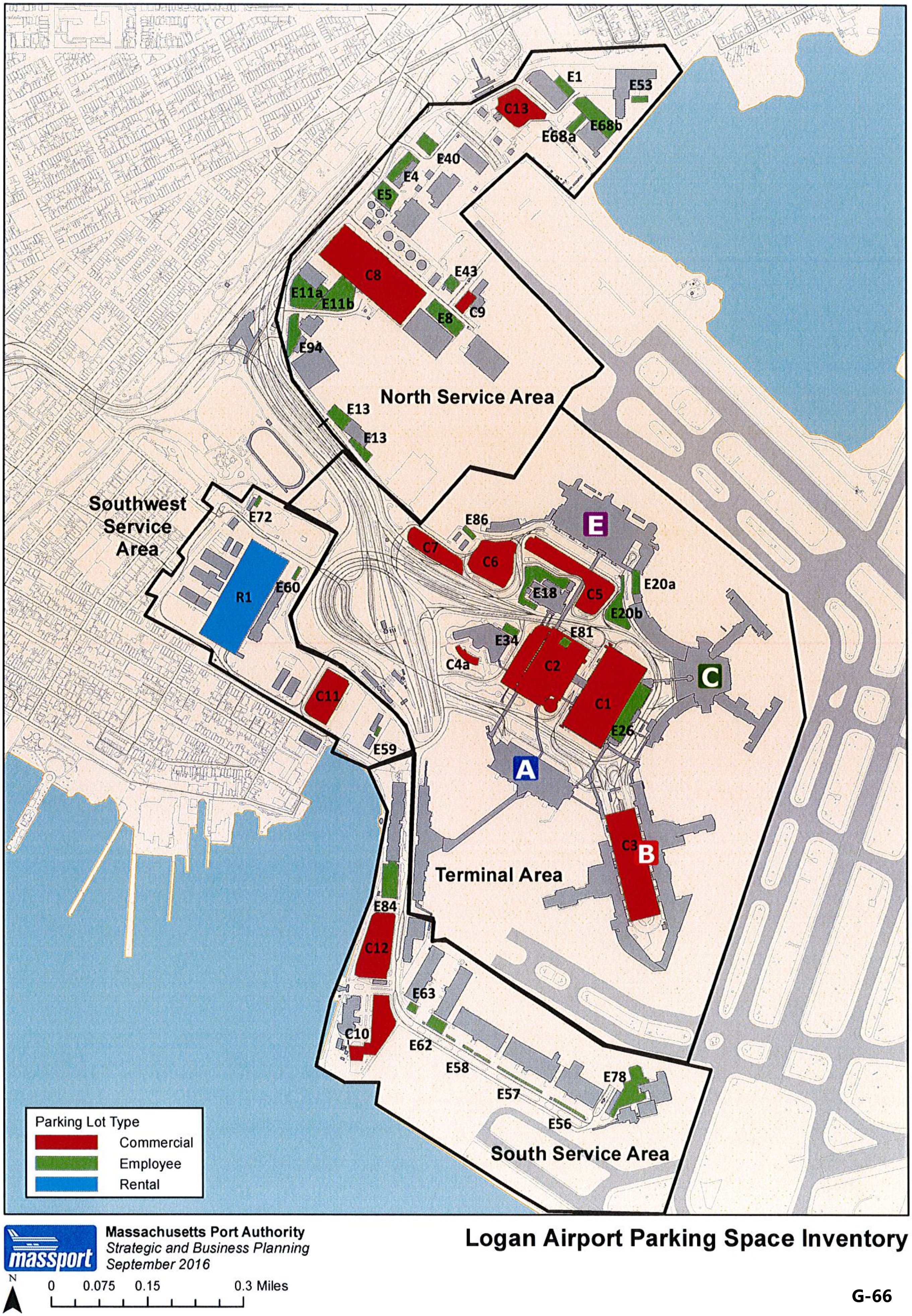
Total Rental Car Spaces		**5,020**



massport

Massachusetts Port Authority
Strategic and Business Planning
September 2016

Logan Airport Parking Space Inventory

Projection: Lambert Conformal Conic **Coordinate System:** NAD 1983 State Plane Massachusetts Mainland FIPS 2001 (Meter)

H

Noise Abatement

This appendix provides detailed information, tables, and figures in support of Chapter 6, *Noise Abatement*. The contents of this appendix are summarized below.

Appendix Contents

- 2017 DNL Levels for Census Block Group Locations
  - Table H-26 2017 DNL Levels for Census Block Group Locations within DNL 50 dB
- Massport and FAA Correspondence Letters
  - Massport and FAA correspondence letter regarding RNAV Pilot Test: Request that FAA adopt the jetBlue Airways RNAV Visual Approach Procedure to Runway 33L dated April 7, 2017
  - Massport and FAA correspondence letter regarding Massport recommended procedural changes to RNAV dated December 20, 2017
  - FAA June 2018 update letter regarding RNAV Pilot Test: Request that FAA adopt the jetBlue Airways RNAV Visual Approach Procedure to Runway 33L dated June 8, 2018

Fundamentals of Acoustics and Environmental Noise

This section introduces the fundamentals of acoustics and noise terminology as well as the effects of noise on human activity and community annoyance.

Introduction to Acoustics and Noise Terminology

Chapter 6, *Noise Abatement* of this *2017 Environmental Status and Planning Report (ESPR)* relies largely on a measure of cumulative noise exposure over an entire calendar year, in terms of a metric called the Day-Night Average Sound Level (DNL). However, DNL does not always provide a sufficient description of noise for many purposes. Other measures are available to address essentially any issue of concern. This section introduces the following acoustic metrics, which are all related to DNL, but provide bases for evaluating a broad range of noise situations. These metrics include:

- Decibel (dB)
- A-Weighted Decibel (dBA)
- Sound Exposure Level (SEL)
- Equivalent Sound Level (Leq)
- Time Above (TA)
- Time Above, Night (TAN)
- DNL

The Decibel (dB)

All sounds come from a sound source – a musical instrument, a voice speaking, or an airplane that passes overhead. It takes energy to produce sound. The sound energy produced by any sound source is transmitted through the air in the form of sound waves – tiny, quick oscillations of pressure just above and just below atmospheric pressure. These oscillations, or sound pressures, impinge on the ear, creating the sound we hear.

Our ears are sensitive to a wide range of sound pressures. The loudest sounds that we hear without pain have about one million times more energy than the quietest sounds we hear. However, our ears are incapable of detecting small differences in these pressures. Thus, to match how we hear this sound energy, we compress the total range of sound pressures to a more meaningful range by introducing the concept of sound pressure level (SPL). SPL is a measure of the sound pressure of a given noise source relative to a standard reference value (typically the quietest sound that a young person with good hearing can detect). SPLs are measured in decibels (abbreviated dB). Decibels are logarithmic quantities – logarithms of the squared ratio of two pressures, the numerator being the pressure of the sound source of interest, and the denominator being the reference pressure (the quietest sound we can hear).

The logarithmic conversion of sound pressure to SPL means that the quietest sound we can hear (the reference pressure) has a SPL of about zero dB, while the loudest sounds we hear without pain have SPLs of about 120 dB. Most sounds in our day-to-day environment have SPLs from 30 to 100 dB.

Because decibels are logarithmic quantities, they do not behave like regular numbers with which we are more familiar. For example, if two sound sources each produce 100 dB and they are operated together, they produce only 103 dB – not 200 dB as we might expect. Four equal sources operating simultaneously result in a total SPL of 106 dB. In fact, for every doubling of the number of equal sources, the SPL goes up another three decibels. A tenfold increase in the number of sources makes the SPL go up 10 dB. A hundredfold increase makes the level go up 20 dB, and it takes a thousand equal sources to increase the level 30 dB.

If one source is much louder than another source, the two sources together will produce the same SPL (and sound to our ears) as if the louder source were operating alone. For example, a 100-dB source plus an 80-dB source produces 100 dB when operating together. The louder source "masks" the quieter one, but if the quieter source gets louder, it will have an increasing effect on the total SPL. When the two sources are equal, as described above, they produce a level 3 dB above the sound of either one by itself.

From these basic concepts, note that one hundred 80 dB sources will produce a combined level of 100 dB; if a single 100-dB source is added, the group will produce a total SPL of 103 dB. Clearly, the loudest source has the greatest effect on the total decibel level.

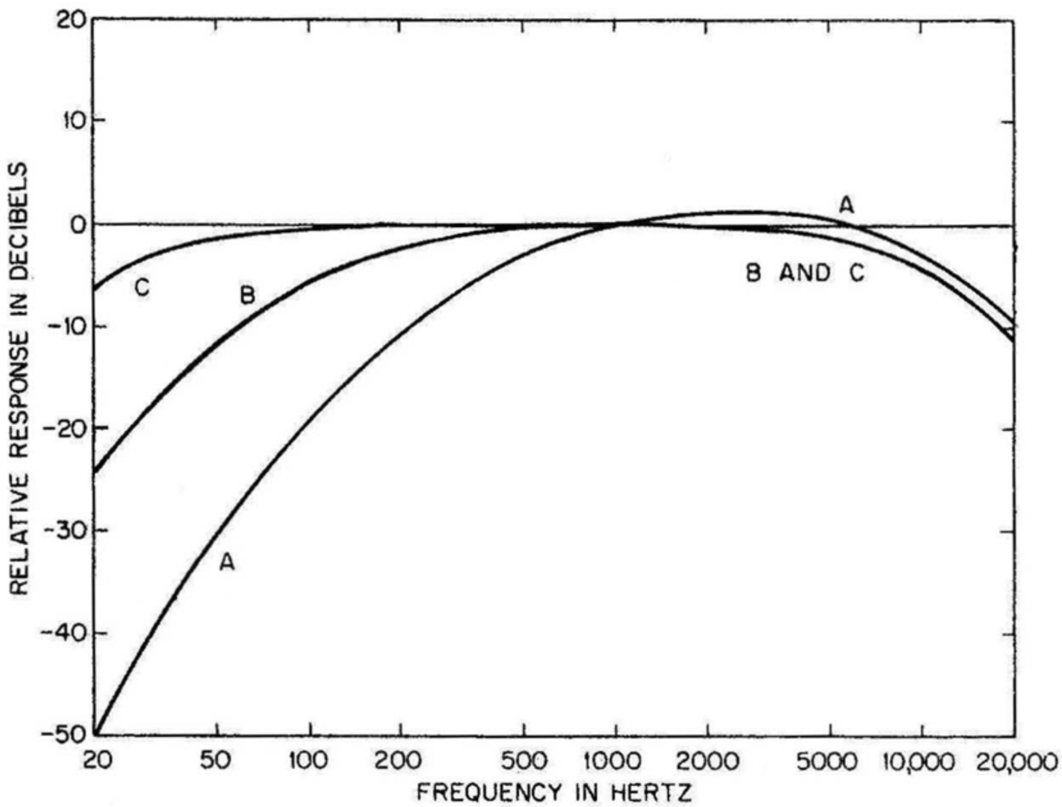
A-Weighted Decibel (dBA)

Another important characteristic of sound is its frequency, or "pitch." This is the rate of repetition of the sound pressure oscillations as they reach our ear. Formerly expressed in cycles per second, frequency is now expressed in units known as Hertz (Hz).

Most people hear from about 20 Hz to about 10,000 to 15,000 Hz. People respond to sound most readily when the predominant frequency is in the range of normal conversation, around 1,000 to 2,000 Hz. Acousticians have developed "filters" to match our ears' sensitivity and help us to judge the relative loudness of sounds made up of different frequencies. The so-called "A" filter does the best job of matching the sensitivity of our ears to most environmental noises. SPLs measured through this filter are referred to as A-weighted levels (dBA). A-weighting significantly de-emphasizes noise at low and very high frequencies (below about 500 Hz and above about 10,000 Hz) where we do not hear as well. Because this filter generally matches our ears' sensitivity, sounds having higher A-weighted sound levels are usually judged louder than those with lower A-weighted sound levels, a relationship which does not always hold true for unweighted levels. It is for these reasons that A-weighted sound levels are normally used to evaluate environmental noise.

Other weighting networks include the B and C filters. They correspond to different level ranges of the ear. The rarely used B-weighting attenuates low frequencies (those less than 500 Hz), but to a lesser degree than A-weighting. C weighting is nearly flat throughout the audible frequency range, hardly de-emphasizing low frequency noise. C-weighted levels can be preferable in evaluating sounds whose low-frequency components are responsible for secondary effects such as the shaking of a building, window rattle, or perceptible vibrations. Uses include the evaluation of blasting noise, artillery fire, and in some cases, aircraft noise inside buildings. **Figure H-1** compares these various weighting networks.

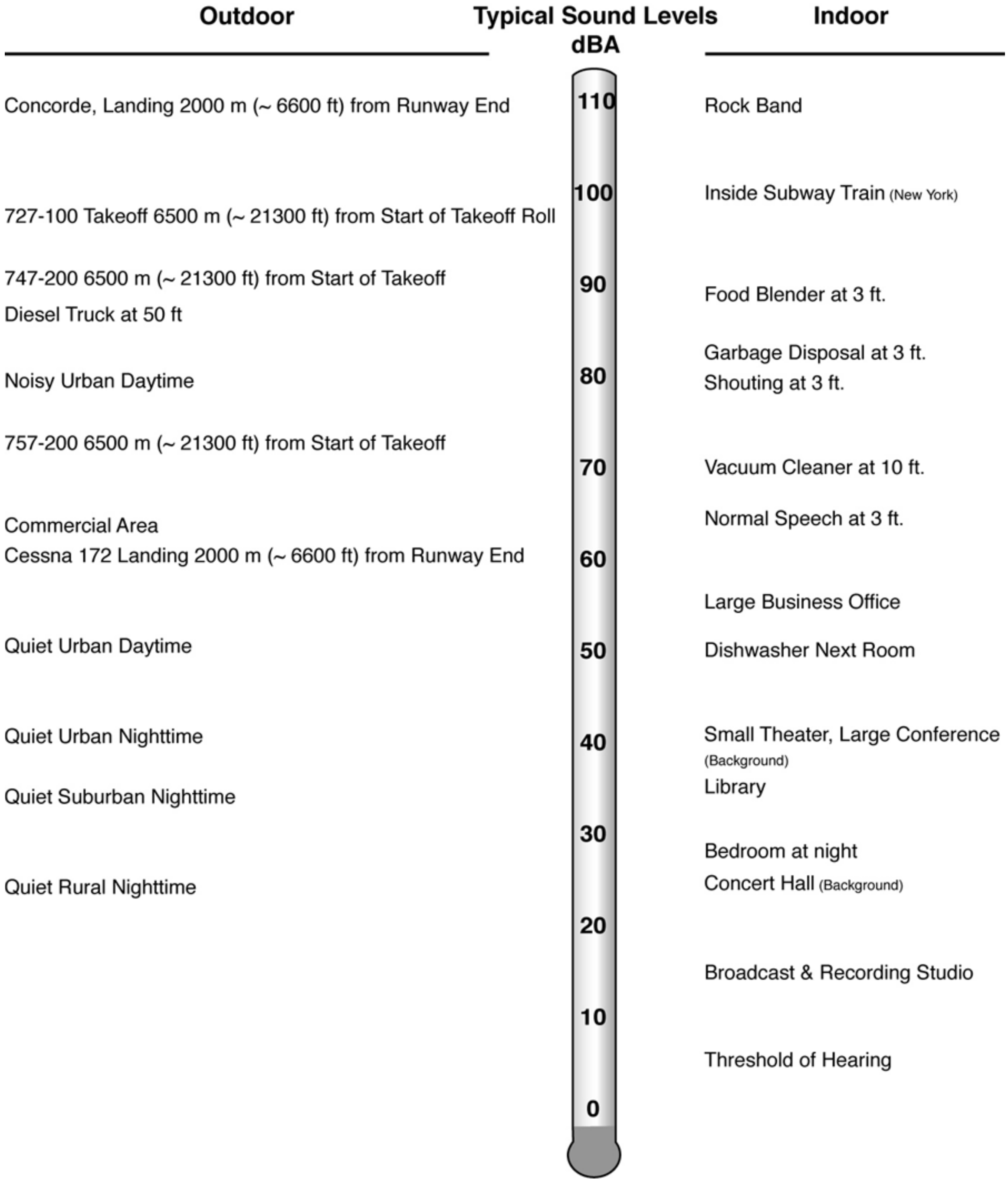
Figure H-1 Frequency-Response Characteristics of Various Weighting Networks



Source: Harris, Cyril M., editor; Handbook of Acoustical Measurements and Noise Control, (Chapter 5, "Acoustical Measurement Instruments"; Johnson, Daniel L.; Marsh, Alan H.; and Harris, Cyril M.); New York; McGraw-Hill, Inc.; 1991; p. 5.13.

Because of the correlation with our hearing, the A-weighted level has been adopted as the basic measure of environmental noise by the U.S. Environmental Protection Agency (EPA) and by nearly every other federal and state agency concerned with community noise. **Figure H-2** presents typical A-weighted sound levels of several common environmental sources.

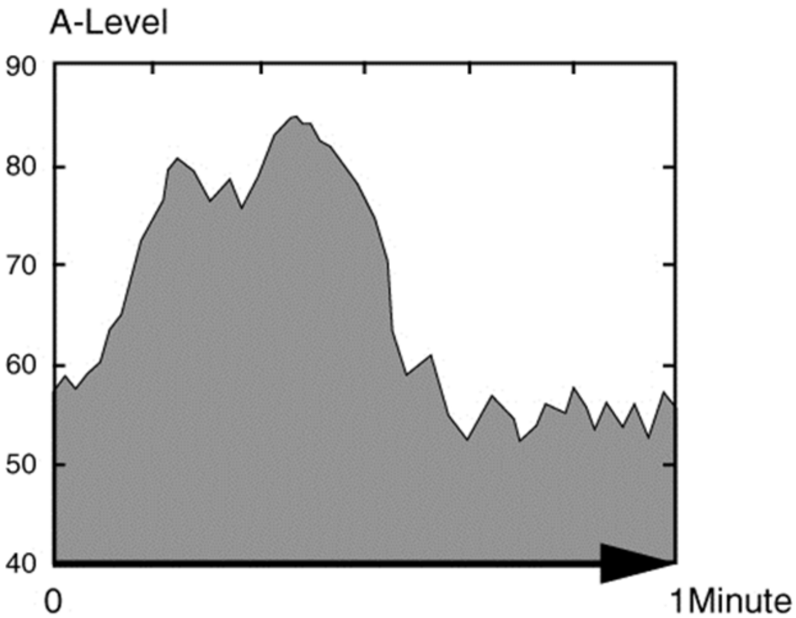
Figure H-2 Common Environmental Sound Levels, in dBA



Source: HMMH (Aircraft noise levels from FAA Advisory Circular 36-3H)
Note: dBA – A-weighted decibel.

An additional dimension to environmental noise is that A-weighted levels vary with time. For example, the sound level increases as an aircraft approaches, then falls and blends into the background as the aircraft recedes into the distance (though even the background varies as birds chirp or the wind blows or a vehicle passes by). **Figure H-3** illustrates this concept.

Figure H-3 Variations in the A-Weighted Sound Level Over Time



Source: HMMH.

Maximum A-Weighted Noise Level (L_{max})

The variation in noise level over time often makes it convenient to describe a particular noise "event" by its maximum sound level, abbreviated as L_{max}. In the figure above, it is approximately 85 dBA.

The maximum level describes only one dimension of an event; it provides no information on the cumulative noise exposure. In fact, two events with identical maxima may produce very different total exposures. One may be of very short duration, while the other may continue for an extended period and be judged much more annoying. The next measure corrects for this deficiency.

Sound Exposure Level (SEL)

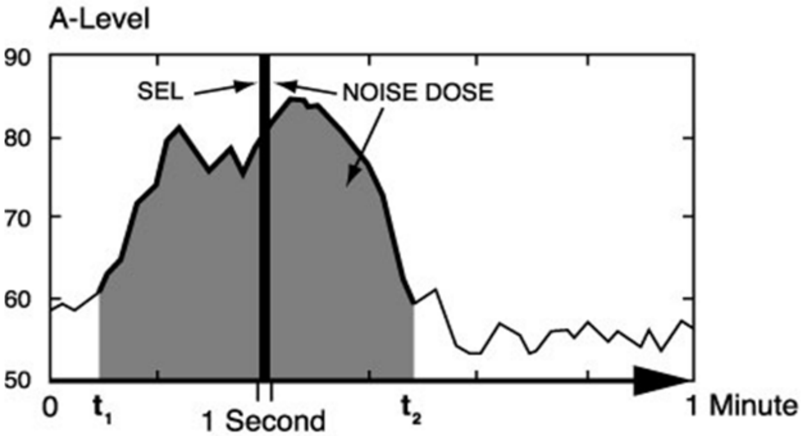
The most frequently used measure of noise exposure for an individual aircraft noise event (and the measure that Part 150[1] specifies for this purpose) is the SEL. SEL is a measure of the total noise energy produced during an event, from the time when the A-weighted sound level first exceeds a threshold level (normally just above the background or ambient noise) to the time that the sound level drops back down below the threshold. To allow comparison of noise events with very different durations, SEL “normalizes” the duration in every case to one second; that is, it is expressed as the steady noise level with just a

1 “Part 150” refers to Federal Aviation Regulations (FAR) Part 150, discussed in detail in the Regulatory Framework Section of this Appendix.

one-second duration that includes the same amount of noise energy as the actual longer duration, time-varying noise. In lay terms, SEL "squeezes" the entire noise event into one second.

Figure H-4 depicts this transformation. The shaded area represents the energy included in an SEL measurement for the noise event, where the threshold is set to 60 dBA. The dark shaded vertical bar, which is 90 dBA high and just one second long (wide), contains the same sound energy as the full event.

Figure H-4 Sound Exposure Level (SEL)



Source: HMMH.

Because the SEL is normalized to one second, it will always be larger than the L_{max} for an event longer than one second. In this case, the SEL is 90 dB; the L_{max} is approximately 85 dBA. For most aircraft overflights, the SEL is normally on the order of 7 to 12 dB higher than L_{max}. Because SEL considers duration, longer exposure to relatively slow, quiet aircraft, such as propeller models, can have the same or higher SEL than shorter exposure to faster, louder planes, such as corporate jets.

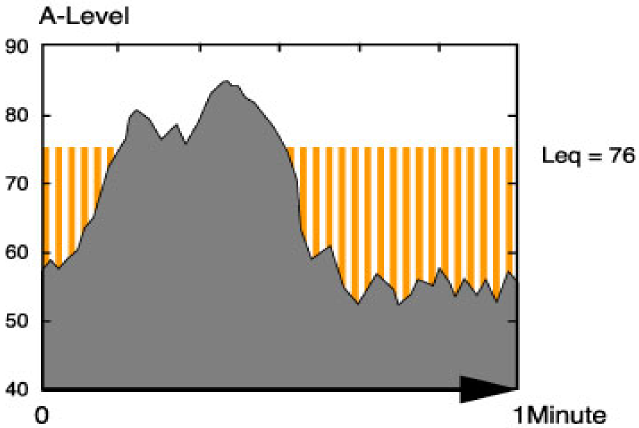
Equivalent Sound Level (L_{eq})

The L_{max} and SEL quantify the noise associated with individual events. The remaining metrics in this section describe longer-term cumulative noise exposure that can include many events.

The Equivalent Sound Level (L_{eq}) is a measure of exposure resulting from the accumulation of A-weighted sound levels over a particular period of interest (e.g., an hour, an eight-hour school day, nighttime, or a full 24-hour day). Because the length of the period can differ, the applicable period should always be identified or clearly understood when discussing the metric. Such durations are often identified through a subscript, for example $L_{eq(8)}$ or $L_{eq(24)}$.

L_{eq} is equivalent to the constant sound level over the period of interest that contains as much sound energy as the actual time-varying level. This is illustrated in **Figure H-5**. Both the solid and striped shaded areas have a one-minute L_{eq} value of 76 dB. It is important to recognize, however, that the two signals (the constant one and the time-varying one) would sound very different in real life. Also, be aware that the "average" sound level suggested by L_{eq} is not an arithmetic value, but a logarithmic, or "energy-averaged" sound level. Thus, loud events dominate L_{eq} measurements.

Figure H-5 Example of a One Minute Equivalent Sound Level (L_{eq})



Source: HMMH.

In airport noise studies, L_{eq} is often presented for consecutive one-hour periods to illustrate how the exposure rises and falls throughout a 24-hour period, and how individual hours are affected by unusual activity, such as rush hour traffic or a few loud aircraft.

Time Above (TA)

TA is a metric that gives the duration, in minutes, for which aircraft-related noise exceeds a specified A-weighted sound level during a given period. The measure is referred to generally as TA. For this *2017 ESPR*, three threshold sound levels are used in the analysis: 65, 75, and 85 dBA. These times are computed using the Federal Aviation Administration (FAA)-approved Integrated Noise Model (INM).

Time Above Night (TAN)

Identical to TA, except it is computed for only the 9-hour period between 10:00 PM and 7:00 AM. The TAN is also developed using three threshold sound levels 65, 75, and 85 dBA.

Day-Night Average Sound Level (DNL)

Virtually all studies of aircraft noise rely on a slightly more complicated measure of noise exposure that describes cumulative noise exposure during an average annual day: the DNL. The EPA identified DNL as the most appropriate means of evaluating airport noise based on the following considerations:[2]

1. The measure should be applicable to the evaluation of pervasive long-term noise in various defined areas and under various conditions over long periods.

2. The measure should correlate well with known effects of the noise environment and on individuals and the public.

2 Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety," U. S. EPA Report No. 550/9-74-004, March 1974.

3. The measure should be simple, practical, and accurate. In principal, it should be useful for planning as well as for enforcement or monitoring purposes.

4. The required measurement equipment, with standard characteristics, should be commercially available.

5. The measure should be closely related to existing methods currently in use.

6. The single measure of noise at a given location should be predictable, within an acceptable tolerance, from knowledge of the physical events producing the noise.

7. The measure should lend itself to small, simple monitors, which can be left unattended in public areas for long periods.

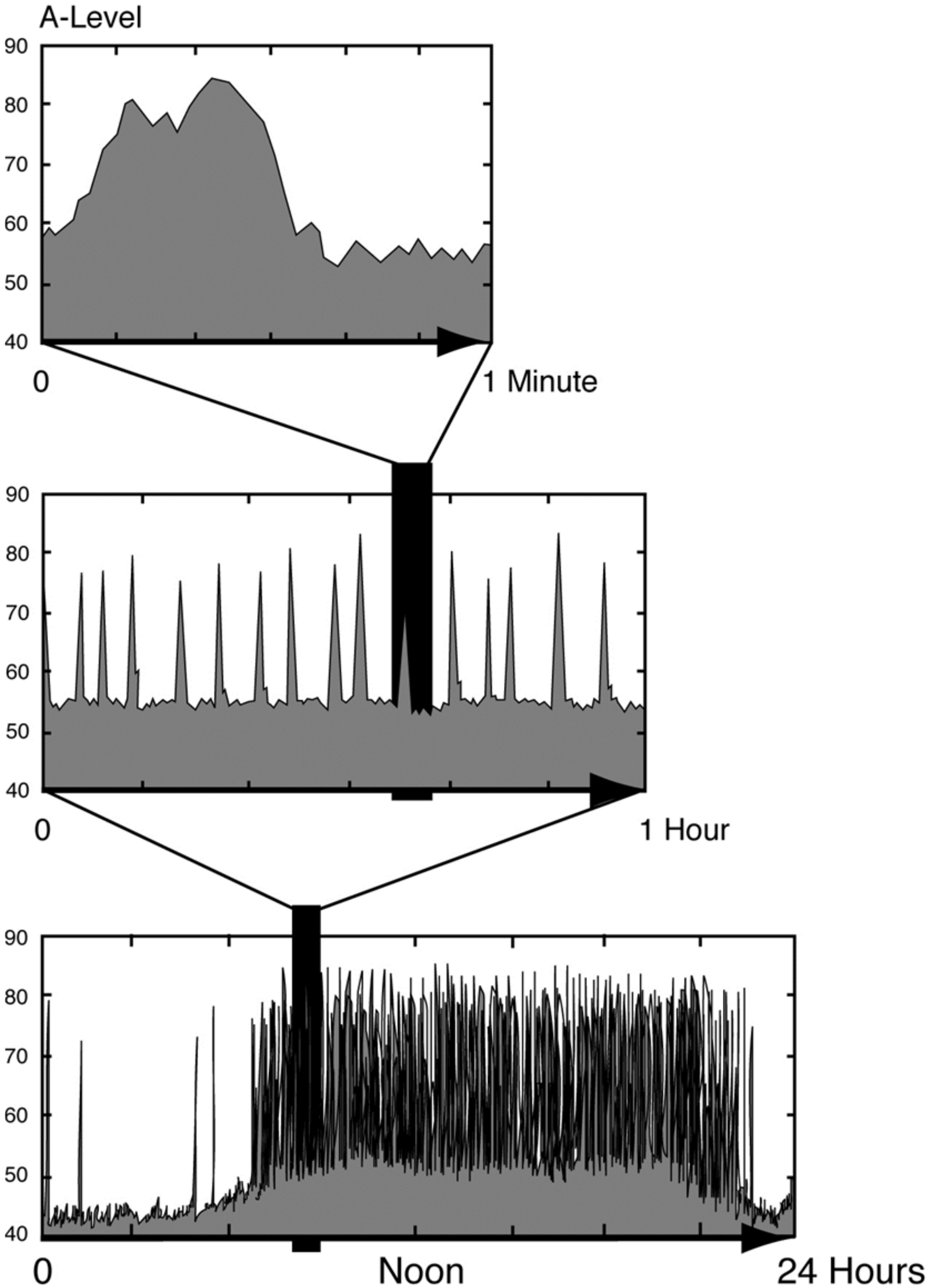
Most federal agencies dealing with noise have formally adopted DNL. The Federal Interagency Committee on Noise (FICON) reaffirmed the appropriateness of DNL in 1992. The FICON summary report stated; "There are no new descriptors or metrics of sufficient scientific standing to substitute for the present DNL cumulative noise exposure metric."

The DNL represents noise as it occurs over a 24-hour period, with one important exception: DNL treats nighttime noise differently from daytime noise. In determining DNL, it is assumed that the A-weighted levels occurring at night (defined as 10:00 PM to 7:00 AM) are 10 dB louder than they really are. This 10-dB penalty is applied to account for greater sensitivity to nighttime noise, and the fact that events at night are often perceived to be more intrusive because nighttime ambient noise is less than daytime ambient noise.

Figure H-4 illustrated the A-weighted sound level due to an aircraft fly-over as it changed with time. The top frame of **Figure H-6** repeats this figure. The shaded area reflects the noise dose that a listener receives during the one-minute period of the sample. The center frame of **Figure H-6** includes this one-minute sample within a full hour. The shaded area represents the noise during that hour with 16 noise events, each producing an SEL. Similarly, the bottom frame includes the one-hour interval within a full 24 hours. Here the shaded area represents the listener's noise dose over a complete day. Note that several overflights occur at a time when the background noise drops some 10 dB, to approximately 45 dBA.

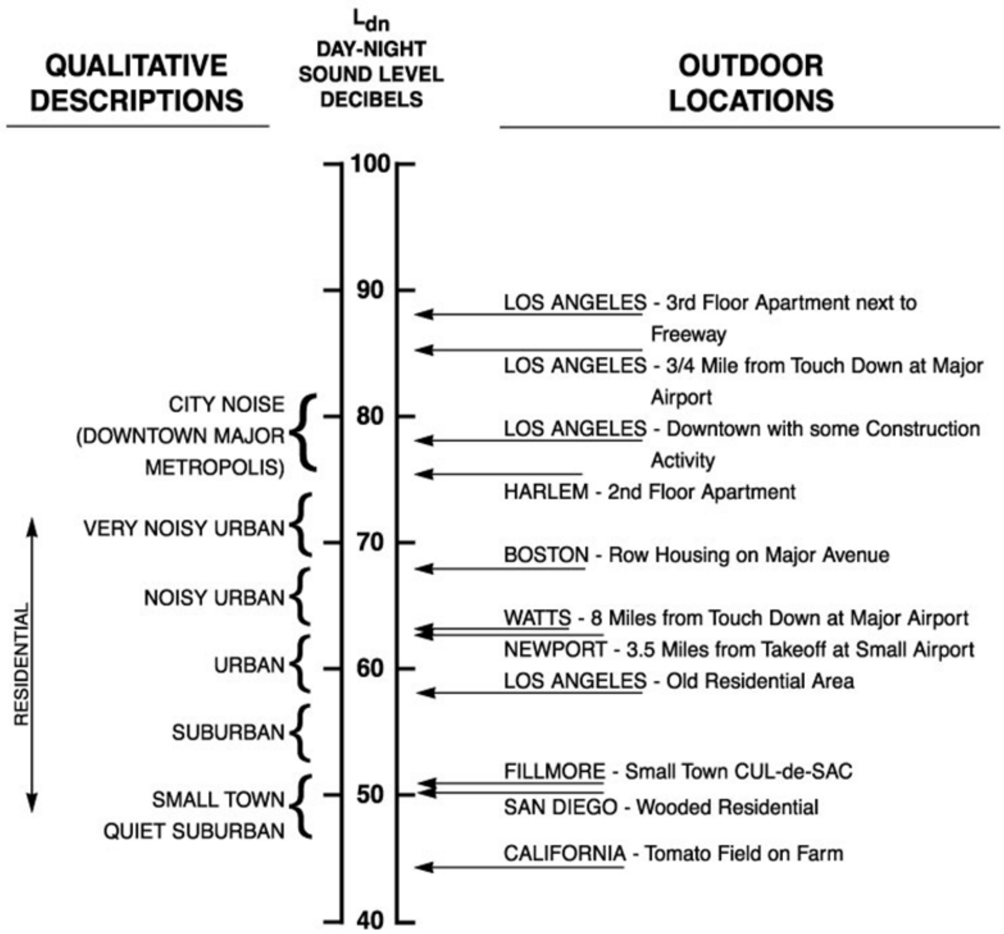
DNL can be measured or estimated. Measurements are practical only for obtaining DNL values for relatively limited numbers of points, and, in the absence of a permanently installed monitoring system, only for relatively short time periods. Most airport noise studies are based on computer-generated DNL estimates, determined by accounting for all the SELs from individual events, which comprise the total noise dose at a given location. Computed DNL values are often depicted in terms of equal-exposure noise contours (much as topographic maps have contours of equal elevation). **Figure H-7** depicts typical DNL values for a variety of noise environments.

Figure H-6 Daily Noise Dose



Source: HMMH.

Figure H-7 Examples of Day-Night Average Sound Levels (DNL)



Source: U.S. Environmental Protection Agency (EPA), Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety, March 1974, p. 14.

As of May 2015, FAA is beginning work on the next step in a multi-year Noise Research Program that will update the scientific evidence on the relationship between aircraft noise exposure and its effects on communities around airports. If changes are warranted, FAA will propose revised policy and related guidance and regulations, subject to interagency coordination, as well as public review and comment.

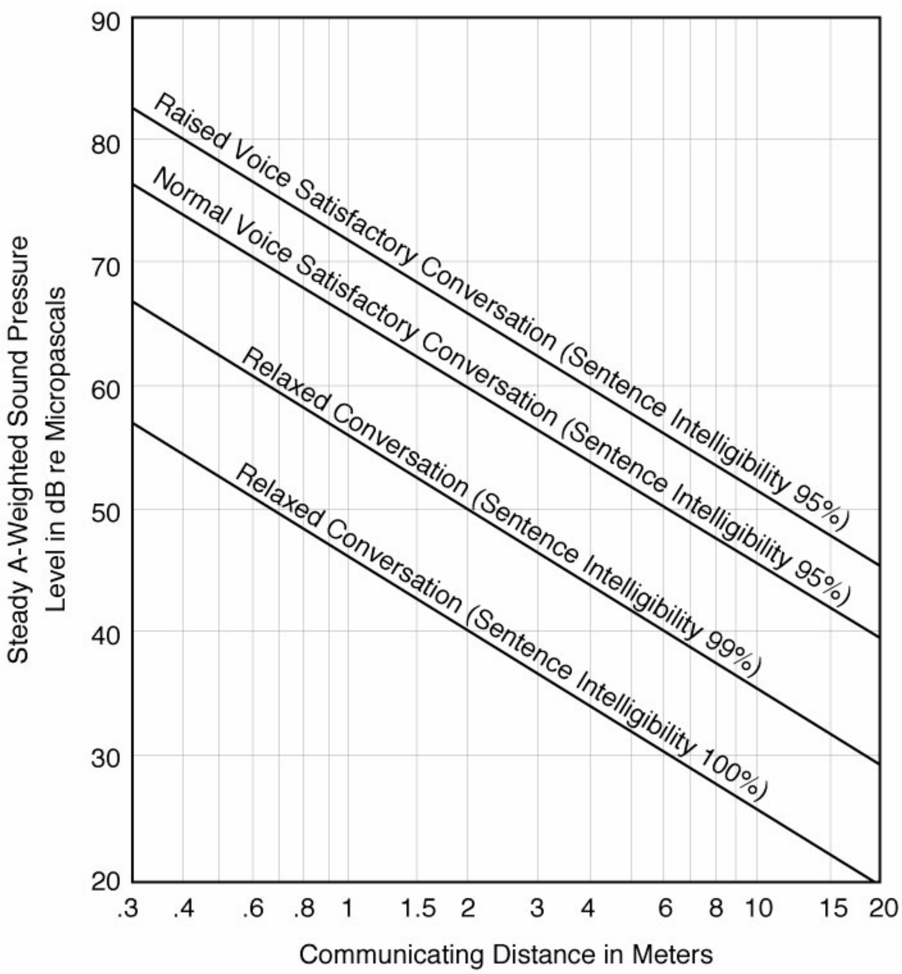
The Effects of Aircraft Noise on People

To residents around airports, aircraft noise can be an annoyance and a nuisance. It can interfere with conversation and listening to television, it can disrupt classroom activities in schools, and it can disrupt sleep. Relating these effects to specific noise metrics helps in the understanding of how and why people react to their environment.

Speech Interference

A primary effect of aircraft noise is its tendency to drown out or "mask" speech, making it difficult to carry on a normal conversation. The sound level of speech decreases as the distance between a talker and listener increases. As the background sound level increases, it becomes harder to hear speech. **Figure H-8** presents typical distances between talker and listener for satisfactory outdoor conversations, in the presence of different steady A-weighted background noise levels for raised, normal, and relaxed voice effort. As the background level increases, the talker must raise his/her voice, or the individuals must get closer together to continue talking.

Figure H-8 Outdoor Speech Intelligibility



Source: U.S. Environmental Protection Agency (EPA), Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety, March 1974, p. D-5.

As indicated in the figure, "satisfactory conversation" does not always require hearing every word; 95 percent intelligibility is acceptable for many conversations. Listeners can infer a few unheard words when they occur in a familiar context. However, in relaxed conversation, we have higher expectations of hearing speech and generally require closer to 100 percent intelligibility. Any combination of talker-listener distances and background noise that falls below the bottom line in **Figure H-8** (thus assuring 100 percent intelligibility) represents an ideal environment for outdoor speech communication and is considered necessary for acceptable indoor conversation as well.

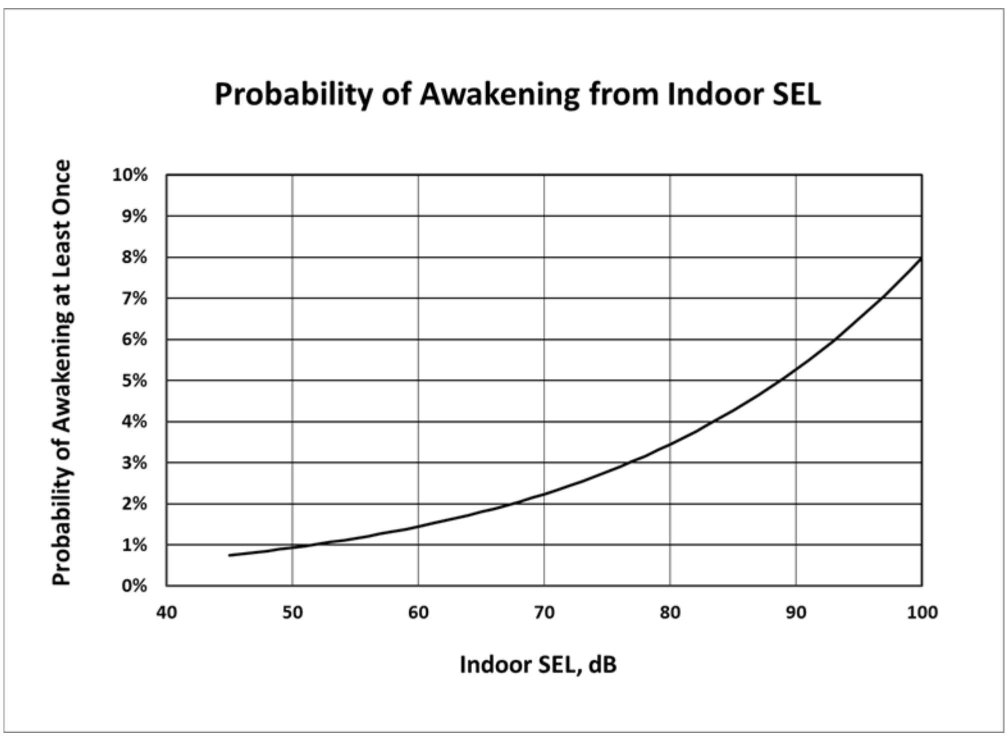
One implication of the relationships in **Figure H-8** is that for typical communication at distances of 3 or 4 feet (1 to 1.5 meters), acceptable outdoor conversations can be carried on in a normal voice as long as the background noise outdoors is less than about 65 dBA. If the noise exceeds this level, as might occur when an aircraft passes overhead, intelligibility would be lost unless vocal effort were increased, or communication distance were decreased.

Indoors, typical distances, voice levels, and intelligibility expectations generally require a background level less than 45 dBA. With windows partly open, housing generally provides about 12 dBA of interior-to-exterior noise level reduction. Thus, if the outdoor sound level is 60 dBA or less, there is a reasonable chance that the resulting indoor sound level will afford acceptable conversation inside. With windows closed, 24 dB of attenuation is typical.

Sleep Interference

Research on sleep disruption from noise has led to widely varying observations. In part, this is because (1) sleep can be disturbed without awakening, (2) the deeper the sleep the more noise it takes to cause arousal, and (3) the tendency to awaken increases with age, and other factors. **Figure H-9** shows one such relationship from recent research conducted in the U.S. – the probability that a group of people will be awakened at least once when exposed to a given indoor SEL.

Figure H-9 Probability of Awakening at Least Once from Indoor Noise Event



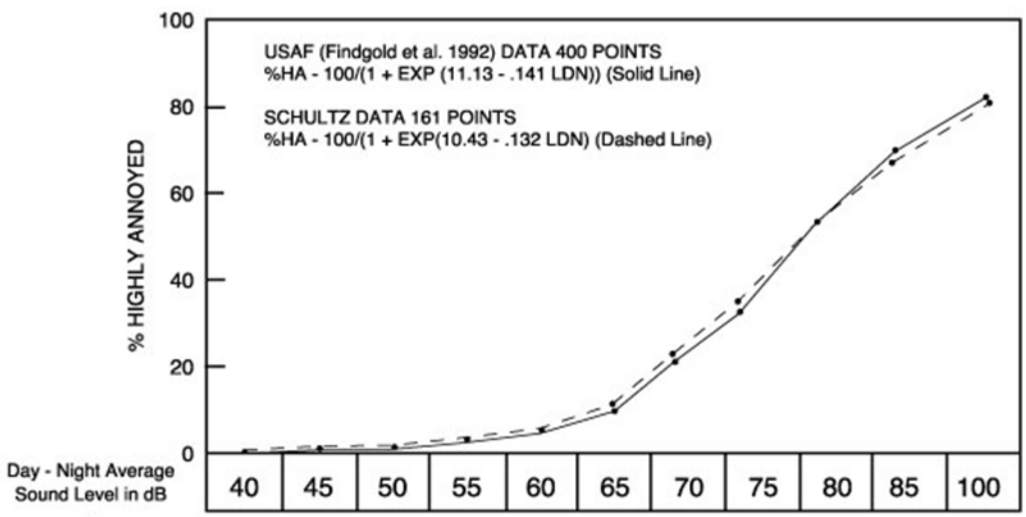
Source: American National Standards Institute (ANSI) S12.9-2008/Part 6, Quantities and Procedures for Description and Measurement of Environmental Sound — Part 6: Methods for Estimation of Awakenings Associated with Outdoor Noise Events Heard in Homes; Equation 1.

For example, an indoor SEL of 80 dB results in approximately 3.5 percent of the exposed population being awakened. If windows are open in the bedroom on a warm evening and a house provides a typical outside-to-inside noise level reduction of around 15 dB, which suggests it takes an SEL of about 95 dB outdoors to awaken 3.5 percent of the population. The American National Standards Institute (ANSI) has extended this concept further and developed a standard (ANSI S12.9-2008/Part 6) for computing the percentage of the population that is likely to be awakened by multiple noise events occurring throughout the night. The Federal Interagency Committee on Aviation Noise (FICAN) subsequently endorsed the standard as the best available means of estimating behavioral awakenings from aircraft noise.

Community Annoyance

Social survey data make it clear that individual reactions to noise vary widely for a given noise level. Nevertheless, as a group, people's aggregate response is predictable and relates well to measures of cumulative noise exposure such as DNL. **Figure H-10** shows a widely recognized relationship between environmental noise and annoyance.

Figure H-10 Percentage of People Highly Annoyed



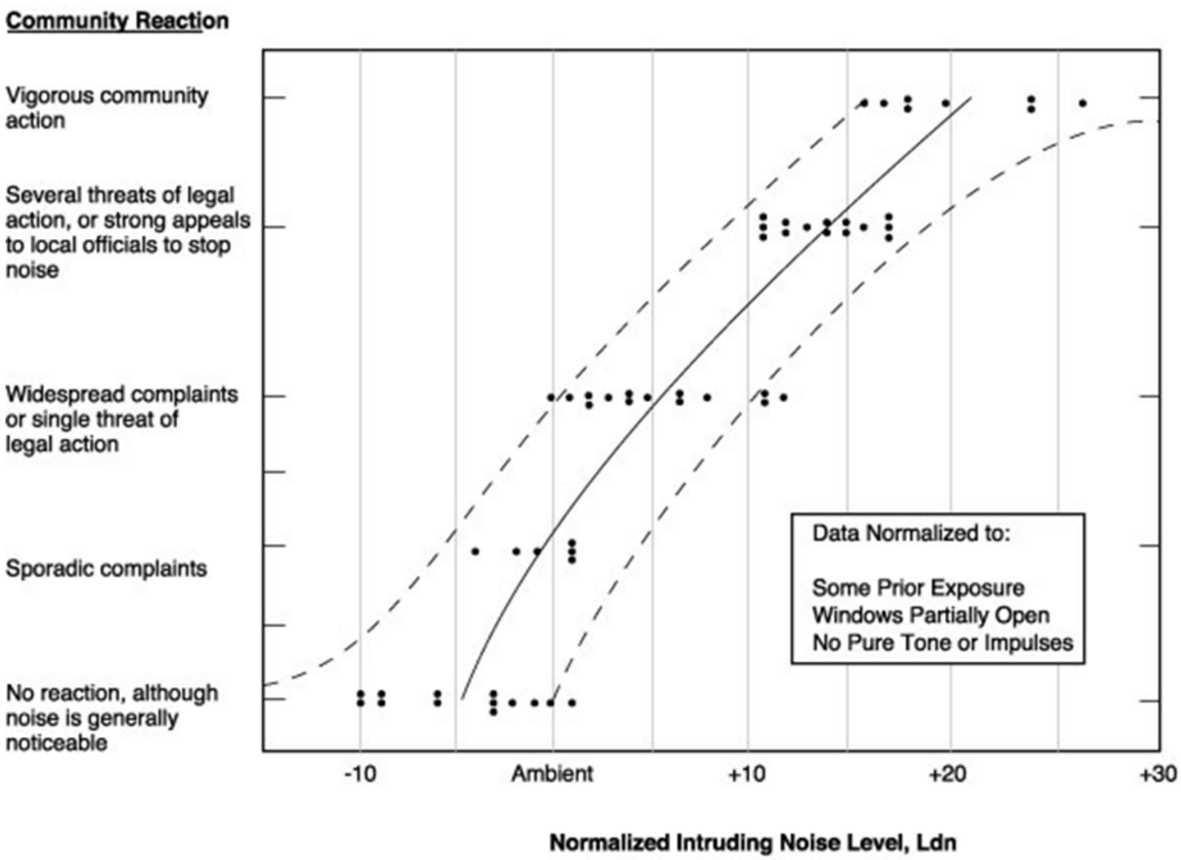
Calculated %HA Points												
	USAF	0.41	0.831	1.66	3.31	6.48	12.29	22.1	36.47	53.74	70.16	82.64
	SCHULTZ	0.576	1.11	2.12	4.03	7.52	13.59	23.32	37.05	53.25	68.78	81

Source: Federal Interagency Committee on Aviation Noise (FICON). "Federal Agency Review of Selected Airport Noise Analysis Issues." August 1992. (From data provided by USAF Armstrong Laboratory). pp. 3-6.

Based on data from 18 surveys conducted worldwide, the curve indicates that at levels as low as DNL 55, approximately 5.0 percent of the people will still be highly annoyed, with the percentage increasing more rapidly as exposure increases above DNL 65.

Separate work by the EPA has shown that overall community reaction to a noise environment can also be related to DNL. This relationship is shown in **Figure H-11**. Levels have been normalized to the same set of exposure conditions to permit valid comparisons between ambient noise environments. Data summarized in **Figure H-11** suggest that little reaction would be expected for intrusive noise levels five decibels below the ambient, while widespread complaints can be expected as intruding noise exceeds background levels by about 5 dB. Vigorous action is likely when the background is exceeded by 20 dB.

Figure H-11 Community Reaction as a Function of Outdoor DNL



Source: Wyle Laboratories, "Community Noise," prepared for the U.S. Environmental Protection Agency, Office of Noise Abatement and Control, Washington, D.C., December 1971, pg. 63.
Note: DNL - Day-Night Average Sound Level.

Regulatory Framework

Logan Airport Noise Abatement Rules and Regulations

Massport's primary mechanism for reducing noise impacts from Logan Airport's operations is the Noise Rules.[3] The Noise Rules were designed to reduce noise impacts by encouraging use of quieter aircraft by requiring decreased use of noisier aircraft and by limiting nighttime activity by louder Stage 2 types. Many secondary goals aimed at limiting noise in specific areas also were stated.

Specific provisions of the Noise Rules, which continue to serve these goals, include:

- Limiting cumulative noise exposure at Logan Airport (as measured by Massport's cumulative noise index [CNI]) to a maximum of 156.5 Effective Perceived Noise Decibels (EPNdB);

3 The Logan International Airport Noise Abatement Rules and Regulations, effective July 1, 1986, are codified at 740 Code of Massachusetts Regulations (CMR) 24.01 et seq (also known as the Noise Rules).

- Maximizing use of Stage 3 aircraft;
- Restricting nighttime operations by Stage 2 aircraft;
- Placing limitations on times and locations of engine run-ups and use of auxiliary power units (APU); and
- Restricting use of certain runways by noisier aircraft and time of day.

These restrictions and limitations are subject to FAA implementation and safe operation of the airport and airspace.

Federal Aviation Regulation (FAR) Part 36

Logan Airport operates within a framework of federal aviation regulations that limits an airport operator's ability to control noise. For example, FAA's FAR Part 36[4] sets noise limits for aircraft certification and the procedures by which aircraft noise emission levels must be measured to determine compliance. The regulation defines noise emission limits for turbojets, turboprops, and helicopters, classifying turbojets into categories referred to as stages based on noise levels at each of three locations: takeoff, landing, and to the side of the runway during takeoff (sideline). The categories are:

- Stage 1 aircraft are the oldest and usually have the loudest operations, having preceded the existence of any noise emission regulation. Rare examples include old, restored civil or military aircraft. There are no Stage 1 aircraft operating at Logan Airport.
- Stage 2 aircraft are less old and less noisy than Stage 1; they were the first aircraft types required to meet a noise limit. A subsequent regulation, FAR Part 91 (described below), prohibits the operation of a Stage 2 aircraft in the continental U.S. unless its takeoff weight is 75,000 pounds or less. FAA Reauthorization bill of 2012 also mandated the phase out of Stage 2 aircraft with a takeoff weight less than 75,000 pounds by the end of 2015. Thus, there are no longer any Stage 2 aircraft operating at Logan Airport.
- Stage 3 aircraft were certified for service before 2006 and have relatively quiet jets, although some are Stage 2 aircraft that have been re-engined, or have been fitted with hushkits, enabling them to meet Stage 3 noise limits.
- Stage 4 aircraft are required to operate with a cumulative noise level at least 10 dB quieter than Stage 3 aircraft at three prescribed measurement points. Jet aircraft certificated after January 1, 2006 must meet the Stage 4 limits. Although not required, the majority of aircraft in the 2017 Logan Airport fleet would also meet the Stage 4 noise limits if they were recertificated.
- Stage 5 aircraft are the newest and quietest aircraft. All aircraft certificated after January 1, 2018 must meet Stage 5 limits, which are a cumulative 7 dB below Stage 4 and 17 dB below Stage 3 aircraft. The Boeing 787, 747-8, and Airbus A350 and A380 are examples of aircraft that meet the new limits. About 18 percent of aircraft in the 2017 Logan Airport fleet would meet Stage 5 noise limits.

4 14 CFR Part 36, "Noise Standards: Aircraft Type and Air Worthiness Certification."

FAR Part 150

First implemented in February 1981, FAR Part 150[5] defines procedures that an airport operator must follow if it chooses to conduct and implement an airport noise and land use compatibility plan. Part 150 Noise Compatibility studies require the use of DNL to evaluate the airport noise environment. FAR Part 150 identifies noise compatibility guidelines for different land uses depending on their sensitivity. Key values include a DNL of 75 dB, above which no residences, schools, hospitals, or churches are considered compatible, and a DNL of 65 dB, above which those land uses are considered compatible only if they are sound insulated.

Noise abatement or mitigation measures that an airport operator must consider in a Part 150 study include acquisition of incompatible land, construction of noise barriers, sound insulation of buildings, implementation of a preferential runway program, use of noise abatement flight tracks, implementation of airport use restrictions, and any other actions that would have a beneficial effect on the public.

While Massport has implemented variations of these and additional measures at Logan Airport, Massport has not filed an official Part 150 noise compatibility study with FAA because all of Logan Airport's program elements, while regularly reviewed and updated, preceded the promulgation of Part 150 and are effectively grandfathered under the regulation.

FAR Parts 91 and 161

The Airport Noise and Capacity Act of 1990 (ANCA)[6] directed the U.S. Secretary of Transportation to undertake three key noise-related actions:

- Establish a schedule for a phase out of Part 36 Stage 2 aircraft by the year 2000;
- Establish a program for FAA review of all new airport noise and access restrictions limiting operations of Stage 2 aircraft; and
- Establish a program for FAA review and approval of any restriction that limits operations of Stage 3 aircraft, including public notice requirements.

FAA addressed these requirements through amendment of an existing federal regulation, "Part 91,"[7] and establishment of a new regulation, "Part 161."[8] ANCA effectively ended Massport's pursuit of any additional operational restrictions outside of this program.

Amendment to Part 91

FAA establishes and regulates operating noise limits for civil aircraft operation in Subpart I, "Operating Noise Limits," of 14 CFR Part 91, "General Operating and Flight Rules." The noise limits are based on aircraft noise certification criteria set forth in 14 CFR Part 36, described above.

In 1976, FAA ordered a phase out of all Stage 1 aircraft with a maximum gross takeoff weight (MGTOW) over 75,000 pounds, to be completed on January 1, 1985. After that date, Stage 1 civil aircraft over

5 14 CFR Part 150, "Airport Noise Compatibility Planning."
6 Pub. L. No. 101-508, 104 Stat. 1388, as recodified at 49 United States Code 47521- 47533.
7 14 CFR Part 91, "General Operating and Flight Rules."
8 14 CFR Part 161, "Notice and Approval of Airport Noise and Access Restrictions."

75,000 pounds MGTOW were banned from operating in the U.S. (with limited exemptions related to commercial service at "small communities," which has since expired in 1988). ANCA required a similar phase out of Stage 2 aircraft over 75,000 pounds by December 31, 1999. The 75,000-pound weight limit exempted most "business" (or "corporate") jets and a very small number of the very smallest "air carrier" type jets until December 31, 2015 when a full ban took effect.[9] Aircraft operators responded to the Stage 1 and 2 phase-outs by retiring their non-compliant aircraft or modifying some of their aircraft to meet the more stringent standards. The modifications undertaken include installation of quieter engines, noise-reducing physical modifications to the airframe and/or existing engines, and limitation of operating weights and procedures to meet the applicable Part 36 limits. Some former Stage 2 airline aircraft that were "recertificated" as Stage 3 with these modifications still operate at Logan Airport, but are generally declining due to the aircrafts' age and high operating costs (in particular due to the generally low fuel efficiency of these older aircraft).

From 2006 to 2017, as airlines add new aircraft, Stage 4 aircraft have been added to their fleets. The Stage 4 noise standard applies to any new jet aircraft type designs over 12,500 pounds requiring FAA approval after January 1, 2006. The International Civil Aviation Organization (ICAO) has also adopted the same regulation for international operators, but neither FAA nor ICAO have indicated there will be restrictions on the remaining recertificated Stage 3 aircraft from carrier fleets.

ICAO and FAA have adopted a higher standard of noise classification called Stage 5 (Chapter 14 for ICAO) which will be effective for new aircraft type certification after December 31, 2017 and December 31, 2020, depending on the weight of the aircraft.[10]

Part 161

FAA implemented the ANCA requirements related to notice, analysis, and approval of use restrictions affecting Stage 2 and 3 aircraft through the establishment of a new regulation, 14 CFR Part 161, "Notice and Approval of Airport Noise and Access Restrictions." In simple terms, Part 161 requires an airport operator that proposes to implement a restriction on Stage 2 or 3 aircraft operations to undertake, document, and publicize certain benefit-cost analyses, comparing the noise benefits of the restriction to its economic costs. Operators must obtain specific FAA approvals of the analysis, documentation, and notice processes, and – for Stage 3 restrictions – approval of the restriction itself.

Part 161 and ANCA define more demanding requirements and explicit guidance for Stage 3 restrictions. To implement a Stage 3 restriction, formal FAA approval is required. FAA's role for Stage 2 restrictions is limited to commenting on compliance with Part 161 notice and analysis procedural requirements. Part 161 provides guidance regarding appropriate information to provide in support of these findings. While Part 161 does not require this information for a Stage 2 restriction, Part 161 states that it would be "useful." Moreover, FAA has required airports to provide this same information for Stage 2 restrictions (and even for Stage 1 restrictions pursued under FAR Part 150), on the grounds that they are required for airports to comply with grant assurance 22(a), "Economic Nondiscrimination," which states that an airport operator "will make its airport available as an airport for public use on reasonable terms and without

9 FAA Modernization and Reform Act of 2012 sets a January 1, 2016 ban of Stage 2 aircraft less than 75,000 lbs.

10 The Final Rule was published on October 4, 2017.

unjust discrimination to all types, kinds, and classes of aeronautical activities, including commercial aeronautical activities offering services to the public at the Airport."[11]

Although several (on the order of a dozen) airports have embarked on efforts to adopt both Stage 2 and 3 restrictions in the past two decades, FAA has found that only one, Naples Municipal Airport, a general aviation (GA) airport in Naples, Florida, has fully complied with Part 161 analysis, notice, and documentation requirements for a ban on Stage 2 jet operations. FAA found the airport was in violation of prior to FAA grant assurances. The airport operator successfully sued FAA to overturn that ruling and has implemented the restriction.

ANCA and Part 161 specifically exempt Stage 3 use restrictions that were effective on or before October 1, 1990 and Stage 2 restrictions that were proposed before that date. The Logan Airport Noise Rules were promulgated in 1986; therefore, ANCA and Part 161 have no bearing on their continued implementation in their current form. Any future proposals to make the rules more stringent regarding Stage 2 operations or to restrict Stage 3 operations in any way would almost certainly trigger Part 161 notice, analysis, and approval processes for Stage 3 restrictions. In 2006, Massport requested an opinion from FAA regarding the pursuit of a Part 161 waiver or exemption to allow Massport to implement a curfew of nighttime operations of hush-kitted Stage 3 aircraft. FAA informed Massport that a waiver or exemption from the requirements of Part 161 is not authorized under, or consistent with, federal statutory and regulatory requirements. A copy of FAA's letter to Massport was provided in Appendix H, *Noise Abatement* in the *2005 Environmental Data Report (EDR).*

Logan Airport Noise Modeling

To relate portions of the foregoing discussion to the specific noise environment around Logan Airport for this *2017 ESPR*, Massport has developed DNL noise contours, TA noise metrics, and population counts for 2017 using the latest version of FAA's Aviation Environmental Design Tool (AEDT version 2d) and the software pre-processor, RC for AEDT™. The pre-processor software takes radar data from individual flights occurring throughout the year, and formats it into a form usable as input to the AEDT which serves as the computational "engine" for calculating noise. Prior to 2016, Massport used the FAA's INM with a pre-processor called RealContours™ which operated in a similar manner.

Standard AEDT input methodology involves development of operational inputs and calculation of the DNL for a prototypical average annual day.[12] This approach requires manually collecting, refining, and entering the enormous amount of data averaged over a full year of activity at an airport. Typically, the model inputs may include an aircraft fleet mix with several dozen representative aircraft types, on the order of 100 to 300 representative flight tracks (common for a facility the size of Logan Airport), and runway use and flight track use percentages for three or four categories of aircraft types with similar performance characteristics. This normal approach to noise modeling meets accepted professional

11 FAA Order 5190.6(b), "Airport Compliance Manual" Chapter 13, Section 14, paragraph (a). To be approved, restrictions must meet the following six statutory criteria: 1) The proposed restriction is reasonable, nonarbitrary, and nondiscriminatory. 2) The proposed restriction does not create an undue burden on interstate or foreign commerce. 3) The proposed restriction maintains safe and efficient use of the navigable airspace. 4) The proposed restriction does not conflict with any existing federal statute or regulation. 5) The applicant has provided adequate opportunity for public comment on the proposed restriction. 6) The proposed restriction does not create an undue burden on the national aviation system.

12 FAA INM Version 7.0 User's Guide, April 2007, p. 12.

standards and reduces the effort and cost that would be associated with manually entering the parameters for every actual operation. However, it represents a significant simplification of the extraordinary diversity of actual aircraft operations over a year.

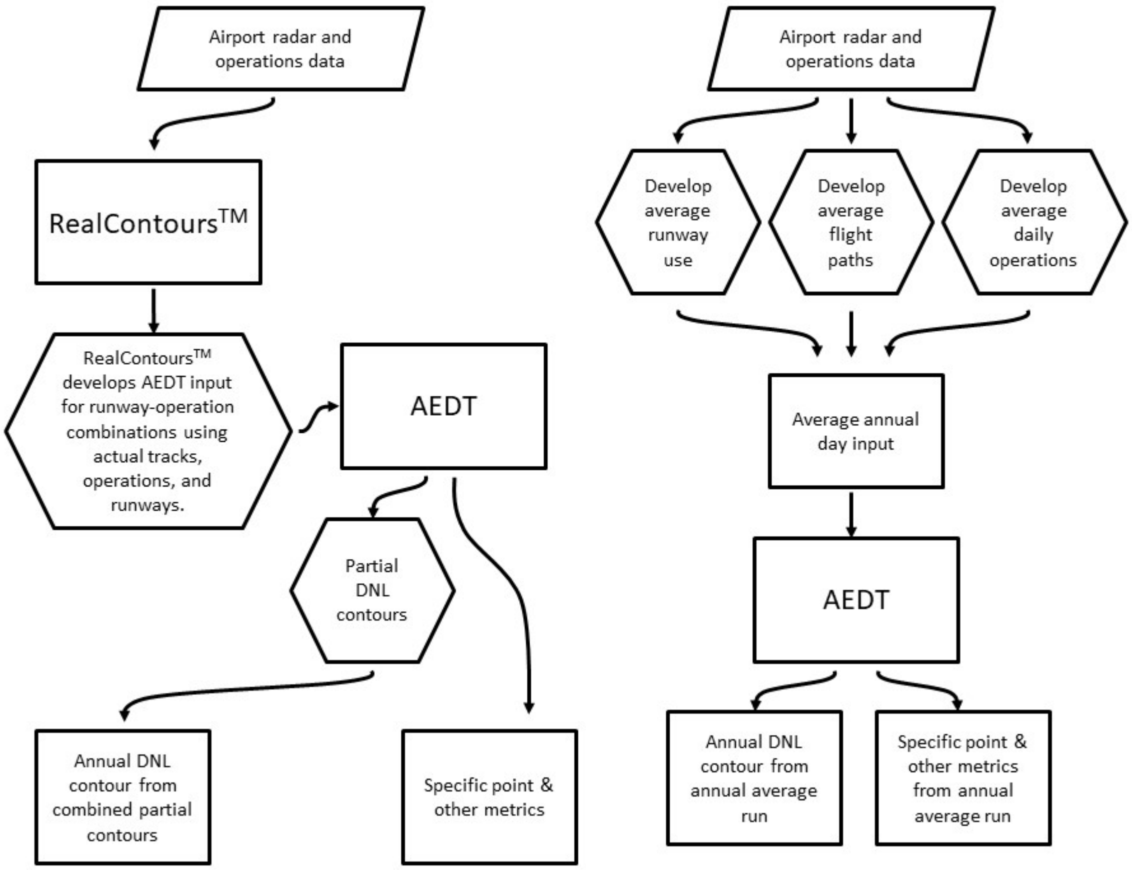
Instead of relying on consolidated data summaries, Massport takes maximum possible advantage of both AEDT's capabilities and the investment that Massport has made in its Noise and Operations Management System (NOMS). RC for AEDT™ improves the precision of modeling by utilizing operations monitoring results in these key areas:

- Directly converts the flight track for every identified aircraft operation to an AEDT track, rather than assigning multiple operations to a limited number of prototypical tracks.
- Models each operation on the specific runway that it actually used, rather than applying a generalized distribution to broad ranges of aircraft types.
- Models each operation in the time period that it occurred, which realistically represent delays that occur during the year, rather than relying on scheduled flight times.
- Selects the specific airframe and engine combination to model, on an operation-by-operation basis, based on the registration data for each flight wherever possible; otherwise, based on the published compositions of the fleets of the specific airlines operating at Logan Airport.

Figure H-12 provides a schematic representation of the RC for AEDT™ noise modeling process compared to the standard AEDT process. The flow chart on the left depicts data from the NOMS system being used as noise model inputs, while the flow chart on the right illustrates the development of a simplified average annual day that would be otherwise necessary.

For 2017, the AEDT noise model used 394,548 flights from the NOMS that retained suitable data.

Figure H-12 Schematic Noise Modeling Process (RC for AEDT™ vs. standard AEDT use)



Source: Federal Aviation Administration (FAA), HMMH.

AEDT Noise Analysis

Logan Airport presents a set of unique challenges to modeling software, and over the course of many years, Massport has addressed these challenges by developing a series of adjustments and customizations to better represent the operations, conditions, and terrain that affect noise at Logan Airport. These adjustments have historically been incorporated into INM analyses:

- ***Custom profiles***. The analysis has developed custom climbing and descent profiles based on radar altitude data, rather than using default profiles built into INM. This results in more accurate aircraft thrust calculations, which in turn affects an aircraft's noise emissions.
- ***Daily weather data***. Noise calculations have used average weather conditions for each day to determine aircraft performance and sound propagation.
- ***Hill effect adjustment***. Due to discrepancies between noise monitor data and INM calculations in the Orient Heights area close to the Airport, adjustments have been included to improve the accuracy of calculations in areas with direct line-of-sight exposure to the airfield.

- ***Over-water adjustment***. The INM calculations assume that noise is absorbed as it propagates over ground. However, Logan Airport is mostly surrounded by water, which reflects rather than absorbs the sound. This results in higher noise levels in areas near the Airport. An adjustment has been used that allows the INM to assume higher aircraft noise emissions when they are close to the ground.

In 2015, FAA released its next-generation environmental analysis software, the AEDT version 2B.[13] AEDT incorporates the computational engines of the legacy tools INM and the Emissions and Dispersion Modeling System (EDMS) and provides a unified database back end and graphical user interface. With a common set of aircraft and airport data that are updated regularly, AEDT ensures that noise and emissions analyses can be performed with up-to-date information.

Massport first explored the use of AEDT for the *2015 EDR* and adopted AEDT as its ongoing noise model beginning with the 2016 EDR. In transitioning from INM to AEDT, Massport has investigated how to implement the historical adjustments in the new software. While the Massachusetts state EDR/ESPR process does not require FAA approval, Massport wishes to perform analysis to FAA standards. Massport has held numerous meetings with FAA since the release of AEDT to get approval for adjustments to AEDT. The set of formal request memoranda from Massport to FAA, and FAA's response, are presented later in this section. The following is a summary of the proposed measures to address the adjustments previously implemented in INM, and FAA's response.

- ***Altitude control codes***. This feature of AEDT performs a similar function to the custom profiles used previously, using altitude data to more accurately calculate aircraft thrust levels. Since this is a capability built into AEDT, **FAA approval is implicit** and was not requested.
- ***Aircraft weight adjustment***. It has been determined that aircraft takeoff weights, based on Department of Transportation T-100 data, do not always match the weight assumptions made by AEDT. Consequently, an adjustment has been made to more accurately represent takeoff weight, and therefore aircraft thrust during takeoff. **FAA concurs with this approach**.
- ***Annual weather***. AEDT by default uses 30-year average weather for the Airport. Massport has proposed using an annual average for the year under study to better capture year-to-year variations in weather.[14] **FAA concurs with this approach**.
- ***Hill effects***. Massport has proposed including the adjustments previously used in INM. **FAA does not concur with this approach**. There are ongoing research studies to develop modifications to the AEDT model and FAA recommends waiting until those methods are available.
- ***Over water adjustment***. Massport explored other options including the existing INM adjustment method. Massport proposed including the adjustments previously used in INM. **FAA does not concur with this approach**. There are ongoing research studies to develop modifications to the AEDT model and FAA recommends waiting until those methods are available.

Massport will continue to work with FAA to address these issues and to incorporate enhancements to AEDT as they become available. In March 2017, the Airport Cooperative Research Program (ACRP) published an FAA-sponsored study entitled "Improving AEDT Noise Modeling of Ground Surfaces." The study recommends a methodology and provides guidance for implementation in AEDT, however at the

13 AEDT 2A was released in 2013 and replaced the NIRS model for airspace analysis. AEDT 2B replaces, AEDT 2A, INM and EDMS.

14 Daily weather is currently not an option in AEDT modeling inputs, however Massport will continue to request that FAA allow for such an option.

time of this study, FAA has not recommended the method for use with AEDT or incorporated the ACRP study information into the AEDT.

In March 2018, ACRP published "Enhanced AEDT Modeling of Aircraft Arrival and Departure Profiles Volume 1: Guidance."[15] It highlights new data with alternate default profiles for specific aircraft and new methodology available to model users to customize flight profiles in greater detail than was previously available. The study recommends a methodology and provides guidance for implementation in AEDT, however at the time of this study, FAA has not recommended the method for use with AEDT or incorporated the ACRP study information into the AEDT.

At this time, FAA has concurred with adjustments for annual average weather and the adjustment of aircraft stage length, but disapproved adjustments for over-water effects and elevated terrain line-of-sight exposure. Massport has performed the AEDT analyses for 2016 and 2017 using only FAA-approved adjustments.

FAA's AEDT version 2c Service Pack 2 (AEDT 2c SP2) was released for general use on March 13, 2017; it was the version used to generate the 2016 DNL contours and accompanying noise analyses. AEDT version 2d was released on September 27, 2017; at the time of this reporting, it is the most current model version. Massport used AEDT 2d for the 2017 DNL contours and accompanying noise analyses.

The updates to AEDT 2d primarily focused on emissions data and reporting and not modifications to noise data or results. Three new aircraft types were added to AEDT 2d and are utilized in the *2017 ESPR* modeling; however, operations with these aircraft are small and differences between AEDT 2d and AEDT 2c SP2 with regard to noise are minimal.

The three new aircraft types are:

- Boeing 737-800 Max (7378MAX) – latest variant of the Boeing 737-800 aircraft with improved emissions and reduced noise levels;
- Global Express 6000 (BD-700-1A10) – Large Business Jet; and
- Global Express 5000 (BD-700-1A11) – Large Business Jet.

The following sections of this appendix provide several tables describing the AEDT input data for 2017. Where possible, the data for 2016 are included for comparison.

2017 Radar Data

Logan Airport's radar data provide the key to the RC for AEDT™ system. The Passive Surveillance Radar System (PASSUR) radar dataset was used for the *2004 ESPR* through the *2008 EDR*. For the *2009 EDR* through the *2014 EDR*, Massport used the radar data from its Harris NOMS system. These radar data are obtained from a multilateration system of eight sensors deployed around the Airport. The positioning data from these sensors are correlated to provide better, more accurate coverage of aircraft (in areas where the traditional FAA radar has limitations) and provide a more complete set of points to define each track. Traditional radar provides points every four to five seconds where the multilateration system provides data every second.

15 Airport Cooperative Research Program Web-Only Document 36: Enhanced AEDT Modeling of Aircraft Arrival and Departure Profiles, Volume 1: Guidance. http://www.trb.org/Main/Blurbs/178074.aspx.

In 2015, the Massport system switched to FAA's NextGen data feed, which integrates the Automatic Dependent Surveillance Broadcast (ADS-B) feed with multiple redundant real-time FAA surveillance sources into a single fused data feed. The NextGen data is a "multisensor based" subscription data source that aggregates all available surveillance sources, including:

- FAA En Route Radars;
- FAA Terminal Radars;
- FAA Airport Surface Detection Equipment X Band (ASDE-X) Systems;
- FAA Aircraft Situational Display to Industry (ASDI) Oceanic and Canadian Tracks only; and
- Harris ADS-B Data Feed.

Logan Airport is supported by an FAA ASDE-X system which provides highly accurate one-second data points for aircraft situational awareness on the Airport and within at least 5 miles of the Airport. These data are fused with the other sources and provided to the Massport NOMS system in a geo-referenced data format. The geo-referenced radar data are imported into the AEDT model, which is built on a geo-referenced platform to retain accuracy of the data for modeling.

The system was able to collect 365 complete days of data for 2017 with approximately 98 percent of these tracks (394,548 out of the total 404,139) usable for the development of the noise exposure contours.

Fleet Mix

The 2017 radar data were first processed to establish a baseline set of operations. After processing, the operations from these tracks were then scaled upwards by airline and aircraft type to match the reported totals provided by Massport for 2017. **Tables H-1a** (2017) and **H-1b** (2016 for comparison) provide the scaled annual operations, by Aircraft Noise and Performance (ANP) aircraft type. Each ANP type listed in **Tables H-1a** and **H-1b** is also mapped to a Runway Use group based on its weight and performance characteristics described in the Runway Use section below.

Regional jets (RJ) are defined as those aircraft with 90 or fewer seats, consistent with the categorization in Chapter 2, *Activity Levels*.[16] For years prior to 2010, the RJs in this report were classified as aircraft with less than 100 seats. When RJs first started gaining popularity, the aircraft types available were typically 50 seats or less with the traditional air carrier jet being 100 seats and higher. As newer aircraft types have become available, the smaller 35 to 50 seat types have been replaced by 70 to 99-seat types, with the 90 and above seat types flying many of the traditional air carrier routes. The majority of the newer types fall into two categories: the 70 to 75-seat category, which remain categorized as RJs, and the 91- to 99-seat category, which are categorized as air carrier jets. The Embraer 190 falls into this category and is now in the Light Jet B group.

16 U.S. Code, 2006 Edition, Supplement 3, Title 49 – Transportation Subtitle VII – Aviation Programs Part A – Air Commerce and Safety, Subpart II, Economic Regulation, Chapter 417 - Operations or Carriers, Subchapter III - Regional Air Service Incentive Program, Sec. 41762 – Definitions – defines RJ air carrier service to be aircraft with a maximum of 75 seats. Therefore, this report categorizes aircraft with 70-75 seats and below as RJ and aircraft with 90 seats and higher aircraft as air carrier (Note: there are no types with 75 to 90 seats).

Table H-1a 2017 Annual Modeled Operations

		Arrivals		Departures		
ANP Type	**Group**	**Day**	**Night**	**Day**	**Night**	**Total**
Commercial Jet Operations						
74720B	Heavy Jet A	2	2	2	1	6
747400	Heavy Jet A	428	18	375	71	891
7478	Heavy Jet A	343	0	341	2	686
A340-211	Heavy Jet A	189	4	107	87	387
A340-642	Heavy Jet A	97	1	81	17	197
A380-861	Heavy Jet A	90	0	88	2	179
767300	Heavy Jet B	1,619	627	1,496	750	4,493
767400	Heavy Jet B	14	3	12	5	34
767CF6	Heavy Jet B	29	11	8	32	80
767JT9	Heavy Jet B	52	13	2	63	130
777200	Heavy Jet B	1,024	182	1,105	101	2,412
777300	Heavy Jet B	16	1	8	9	34
7773ER	Heavy Jet B	841	160	228	773	2,002
7878R	Heavy Jet B	1,614	27	1,345	296	3,282
A300-622R	Heavy Jet B	374	639	572	441	2,025
A310-304	Heavy Jet B	436	47	244	239	966
A330-301	Heavy Jet B	2,463	12	2,094	381	4,949
A330-343	Heavy Jet B	1,565	13	751	827	3,157
DC1010	Heavy Jet B	168	97	199	66	531
DC1030	Heavy Jet B	16	7	15	8	46
MD11GE	Heavy Jet B	52	14	45	21	132
MD11PW	Heavy Jet B	23	4	21	6	54
717200	Light Jet A	2,282	468	2,151	598	5,499
MD9025	Light Jet A	476	25	490	11	1,002
MD9028	Light Jet A	238	12	246	4	501
737300	Light Jet B	1,193	432	1,349	275	3,250
737400	Light Jet B	14	9	9	15	47
737500	Light Jet B	0	2	0	2	4
737700	Light Jet B	6,696	2,064	7,339	1,421	17,520
737800	Light Jet B	18,826	6,821	20,999	4,649	51,295
7378MAX	Light Jet B	16	0	15	1	32
757300	Light Jet B	716	313	772	257	2,059
757PW	Light Jet B	1,303	505	1,258	547	3,612
757RR	Light Jet B	2,165	491	2,396	263	5,316
A319-131	Light Jet B	8,914	1,633	9,053	1,494	21,094
A320-211	Light Jet B	3,691	1,144	4,452	383	9,670
A320-232	Light Jet B	17,318	6,766	20,347	3,737	48,169
A321-232	Light Jet B	8,619	3,132	10,286	1,465	23,502
EMB190	Light Jet B	28,627	4,399	28,269	4,757	66,053
MD83	Light Jet B	503	72	534	42	1,151

Table H-1a 2017 Annual Modeled Operations (Continued)

		Arrivals		Departures		
ANP Type	**Group**	**Day**	**Night**	**Day**	**Night**	**Total**
Commercial Jet Operations, continued						
CL600	RJ	4,614	125	4,442	296	9,477
CRJ9-ER	RJ	6,024	548	5,842	730	13,144
EMB145	RJ	314	28	303	39	684
EMB14L	RJ	1,060	28	1,012	76	2,176
EMB170	RJ	1,588	167	1,615	140	3,509
EMB175	RJ	4,533	708	4,575	667	10,483
LEAR35	RJ	1	1	1	1	4
	Commercial Jets Subtotal	**131,184**	**31,779**	**136,894**	**26,069**	**325,926**
Commercial Non-Jet Operations						
BEC58P	Non-jet	16,256	361	16,557	61	33,235
DHC8	Non-jet	43	0	43	0	87
DHC830	Non-jet	3,400	158	3,323	236	7,117
PA42	Non-jet	190	3	193	0	386
SF340	Non-jet	1,719	0	1,719	0	3,438
	Commercial Non-Jet Operations Subtotal	**21,609**	**522**	**21,835**	**296**	**44,264**
	Commercial Aircraft Total	**152,793**	**32,302**	**158,729**	**26,366**	**370,190**
General Aviation Operations						
A109	Helicopter	17	1	17	1	36
B206L	Helicopter	2	0	2	0	4
B407	Helicopter	2	0	2	0	4
B429	Helicopter	4	0	4	0	8
B430	Helicopter	2	0	2	0	4
EC130	Helicopter	8	0	8	1	17
H500D	Helicopter	1	0	1	0	2
S76	Helicopter	116	11	107	20	254
SA330J	Helicopter	170	9	166	13	358
SA350D	Helicopter	3	0	3	0	6
SA355F	Helicopter	2	0	2	0	4
SA365N	Helicopter	2	0	2	0	4
747400	Heavy Jet A	0	1	0	1	2
747SP	Heavy Jet A	1	1	2	1	6
767300	Heavy Jet B	2	0	2	0	4
A330-301	Heavy Jet B	2	0	2	0	4
727EM1	Light Jet A	2	0	1	1	4
727EM2	Light Jet A	0	1	1	0	2
737400	Light Jet B	18	8	20	6	51

Table H-1a 2017 Annual Modeled Operations (Continued)

		Arrivals		Departures		
ANP Type	Group	Day	Night	Day	Night	Total
General Aviation Operations, continued						
737700	Light Jet B	12	1	12	1	26
737N17	Light Jet B	0	1	0	1	2
757300	Light Jet B	1	0	0	1	2
757RR	Light Jet B	0	1	1	0	2
A319-131	Light Jet B	3	0	2	1	6
A320-211	Light Jet B	1	0	1	0	2
EMB190	Light Jet B	3	1	4	0	8
MD81	Light Jet B	1	2	0	3	6
1900D	Non-jet	4	0	4	0	8
BEC58P	Non-jet	705	44	703	46	1,498
CNA172	Non-jet	29	0	29	0	58
CNA182	Non-jet	71	1	71	1	143
CNA206	Non-jet	20	0	20	0	40
CNA208	Non-jet	1,272	267	1,441	98	3,078
CNA441	Non-jet	37	5	41	2	85
COMSEP	Non-jet	352	52	375	30	808
DHC6	Non-jet	856	97	854	98	1,905
DHC8	Non-jet	2	0	2	0	4
DO328	Non-jet	7	0	7	0	13
EMB120	Non-jet	2	0	2	0	4
GASEPF	Non-jet	21	0	21	0	41
GASEPV	Non-jet	208	6	205	9	428
PA28	Non-jet	23	0	23	0	45
PA30	Non-jet	7	1	8	0	15
PA42	Non-jet	25	0	24	2	51
SF340	Non-jet	770	2	767	5	1,545
BD-700-1A10	RJ	351	35	347	39	772
BD-700-1A11	RJ	97	14	103	8	220
CIT3	RJ	30	2	28	4	64
CL600	RJ	1,269	103	1,289	83	2,745
CL601	RJ	203	21	208	16	448
CNA500	RJ	138	17	146	10	311
CNA510	RJ	86	10	85	11	192
CNA525C	RJ	266	51	293	23	633
CNA55B	RJ	629	60	634	54	1,377
CNA560E	RJ	148	9	151	7	315
CNA560U	RJ	904	77	918	64	1,963
CNA560XL	RJ	202	13	202	13	430
CNA680	RJ	619	46	639	26	1,330
CNA750	RJ	1,465	148	1,493	119	3,225

Table H-1a 2017 Annual Modeled Operations (Continued)

		Arrivals		Departures		
ANP Type	**Group**	**Day**	**Night**	**Day**	**Night**	**Total**
General Aviation Operations, continued						
ECLIPSE500	RJ	40	0	39	1	79
EMB145	RJ	31	2	33	0	66
EMB14L	RJ	22	1	24	0	47
GIV	RJ	575	49	578	47	1,249
GV	RJ	491	73	519	45	1,128
IA1125	RJ	182	9	184	8	382
LEAR35	RJ	1,177	129	1,178	128	2,611
MU3001	RJ	473	27	470	30	1,000
General Aviation Total		**14,180**	**1,410**	**14,514**	**1,077**	**31,181**
Grand Total		**166,974**	**33,712**	**173,243**	**27,443**	**401,371**

Source: HMMH, 2018.
Notes: ANP - Aircraft Noise and Performance.
BEC58P is the AEDT substitution for the Cessna 402.
The CRJ9-ER in the RJ category is the CRJ700 aircraft.
Annual operations modeled in the 2017 annual contour.
Some totals may not match due to rounding.

Table H-1b 2016 Annual Modeled Operations

		Arrivals		Departures		
ANP Type	**Group**	**Day**	**Night**	**Day**	**Night**	**Total**
Commercial Jet Operations						
747400	HJA	877	19	491	405	1,792
7478	HJA	274	1	260	15	549
A340-211	HJA	125	0	51	75	250
A340-642	HJA	502	1	400	103	1,006
A380-841	HJA	1	1	2	0	4
A380-861	HJA	1	0	1	0	2
767300	HJB	1,051	582	979	653	3,264
767400	HJB	484	2	480	6	972
767CF6	HJB	70	1	67	3	141
767JT9	HJB	27	0	19	8	54
777200	HJB	775	123	789	109	1,797
777300	HJB	1	0	1	0	2
7773ER	HJB	962	102	452	611	2,127
7878R	HJB	1,224	33	1,141	117	2,515
A300-622R	HJB	188	478	328	338	1,331
A310-304	HJB	190	36	91	135	451
A330-301	HJB	2,354	27	1,654	728	4,764
A330-343	HJB	1,062	7	549	520	2,138
DC1010	HJB	256	188	268	175	886
DC1030	HJB	74	48	74	47	242
MD11GE	HJB	37	20	27	29	113
MD11PW	HJB	22	12	18	16	68
717200	LJA	2,798	413	2,866	345	6,421
727EM2	LJA	1	0	1	0	1
MD9025	LJA	1,064	161	1,064	161	2,450
MD9028	LJA	538	72	536	74	1,220
737300	LJB	1,792	324	1,829	287	4,234
7373B2	LJB	112	25	120	18	274
737400	LJB	11	5	8	8	32
737500	LJB	1	0	1	0	2
737700	LJB	7,262	2,260	7,908	1,613	19,042
737800	LJB	16,665	6,965	19,675	3,954	47,259
737N17	LJB	1	0	1	0	2
757300	LJB	815	436	1,008	242	2,501
757PW	LJB	1,516	547	1,583	480	4,125
757RR	LJB	2,353	481	2,411	423	5,668
A319-131	LJB	9,753	1,822	10,077	1,499	23,151
A320-211	LJB	3,879	900	4,417	362	9,557
A320-232	LJB	17,885	6,357	20,796	3,446	48,484
A321-232	LJB	5,299	1,552	5,750	1,101	13,702
EMB190	LJB	26,332	2,907	25,460	3,779	58,477

Table H-1b	2016 Annual Modeled Operations (Continued)					
		Arrivals		Departures		
ANP Type	**Group**	**Day**	**Night**	**Day**	**Night**	**Total**
Commercial Jet Operations, continued						
EMB195	LJB	1,608	124	1,549	183	3,464
MD82	LJB	6	0	6	0	12
MD83	LJB	827	135	810	152	1,924
CL601	RJ	5,418	167	5,153	432	11,170
CRJ9-ER	RJ	4,442	282	4,243	481	9,448
CRJ9-LR	RJ	1,446	61	1,390	118	3,014
EMB145	RJ	80	1	81	0	162
EMB14L	RJ	1,516	16	1,514	18	3,064
EMB170	RJ	1,691	218	1,750	159	3,818
EMB175	RJ	2,654	330	2,641	342	5,966
GV	RJ	13	1	12	1	27
LEAR35	RJ	34	11	36	9	89
	Commercial Jets Subtotal	**128,363**	**28,250**	**132,832**	**23,782**	**313,227**
Commercial Non-Jet Operations						
BEC58P	Non-Jet	17,559	438	17,787	210	35,994
CNA208	Non-Jet	198	0	198	0	396
CNA441	Non-Jet	4	0	2	2	8
DHC8	Non-Jet	427	4	415	16	861
DHC830	Non-Jet	2,980	146	2,850	275	6,251
SF340	Non-Jet	1,827	4	1,826	5	3,662
	Commercial Non-Jet Operations Subtotal	**22,995**	**592**	**23,078**	**509**	**47,173**
	Commercial Aircraft Total	**151,358**	**28,842**	**155,911**	**24,290**	**360,401**
General Aviation Operations						
A109	Helicopter	29	1	28	2	59
B206B3	Helicopter	35	5	29	11	80
B206L	Helicopter	23	3	20	7	53
B212	Helicopter	14	0	11	3	29
B222	Helicopter	2	1	1	2	6
B407	Helicopter	25	2	24	4	55
B427	Helicopter	2	0	2	0	4
B429	Helicopter	9	0	7	2	18
BO105	Helicopter	7	0	7	0	14
EC130	Helicopter	14	0	13	1	29
H500D	Helicopter	6	1	6	1	14
R44	Helicopter	13	2	15	0	31
S61	Helicopter	6	0	6	0	12
S70	Helicopter	16	3	17	2	39
S76	Helicopter	61	9	59	10	139

Table H-1b 2016 Annual Modeled Operations (Continued)

		Arrivals		Departures		
ANP Type	**Group**	**Day**	**Night**	**Day**	**Night**	**Total**
General Aviation Operations, continued						
SA330J	Helicopter	108	4	105	7	223
SA350D	Helicopter	6	1	5	2	14
SA355F	Helicopter	26	0	21	4	51
SC300C	Helicopter	4	1	5	0	10
A340-211	HJA	2	0	1	1	4
A340-642	HJA	2	1	1	2	6
777200	HJB	0	2	0	2	4
DC93LW	LJA	2	0	0	2	4
737400	LJB	13	7	12	7	39
737700	LJB	16	3	16	3	39
737800	LJB	1	1	2	0	4
737N17	LJB	1	0	1	0	2
757PW	LJB	3	2	3	2	10
757RR	LJB	9	0	7	2	18
A319-131	LJB	2	7	8	1	18
A320-211	LJB	0	2	0	2	4
A320-232	LJB	1	1	2	0	4
EMB190	LJB	2	0	1	1	4
MD81	LJB	2	2	1	2	6
MD83	LJB	5	6	8	2	21
1900D	Non-Jet	2	0	2	0	4
BEC58P	Non-Jet	512	28	511	29	1,079
CNA172	Non-Jet	90	2	89	2	182
CNA182	Non-Jet	68	0	66	1	135
CNA206	Non-Jet	82	0	81	1	164
CNA208	Non-Jet	1,952	205	2,076	81	4,313
CNA20T	Non-Jet	9	0	9	0	18
CNA441	Non-Jet	409	56	398	67	930
DHC6	Non-Jet	1	0	1	0	2
DO228	Non-Jet	618	41	621	38	1,317
DO328	Non-Jet	3	0	3	0	6
GASEPF	Non-Jet	5	0	5	0	10
GASEPV	Non-Jet	406	18	406	18	848
PA28	Non-Jet	50	0	50	0	100
PA31	Non-Jet	72	1	71	2	145
PA42	Non-Jet	0	2	2	0	4
SD330	Non-Jet	15	0	15	0	31
CIT3	RJ	40	2	39	3	84
CL600	RJ	1,219	93	1,224	88	2,624
CL601	RJ	1,094	106	1,140	59	2,398
CNA500	RJ	44	5	46	3	98

Table H-1b 2016 Annual Modeled Operations (Continued)

		Arrivals		Departures		
ANP Type	**Group**	**Day**	**Night**	**Day**	**Night**	**Total**
General Aviation Operations, continued						
CNA510	RJ	39	11	39	11	100
CNA525C	RJ	360	43	351	51	805
CNA55B	RJ	159	15	152	22	348
CNA560E	RJ	605	67	628	45	1,346
CNA560U	RJ	118	9	116	11	254
CNA560XL	RJ	890	74	914	49	1,927
CNA680	RJ	441	22	430	33	926
CNA750	RJ	497	54	523	28	1,102
ECLIPSE500	RJ	16	0	16	0	33
EMB145	RJ	37	4	39	2	82
EMB14L	RJ	1	0	0	1	2
F10062	RJ	489	48	490	46	1,073
GIV	RJ	605	50	584	71	1,309
GV	RJ	884	98	904	78	1,964
IA1125	RJ	101	5	103	3	213
LEAR35	RJ	1,197	135	1,221	110	2,662
MU3001	RJ	522	32	523	31	1,108
General Aviation Total		**14,118**	**1,292**	**14,337**	**1,074**	**30,821**
Grand Total		**165,477**	**30,133**	**170,248**	**25,364**	**391,222**

Source: HMMH, 2017.
Notes: ANP - Aircraft Noise and Performance.
Annual operations modeled in the 2016 Annual contour.
Some totals may not match due to rounding.

In the calculation of DNL, annual operations data are scaled to represent an average annual day by dividing by the 365 days in a year. To compare operations between years, it is simpler to look at category totals. **Table H-2** summarizes the numbers of average daily operations by categories of aircraft operating at Logan Airport from 1990 through 2017. Operations are summarized by operator category (commercial/GA), aircraft category, and day or night operation (night defined as 10:00 PM to 7:00 AM, consistent with the definition of DNL). GA operations were not included in the noise modeling prior to 1998 and commercial jet operations were not separated until 1999.

Table H-2 Modeled Daily Operations[1] by Commercial and General Aviation (GA) Aircraft – 1990 to 2017

		1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Commercial Aircraft											
Stage 2 Jets[2]	Day	312.40	N/A	228.89	203.34	189.40	156.90	132.40	108.46	84.93	83.30
	Night	19.99	N/A	13.13	7.44	10.10	5.50	4.79	7.75	5.92	6.66
	Total	**332.39**	N/A	**242.02**	**210.78**	**199.50**	**162.40**	**137.19**	**116.21**	**90.85**	**89.96**
Stage 3 Jets	Day	288.89	N/A	384.49	418.99	425.70	429.40	439.81	505.08	541.43	597.28
	Night	57.25	N/A	58.29	65.47	62.80	69.00	80.16	85.06	95.54	98.59
	Total	**346.14**	N/A	**442.78**	**484.46**	**488.50**	**498.40**	**519.97**	**590.14**	**636.97**	**695.87**
Air Carrier Jets	Day	N/A[3]	N/A	N/A[3]	N/A[3]	N/A[3]	N/A[3]	N/A[3]	N/A[3]	N/A[3]	569.18
	Night	N/A[3]	N/A	N/A[3]	N/A[3]	N/A[3]	N/A[3]	N/A[3]	N/A[3]	N/A[3]	96.21
	Total	**N/A[3]**	N/A	**N/A[3]**	**N/A[3]**	**N/A[3]**	**N/A[3]**	**N/A[3]**	**N/A[3]**	**N/A[3]**	**665.39**
Regional Jets[5]	Day	N/A[3]	N/A	N/A[3]	N/A[3]	N/A[3]	N/A[3]	N/A[3]	N/A[3]	N/A[3]	28.10
	Night	N/A[3]	N/A	N/A[3]	N/A[3]	N/A[3]	N/A[3]	N/A[3]	N/A[3]	N/A[3]	2.38
	Total	**N/A[3]**	N/A	**N/A[3]**	**N/A[3]**	**N/A[3]**	**N/A[3]**	**N/A[3]**	**N/A[3]**	**N/A[3]**	**30.48**
Non-jets	Day	444.41	N/A	411.84	598.16	541.97	526.85	505.31	514.7	552.56	448.82
	Night	11.72	N/A	69.32	46.84	13.59	11.14	13.73	27.27	21.86	16.63
	Total	**456.13**	N/A	**481.16**	**645.00**	**555.56**	**537.99**	**519.04**	**541.97**	**574.42**	**465.45**
Total Commercial Operations											
Operations	Day	1045.70	N/A	1,025.22	1,220.49	1,157.07	1,113.15	1,077.52	1,128.24	1,178.92	1,129.90
	Night	88.96	N/A	140.74	119.75	86.49	85.64	98.68	120.08	123.32	121.88
	Total	**1,134.66**	N/A	**1,165.96**	**1,340.24**	**1,243.56**	**1,198.79**	**1,176.20**	**1,248.32**	**1,302.24**	**1,251.78**
GA Aircraft											
Stage 2 Jets[2]	Day	N/A[4]	N/A	N/A[4]	N/A[4]	N/A[4]	N/A[4]	N/A[4]	N/A[4]	5.25	9.89
	Night	N/A[4]	N/A	N/A[4]	N/A[4]	N/A[4]	N/A[4]	N/A[4]	N/A[4]	0.40	0.74
	Total	**N/A[4]**	N/A	**N/A[4]**	**N/A[4]**	**N/A[4]**	**N/A[4]**	**N/A[4]**	**N/A[4]**	**5.65**	**10.63**
Stage 3 Jets	Day	N/A[4]	N/A	N/A[4]	N/A[4]	N/A[4]	N/A[4]	N/A[4]	N/A[4]	30.54	48.46
	Night	N/A[4]	N/A	N/A[4]	N/A[4]	N/A[4]	N/A[4]	N/A[4]	N/A[4]	4.21	6.55
	Total	**N/A[4]**	N/A	**N/A[4]**	**N/A[4]**	**N/A[4]**	**N/A[4]**	**N/A[4]**	**N/A[4]**	**34.75**	**55.01**
Non-jets	Day	N/A[4]	N/A	N/A[4]	N/A[4]	N/A[4]	N/A[4]	N/A[4]	N/A[4]	37.29	19.36
	Night	N/A[4]	N/A	N/A[4]	N/A[4]	N/A[4]	N/A[4]	N/A[4]	N/A[4]	16.28	18.89
	Total	**N/A[4]**	N/A	**N/A[4]**	**N/A[4]**	**N/A[4]**	**N/A[4]**	**N/A[4]**	**N/A[4]**	**53.57**	**38.25**
Total GA Operations											
Operations	Day	N/A[4]	N/A	N/A[4]	N/A[4]	N/A[4]	N/A[4]	N/A[4]	N/A[4]	73.08	77.71
	Night	N/A[4]	N/A	N/A[4]	N/A[4]	N/A[4]	N/A[4]	N/A[4]	N/A[4]	20.89	26.17
	Total	**N/A[4]**	N/A	**N/A[4]**	**N/A[4]**	**N/A[4]**	**N/A[4]**	**N/A[4]**	**N/A[4]**	**93.97**	**103.88**
Overall totals											
Total	Day	1,045.70	N/A	1,025.22	1,220.49	1,157.07	1,113.15	1,077.52	1,128.24	1,252.00	1,207.61
	Night	88.96	N/A	140.74	119.75	86.49	85.64	98.68	120.08	144.21	148.05
	Total[4]	**1,134.66**	N/A	**1,165.96**	**1,340.24**	**1,243.56**	**1,198.79**	**1,176.20**	**1,248.32**	**1,396.21**	**1,355.66**

Table H-2 Modeled Daily Operations[1] by Commercial and General Aviation (GA) Aircraft – 1990 to 2017 (Continued)

		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Commercial Aircraft											
Stage 2 Jets[2]	Day	5.13	1.18	0.05	0.08	0.03	0.05	0.03	0.03	0.01	0.00
	Night	0.26	0.05	0.00	0.00	0.01	0.01	0.00	0.01	0.01	0.00
	Total	**5.39**	**1.23**	**0.05**	**0.08**	**0.05**	**0.06**	**0.03**	**0.04**	**0.02**	**0.00**
Stage 3 Jets	Day	727.09	756.24	740.75	717.85	772.39	765.76	767.55	748.13	699.39	667.45
	Night	103.66	109.77	97.04	92.69	113.24	113.66	114.81	118.29	114.30	103.05
	Total	**830.75**	**866.01**	**837.79**	**810.54**	**885.63**	**879.42**	**882.36**	**866.42**	**813.69**	**770.50**
Air Carrier Jets	Day	648.95	569.99	500.70	461.06	518.96	505.48	490.63	472.39	443.15	422.92
	Night	99.79	101.30	83.52	72.69	89.24	91.99	92.71	96.28	89.89	82.21
	Total	**748.74**	**671.29**	**584.22**	**533.75**	**608.20**	**597.47**	**583.34**	**568.66**	**533.04**	**505.14**
Regional Jets[5]	Day	78.14	186.25	240.05	256.80	253.43	260.34	276.95	275.77	256.24	244.53
	Night	3.87	8.47	13.52	19.99	24.00	21.68	22.11	22.03	24.40	20.84
	Total	**82.01**	**194.72**	**253.57**	**276.79**	**277.43**	**282.01**	**299.06**	**297.80**	**280.64**	**265.37**
Non-jets	Day	409.62	317.62	165.45	135.18	133.24	148.77	140.81	145.27	132.52	136.43
	Night	21.58	10.97	3.45	2.41	3.03	3.02	3.26	3.47	4.00	5.56
	Total	**431.20**	**328.58**	**168.89**	**137.59**	**136.28**	**151.79**	**144.07**	**148.73**	**136.52**	**141.99**
Total Commercial Operations											
Operations	Day	1,141.84	1,075.04	906.25	853.10	905.66	914.59	908.41	893.43	831.92	804.77
	Night	125.51	120.79	100.49	95.10	116.29	116.68	118.09	121.77	118.31	108.65
	Total	**1,267.35**	**1,195.82**	**1,006.73**	**948.20**	**1,021.95**	**1,031.27**	**1,026.51**	**1,015.19**	**950.23**	**913.42**
GA Aircraft											
Stage 2 Jets[2]	Day	7.29	5.15	3.65	2.84	0.94	2.29	1.90	1.24	0.36	0.09
	Night	0.64	0.50	0.41	0.26	0.14	0.25	0.17	0.19	0.03	0.01
	Total	**7.93**	**5.65**	**4.08**	**3.10**	**1.08**	**2.54**	**2.07**	**1.43**	**0.38**	**0.10**
Stage 3 Jets	Day	40.08	34.23	37.83	46.21	53.72	58.84	61.08	54.82	43.98	22.31
	Night	3.21	3.28	6.42	6.98	8.37	9.33	6.57	6.39	4.52	2.28
	Total	**43.29**	**37.51**	**44.25**	**53.19**	**62.09**	**68.16**	**67.65**	**61.21**	**48.49**	**23.59**
Non-jets	Day	34.57	37.31	17.36	17.81	16.95	14.00	15.05	11.98	15.13	8.19
	Night	1.83	1.92	4.45	4.40	5.20	4.75	1.39	3.61	1.08	0.74
	Total	**36.40**	**39.23**	**21.81**	**22.21**	**22.14**	**18.75**	**16.44**	**15.58**	**16.20**	**8.93**
Total GA Operations											
Operations	Day	81.94	76.68	58.84	66.88	71.60	75.12	78.03	68.04	59.46	30.46
	Night	5.68	5.71	11.29	11.64	13.71	14.33	8.13	10.19	5.62	3.08
	Total	**87.62**	**82.39**	**70.13**	**78.52**	**85.31**	**89.46**	**86.15**	**78.22**	**65.05**	**33.54**
Overall totals											
Total	Day	1,223.78	1,151.72	965.09	919.98	977.27	989.71	986.43	961.46	891.39	834.33
	Night	131.19	126.50	111.78	106.74	130.00	131.02	126.22	131.96	123.93	111.70
	Total[4]	**1,354.97**	**1,278.21**	**1,076.86**	**1,026.72**	**1,107.26**	**1,120.73**	**1,112.66**	**1,093.42**	**1,015.31**	**946.03**

Table H-2 Modeled Daily Operations[1] by Commercial and General Aviation (GA) Aircraft – 1990 to 2017 (Continued)

		2010	2011	2012	2013	2014	2015	2016[6]	2017	Change 2016 to 2017
Commercial Aircraft										
Stage 2 Jets[2]	Day	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00
	Night	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total	**0.02**	**0.01**	**0.01**	**0.01**	**0.00**	**0.00**	**0.00**	**0.00**	0.00
Stage 3 Jets	Day	674.25	684.19	649.22	667.65	670	685.92	713.65	734.46	20.81
	Night	107.92	109.38	106.55	115.91	123.6	130.96	142.16	158.49	16.33
	Total	**782.17**	**793.57**	**755.77**	**783.56**	**793.61**	**816.88**	**855.81**	**892.95**	37.14
Air Carrier Jets	Day	521.64	571.03	530.76	546.27	556.59	585.55	620.45	636.04	15.59
	Night	93.98	99.17	98.68	107.17	115.84	126.36	134.93	148.75	13.82
	Totals	**615.62**	**670.2**	**629.44**	**653.44**	**672.43**	**711.92**	**755.38**	**784.79**	29.41
Regional Jets[5]	Day	152.61	113.16	118.46	121.38	113.41	100.36	93.20	98.42	5.22
	Night	13.94	10.21	7.87	8.74	7.77	4.6	7.23	9.74	2.51
	Total	**166.55**	**123.37**	**126.33**	**130.12**	**121.18**	**104.96**	**100.43**	**108.16**	7.72
Non-jets	Day	138.53	135.18	133.92	132.33	128.45	125.27	125.88	119.03	(6.85)
	Night	5.21	4.73	3.06	3.21	2.28	2.41	3.01	2.24	(0.76)
	Total	**143.74**	**139.91**	**136.98**	**135.54**	**130.73**	**127.68**	**128.89**	**121.27**	(7.62)
Total Commercial Operations										
Operations	Day	812.78	819.39	783.14	799.99	798.45	811.19	839.53	853.49	13.96
	Night	113.13	114.11	109.62	119.12	125.88	133.37	145.17	160.73	15.56
	Total	**925.91**	**933.5**	**892.76**	**919.12**	**924.33**	**944.56**	**984.70**	**1,014.22**	29.52
GA Aircraft										
Stage 2 Jets[2]	Day	0.27	0.08	0.25	0.31	0.00	0.28	0.00	0.00	0.00
	Night	0.04	0.00	0.04	0.02	0.00	0.02	0.00	0.00	0.00
	Total	**0.30**	**0.08**	**0.29**	**0.33**	**0.00**	**0.30**	**0.00**	**0.00**	0.00
Stage 3 Jets	Day	27.80	52.51	52.93	51.21	52.64	51.82	51.82	52.19	0.36
	Night	3.21	5.35	7.20	5.10	4.65	4.28	4.59	4.56	(0.03)
	Total	**31.01**	**57.87**	**60.13**	**56.31**	**57.29**	**56.10**	**56.41**	**56.75**	0.34
Non-jets	Day	8.19	18.18	15.16	13.06	13.95	19.31	25.92	26.43	0.50
	Night	0.72	1.29	1.29	1.15	1.13	1.46	1.87	2.25	0.38
	Total	**8.92**	**19.48**	**16.45**	**14.22**	**15.08**	**20.77**	**27.79**	**28.68**	0.88
Total GA Operations										
Operations	Day	36.26	70.78	68.35	64.58	66.59	71.40	77.75	78.61	0.87
	Night	3.97	6.65	8.52	6.28	5.78	5.77	6.46	6.81	0.35
	Total	**40.22**	**77.43**	**76.86**	**70.85**	**72.37**	**77.17**	**84.21**	**85.43**	1.22
Overall Totals										
Total	Day	849.03	890.16	851.49	864.57	865.05	882.59	917.28	932.10	14.82
	Night	117.10	120.76	118.13	125.40	131.66	139.14	151.63	167.54	15.92
	Total[4]	**966.13**	**1,010.92**	**969.61**	**989.97**	**996.70**	**1,021.73**	**1,068.91**	**1,099.65**	30.74

Source: Massport's Noise Monitoring System and Revenue Office numbers, HMMH 2018.

Notes: N/A - Not available. Data from 1991 not available. Sums may be off slightly due to rounding. Negative numbers shown in parentheses ( ).

1 Includes scheduled and unscheduled operations.

2 Stage 2 aircraft are no longer permitted, effective December 31, 2015.

3 Regional Jet (RJ) operations were not tracked separately prior to 1999.

4 Totals prior to 1998 do not include GA operations.

5 RJ prior to 2010 was a jet with 100 seats or less. RJ in 2010 is a jet with less than 80 seats.

6 Minor errors reported for 2016 data in *2016 EDR* have been corrected in this table.

Commercial Jet Aircraft by Part 36 Stage Category

As described in the Regulatory Framework section of this appendix, jet aircraft are classified into categories referred to as stages based on noise levels. The heavier the aircraft, the more noise it is permitted to make within limits. Aircraft are allowed to be recertificated to the higher standard when modifications are made to the aircraft engine or design. Because of the substantial differences in noise between Stage 2, recertificated Stage 3, Stage 3, Stage 4, and Stage 5 aircraft, Massport tracks operations by these separate categories to follow their trends. **Table H-3** shows the percentage of commercial jet operations by stage category from 1998 through 2017.

One of the most significant changes occurring after the economic downturn in 2001 was the almost immediate retirement of the re-certificated Stage 3 aircraft from airlines' fleets due to their high operating costs. This type of accelerated retirement was not as prevalent during the 2008 to 2009 economic downturn since the major airlines no longer operated these aircraft.

Table H-3 Percentage of Commercial Jet Operations by Part 36 Stage Category – 1998 to 2017

	Stage 5 Requirements[1]	Stage 4 Requirements[2]	Stage 3[3]	Recertificated Stage 3[4]	Stage 2 Greater than 75,000 lbs.	Total
1998	N/A	N/A	65.9%	21.7%	12.4%	100%
1999	N/A	N/A	70.0%	21.0%	9.0%	100%
2000	N/A	N/A	75.0%	24.0%	1.0%	100%
2001	N/A	N/A	86.3%	13.6%	0.1%	100%
2002	N/A	N/A	92.8%	7.2%	0.0%	100%
2003	N/A	N/A	95.8%	4.1%	0.0%	100%
2004	N/A	N/A	97.8%	2.2%	0.0%	100%
2005	N/A	N/A	98.0%	2.0%	0.0%	100%
2006	N/A	N/A	98.6%	1.4%	0.0%	100%
2007	N/A	N/A	98.9%	1.1%	0.0%	100%
2008	N/A	N/A	99.1%	0.9%	0.0%	100%
2009	N/A	87.8%	11.3%	0.9%	0.0%	100%
2010	N/A	93.2%	5.7%	1.1%	0.0%	100%
2011	N/A	95.5%	4.0%	0.5%	0.0%	100%
2012	N/A	95.8%	4.1%	0.1%	0.0%	100%
2013	N/A	97.4%	2.6%	0.0%	0.0%	100%
2014	N/A	97.4%	2.6%	0.0%	0.0%	100%
2015	N/A	96.7%	3.3%	0.0%	0.0%	100%
2016	17.8%	79.2%	3.0%	0.0%	0.0%	100%
2017	17.7%	79.8%	2.4%	0.0%	0.0%	100%

Source: Massport and Federal Aviation Administration (FAA) radar data, HMMH 2018.
Notes: N/A – not applicable.
1 This column includes operations by aircraft that would qualify as Stage 5 recertificated. Aircraft certificated after January 1, 2018 must meet Stage 5 standards. The percent of Logan Airport operations in aircraft meeting Stage 5 requirements was not determined prior to 2016.
2 Aircraft that meet Stage 4 requirements are aircraft that are either certificated Stage 4 or would qualify if recertificated. Certificated Stage 4 aircraft were not available until 2006 and the percent of Logan Airport operations in aircraft that meet Stage 4 requirements was not determined prior to 2009.
Values less than 0.1% appear as 0.0% due to rounding.
3 Certificated Stage 3 aircraft are originally manufactured meeting Stage 3 requirements under Federal Regulation Part 36. This column includes only operations by Certificated Stage 3 aircraft that do not meet higher certification standards.
4 Recertificated Stage 3 aircraft are aircraft originally manufactured as a certified Stage 1 or 2 aircraft under Federal Regulation Part 36, which either have been treated with hushkits or have been re-engineered to meet Stage 3 requirements.

Nighttime Operations

Massport tracks flights that operate in the defined nighttime period between the hours of 10:00 PM to 7:00 AM, when each flight is penalized 10 dB in calculations of DNL. **Table H-4** shows this nighttime activity by different groups of aircraft. Nighttime flights by commercial jet operators increased by 11.2 percent in 2017 over the previous year. This follows increases of 6.6 percent in 2014, 5.9 percent in 2015, and 8.9 percent in 2016. Commercial non-jet operations decreased by 25.6 percent in 2017, following a decrease of 29 percent in 2014, and then increases of 5.7 percent in 2015, and 24.9 percent in 2016. GA traffic increased by 5.1 percent in 2017, following decreases of 8.0 percent in 2014, 0.2 percent in 2015, and an increase of 12.3 percent in 2016. Overall, nighttime operations at Logan Airport increased by 10.2 percent in 2017, after increasing 5.0 percent in 2014, 5.7 percent in 2015, and 9.3 percent in 2016. As in years past, the majority of 2017 nighttime operations (between 10:00 PM and 7:00 AM) occurred either before midnight or after 5:00 AM.

Table H-4 Modeled Nighttime Operations at Logan Airport – 1990 to 2017

	Commercial Jets	Commercial Non-Jets	General Aviation	Total
1990	77.24	11.72	N/A	88.96
1991	N/A	N/A	N/A	N/A
1992	71.42	69.32	N/A	140.74
1993	72.91	46.84	N/A	119.75
1994	72.90	13.59	N/A	86.49
1995	74.50	11.14	N/A	85.64
1996	84.95	13.73	N/A	98.68
1997	92.81	27.27	N/A	120.08
1998	101.46	21.86	20.89[1]	144.21
1999	105.25	16.63	26.17	148.05
2000	103.92	21.58	5.68	131.19
2001	109.82	10.97	5.71	126.50
2002	97.04	3.45	11.29	111.78
2003	92.69	2.41	11.64	106.74
2004	113.26	3.03	13.71	130.00
2005	113.67	3.02	14.33	131.02
2006	114.81	3.26	8.13	126.22
2007	118.30	3.47	10.19	131.96
2008	114.31	4.00	5.62	123.93
2009	103.05	5.56	3.08	111.70
2010	107.93	5.21	3.97	117.10
2011	109.38	4.73	6.65	120.76
2012	106.55	3.06	8.52	118.13
2013	115.91	3.21	6.28	125.40
2014	123.60	2.28	5.78	131.66
2015	130.96	2.41	5.77	139.14
2016[2]	142.16	3.01	6.48	151.63
2017	158.49	2.24	6.81	167.55
Change (2016 to 2017)	**16.33**	**-0.77**	**0.33**	**15.5**
Percent Change	**11.5%**	**-25.6%**	**5.1%**	**10.5%**

Source: Massport, HMMH, 2018.
Notes: GA – general aviation; N/A - not available.
1 Previously reported as N/A. 1998 was the first year GA operations were reported and included in the total nighttime operations.
2 Minor errors reported for 2016 data in *2016 EDR* have been corrected in this table.

Runway Use

Using radar data, RC for AEDT™ determines which runway was used, the specific aircraft type, and time classification (daytime or nighttime) for each flight. Massport compares annual runway use to previous years using a variety of summary tables with different perspectives.

The first summary of daytime and nighttime runway usages presented here is broken into six representative aircraft groups, listed below with example aircraft types from each group:

- Heavy Jet A – B747s, A340s, DC-8s;
- Heavy Jet B – B767s, B777s, A300s, A310s, A330s, DC-10s, L1011s, MD-11s;
- Light Jet A – B717s, B727s, DC-9s, F100s, MD-90s;
- Light Jet B – B737s, B757s, A319s, A320s, B-146s, MD-80s, E190;
- Regional Jet (RJ) – E135, E145, E170, CRJ2, CRJ7, CRJ9, J328 and Corporate Jets; and
- Turboprops and Piston Aircraft (non-jets).

Table H-5a shows the runway use summary from the modeled 2017 noise conditions. **Table H-5b** shows the corresponding summary from the modeled 2016 noise conditions. The turbojet aircraft in the table were grouped into different categories for reporting purposes. Because the DNL contours developed using RC for AEDT™ reflect the actual use of the runways by each flight, they accurately represent Logan Airport's noise environment. The modeled runway use for each particular aircraft type may be different from the overall group runway use presented in **Tables H-5a** and **H-5b**.

Comparing **Table H-5a** (2017) with the similar **Table H-5b** (2016) shows the largest changes were a 29-percent increase in the share of nighttime arrivals of the Heavy Jet A group on Runway 33L, and corresponding decreases in the same category of 19 percent and 8 percent to Runways 22L and 4R, respectively. All other categories also show less use of Runways 22L and 4R, in both arrival and departure operations (with the exception of Light Jet A daytime operations). Runway 4R-22L was closed for 35 days in 2017, which explains its decrease annual usage. Departures on Runway 33L showed increases in every category, as did arrivals to Runway 15R.

Table H-5a 2017 Modeled Runway Use by Aircraft Group

	Heavy Jet A		Heavy Jet B		Light Jet A		Light Jet B		Regional Jets		Non-Jets	
ARRIVALS												
Runway	**Day (%)**	**Night (%)**	**Day (%)**	**Night (%)**	**Day (%)**	**Night (%)**	**Day (%)**	**Night (%)**	**Day (%)**	**Night (%)**	**Day (%)**	**Night (%)**
04L	1.47	0.00	2.33	1.49	3.56	1.85	4.66	1.65	8.90	2.26	16.96	4.03
04R	30.73	22.06	30.11	13.13	25.28	12.55	22.76	12.06	18.54	14.18	9.72	9.78
09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15L	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.18	0.29
15R	7.22	3.59	6.30	3.33	5.05	3.22	4.78	3.30	4.17	2.64	4.60	4.00
22L	24.67	24.39	22.88	27.48	23.82	25.74	22.27	24.73	23.09	27.40	25.32	27.22
22R	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.04	0.00	2.55	1.15
27	8.07	3.44	20.44	5.42	30.98	22.43	29.99	25.94	23.61	31.74	7.27	14.64
32	0.00	0.00	0.00	0.00	0.00	0.00	1.48	0.01	6.08	0.16	14.15	0.00
33L	27.84	46.52	17.94	49.16	11.31	34.21	14.06	32.31	15.58	21.63	9.82	30.42
33R	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.43	8.47
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
DEPARTURES												
Runway	**Day (%)**	**Night (%)**	**Day (%)**	**Night (%)**	**Day (%)**	**Night (%)**	**Day (%)**	**Night (%)**	**Day (%)**	**Night (%)**	**Day (%)**	**Night (%)**
04L	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	15.17	6.42
04R	5.64	3.86	7.13	2.05	0.65	0.36	2.66	1.31	0.16	0.35	3.74	0.81
09	6.44	4.92	14.85	10.10	29.26	17.65	27.13	15.25	31.70	19.35	17.44	9.02
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.00
15L	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15R	30.52	26.79	16.32	21.90	1.33	10.22	3.25	14.61	0.40	9.29	1.51	20.17
22L	6.25	0.84	4.37	1.09	0.26	0.36	1.39	0.62	0.03	0.11	0.03	0.16
22R	17.15	16.44	23.02	21.32	30.93	25.66	28.77	19.97	31.84	26.24	30.73	22.78
27	1.90	0.00	7.42	1.54	17.81	35.64	13.04	28.26	14.62	28.33	6.95	5.51
32	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
33L	32.10	47.15	26.91	41.99	19.75	10.11	23.76	19.98	21.25	16.35	24.37	35.14
33R	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: Massport, HMMH, 2018.
Notes: Night for noise modeling is defined as 10:00 PM to 7:00 AM.
Values may not add to 100 percent due to rounding.

Table H-5b 2016 Modeled Runway Use by Aircraft Group

	Heavy Jet A		Heavy Jet B		Light Jet A		Light Jet B		Regional Jets		Non-Jets	
ARRIVALS												
Runway	**Day (%)**	**Night (%)**	**Day (%)**	**Night (%)**	**Day (%)**	**Night (%)**	**Day (%)**	**Night (%)**	**Day (%)**	**Night (%)**	**Day (%)**	**Night (%)**
04L	0.06	0.00	0.09	0.00	3.31	0.15	3.15	0.15	10.31	0.67	21.94	1.16
04R	42.33	30.39	39.39	22.67	34.49	19.77	34.35	20.51	27.01	23.83	16.74	21.14
09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15L	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.19	0.00
15R	0.95	0.00	0.89	0.96	0.62	1.10	0.80	0.55	0.59	0.74	0.50	0.18
22L	31.07	43.55	25.75	27.69	20.99	30.81	22.67	30.33	23.51	32.15	26.39	37.01
22R	0.00	0.00	0.00	0.00	0.02	0.00	0.01	0.00	0.02	0.00	3.03	3.12
27	5.46	8.68	18.07	3.97	27.61	28.16	25.91	19.35	19.68	20.03	5.14	10.61
32	0.00	0.00	0.00	0.00	0.00	0.00	1.13	0.00	5.25	0.00	11.97	0.00
33L	20.13	17.37	15.80	44.70	12.96	20.00	11.99	29.11	13.63	22.58	7.77	20.63
33R	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.32	6.15
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
DEPARTURES												
Runway	**Day (%)**	**Night (%)**	**Day (%)**	**Night (%)**	**Day (%)**	**Night (%)**	**Day (%)**	**Night (%)**	**Day (%)**	**Night (%)**	**Day (%)**	**Night (%)**
04L	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	18.85	11.48
04R	9.16	6.87	10.78	4.05	0.65	1.92	4.94	3.61	0.58	0.71	4.60	4.85
09	8.67	6.70	16.72	11.23	37.90	25.24	31.28	20.45	37.50	25.94	19.94	8.58
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.00
15L	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15R	31.30	33.68	15.41	25.89	2.30	8.66	3.99	15.82	2.25	14.83	2.28	12.62
22L	7.82	3.02	6.57	2.53	0.29	1.04	2.48	2.42	0.17	0.55	0.35	0.54
22R	17.75	18.08	21.50	19.38	29.18	29.58	27.25	22.31	29.80	26.17	29.67	34.91
27	0.58	0.33	6.21	0.94	14.94	29.55	11.73	22.52	12.60	20.82	5.32	7.32
32	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.14
33L	24.72	31.32	22.80	35.99	14.75	4.01	18.33	12.87	17.09	10.97	18.82	19.56
33R	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.00
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: Massport, HMMH, 2017.
Notes: Nighttime for noise modeling is defined as 10:00 PM to 7:00 AM.
Values may not add to 100 percent due to rounding.

While **Tables H-5a** and **H-5b** present runway use by aircraft groups, **Tables H-6a** and **H-6b** present the total runway use (jets and non-jets) by runway and time of day. The first section of the table displays the number of operations on each runway by time period for an average day. The second section displays the same information for the entire year and the last section displays the percent that each runway is used for a given operation type and time of day. **Table H-6a** shows that on an average day in 2017 Runway 22R had the most departures (154.7 per day and night combined) and Runway 27 had the most arrivals (135.6 per day and night combined). Considering just the nighttime period, Runways 27 and 33L each had over 17 departures, on average, per night, while Runway 33L had the most arrivals (30 per night). In comparison, **Table H-6b** shows that on an average day in 2016, Runway 9 had the most departures (151.7 per day and night combined) and Runway 4R had the most arrivals (155.2 per day and night combined). At night, Runway 22R had the most departures (15.7 per night) but Runway 22L had the most arrivals (25.1 per night).

Table H-6a Summary of Jet and Non-Jet Aircraft Runway Use: 2017

	Runway												
	4L	**4R**	**9**	**14**	**15L**	**15R**	**22L**	**22R**	**27**	**32**	**33L**	**33R**	**Total**
2017 Daily Operations													
Dep Day	11.1	12.4	122.0	0.1	0.0	15.5	5.3	138.9	57.6	0.0	111.8	0.0	474.6
Dep Night	0.1	1.0	11.1	0.0	0.0	11.5	0.5	15.8	17.9	0.0	17.4	0.0	75.2
Arr Day	32.5	94.1	0.0	0.0	1.6	21.8	105.1	1.9	112.7	18.8	63.6	5.4	457.5
Arr Night	1.6	11.3	0.0	0.0	0.0	3.0	23.3	0.0	22.9	0.0	30.0	0.2	92.4
Total Daily Operations	45.4	118.8	133.1	0.1	1.6	51.8	134.1	156.6	211.1	18.8	222.8	5.6	1,099.6
2017 Annual Operations													
Dep Day	4,058	4,524	44,529	19	0	5,653	1,922	50,703	21,012	0	40,822	0	173,243
Dep Night	40	357	4,051	0	0	4,181	170	5,761	6,550	0	6,333	0	27,443
Arr Day	11,867	34,355	0	0	575	7,957	38,366	689	41,130	6,848	23,229	1,957	166,974
Arr Night	595	4,122	0	0	3	1,103	8,488	12	8,357	7	10,939	86	33,712
Total Annual Operations	16,560	43,358	48,580	19	578	18,895	48,947	57,164	77,050	6,855	81,323	2,043	401,371
2017 Percentage Operations													
Dep Day	2%	3%	26%	<1%	0%	3%	1%	29%	12%	0%	24%	0%	100%
Dep Night	<1%	1%	15%	0%	0%	15%	1%	21%	24%	0%	23%	0%	100%
Arr Day	7%	21%	0%	0%	<1%	5%	23%	<1%	25%	4%	14%	1%	100%
Arr Night	2%	12%	0%	0%	<1%	3%	25%	<1%	25%	<1%	32%	<1%	100%

Source: Massport Noise Office and HMMH 2018.

Notes: These data reflect actual counts or percentages of aircraft operations on each runway end. They should not be confused with effective runway use, which is used by the Preferential Runway Advisory System (PRAS) to derive recommendations for use of a particular runway.

Runway 14-32 is unidirectional: there are no arrivals to Runway 14 and no departures from Runway 32.

Values may not add to 100 percent due to rounding.

Table H-6b Summary of Jet and Non-Jet Aircraft Runway Use: 2016

	Runway												
	4L	4R	9	14	15L	15R	22L	22R	27	32	33L	33R	Total
2016 Daily Operations													
Dep Day	14.2	20.3	138.4	0.0	0.0	18.8	8.9	129.0	49.2	0.0	85.2	0.1	464.1
Dep Night	0.2	2.4	13.2	0.0	0.0	12.0	1.5	15.7	12.8	0.0	11.3	0.0	69.1
Arr Day	32.6	138.1	0.0	0.0	0.1	3.2	106.6	2.3	94.2	15.7	53.5	4.7	451.0
Arr Night	0.2	17.2	0.0	0.0	0.0	0.5	25.1	0.1	15.2	0.0	23.9	0.2	82.2
Total Daily Operations	47.1	177.9	151.7	0.0	0.1	34.5	142.1	147.0	171.4	15.8	173.9	4.9	1,066.5
2016 Annual Operations													
Dep Day	5,179	7,413	50,669	8	0	6,897	3,268	47,196	18,019	14	31,175	25	169,865
Dep Night	86	880	4,836	0	0	4,375	555	5,743	4,699	1	4,130	0	25,305
Arr Day	11,921	50,529	0	0	53	1,185	39,010	837	34,462	5,752	19,597	1,723	165,069
Arr Night	62	6,278	0	0	0	176	9,191	30	5,555	0	8,750	58	30,100
Total Annual Operations	17,247	65,101	55,505	8	53	12,633	52,024	53,806	62,736	5,768	63,653	1,806	390,339
2016 Percentage Operations													
Dep Day	3%	4%	30%	<1%	0%	4%	2%	28%	11%	<1%	18%	<1%	100%
Dep Night	<1%	3%	19%	0%	0%	17%	2%	23%	19%	<1%	16%	0%	100%
Arr Day	7%	31%	0%	0%	<1%	1%	24%	1%	21%	3%	12%	1%	100%
Arr Night	<1%	21%	0%	0%	0%	1%	31%	<1%	18%	0%	29%	<1%	100%

Source: Massport Noise Office and HMMH 2017.

Notes: These data reflect actual counts or percentages of aircraft operations on each runway end. They should not be confused with effective runway use, which is used by the Preferential Runway Advisory System (PRAS) to derive recommendations for use of a particular runway.
Runway 14-32 is unidirectional: there are no arrivals to Runway 14 and no departures from Runway 32.
Values may not add to 100 percent due to rounding.

Runway use can also be presented in terms of percent of total operations. **Table H-7** presents the 2017 and 2016 runway use for all operations which use Logan Airport, supplementing the information in **Tables H-5a** and **H-5b** that separate runway use by aircraft group and time of day, and the data in **Tables H-6a** and **H-6b** which total the runway use by operation type and time of day.

In 2017, Runway 33L was the runway with the highest activity (a mix of jet arrivals and departures) with Runway 27 a very close second. For 2016, Runway 4R was the most active, with primarily jet arrivals, followed by Runway 33L and Runway 27, each with a mix of arrivals and departures. Non-jets use Runways 4L and 22L most for arrivals, and Runway 22R most for departures.

Table H-7 Total 2017 and 2016 Modeled Runway Use by All Operations

	Jet Arrivals		Non-Jet Arrivals		Jet Departures		Non-Jet Departures		All Operations
	Day	Night	Day	Night	Day	Night	Day	Night	
Runway	**2017 Operations**								
4L	1.8%	0.1%	1.1%	<0.1%	0.0%	0.0%	1.0%	<0.1%	4.1%
4R	7.9%	1.0%	0.6%	<0.1%	0.9%	0.1%	0.2%	<0.1%	10.8%
9	0.0%	0.0%	0.0%	0.0%	9.9%	1.0%	1.2%	<0.1%	12.1%
14	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	<0.1%	0.0%	<0.1%
15L	0.0%	0.0%	0.1%	<0.1%	0.0%	0.0%	0.0%	0.0%	0.1%
15R	1.7%	0.3%	0.3%	<0.1%	1.3%	1.0%	0.1%	<0.1%	4.7%
22L	7.9%	2.0%	1.7%	0.1%	0.5%	<0.1%	<0.1%	<0.1%	12.2%
22R	<0.1%	0.0%	0.2%	<0.1%	10.6%	1.4%	2.0%	<0.1%	14.2%
27	9.8%	2.0%	0.5%	<0.1%	4.8%	1.6%	0.5%	<0.1%	19.2%
32	0.8%	<0.1%	0.9%	0.0%	0.0%	0.0%	0.0%	0.0%	1.7%
33L	5.1%	2.6%	0.6%	0.1%	8.5%	1.5%	1.6%	0.1%	20.3%
33R	0.0%	0.0%	0.5%	<0.1%	0.0%	0.0%	0.0%	0.0%	0.5%
Total	35.0%	8.1%	6.6%	0.3%	36.5%	6.7%	6.7%	0.2%	100.0%
	Jet Arrivals		**Non-Jet Arrivals**		**Jet Departures**		**Non-Jet Departures**		**All Operations**
	Day	**Night**	**Day**	**Night**	**Day**	**Night**	**Day**	**Night**	
Runway	**2016 Operations**								
4L	1.5%	<0.1%	1.5%	<0.1%	0.0%	0.0%	1.3%	<0.1%	4.4%
4R	11.8%	1.6%	1.2%	0.1%	1.6%	0.2%	0.3%	<0.1%	16.7%
9	0.0%	0.0%	0.0%	0.0%	11.6%	1.2%	1.4%	<0.1%	14.2%
14	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	<0.1%	0.0%	<0.1%
15L	0.0%	0.0%	<0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	<0.1%
15R	0.3%	<0.1%	<0.1%	<0.1%	1.6%	1.1%	0.2%	<0.1%	3.2%
22L	8.1%	2.3%	1.8%	0.1%	0.8%	0.1%	<0.1%	<0.1%	13.3%
22R	<0.1%	0.0%	0.2%	<0.1%	10.0%	1.4%	2.1%	0.1%	13.8%
27	8.5%	1.4%	0.4%	<0.1%	4.2%	1.2%	0.4%	<0.1%	16.1%
32	0.6%	0.0%	0.8%	0.0%	0.0%	0.0%	<0.1%	<0.1%	1.5%
33L	4.5%	2.2%	0.5%	<0.1%	6.7%	1.0%	1.3%	<0.1%	16.3%
33R	0.0%	0.0%	0.4%	<0.1%	0.0%	0.0%	<0.1%	0.0%	<0.1%
Total	35.3%	7.5%	7.0%	0.2%	36.5%	6.3%	7.0%	0.2%	100.0%

Source: Massport, HMMH, 2018.
Notes: Night for noise modeling is defined as 10:00 PM to 7:00 AM.
Nighttime runway restrictions are from 11:00 PM to 6:00 AM.
Some percentages less than 0.5 percent for 2016 were reported as <0.1 percent; correct values shown here.
Values may not add to 100 percent due to rounding.

Table H-8 presents a historical summary of runway use by jets. Since 2009, the radar data have been analyzed with Massport's Harris NOMS. Data from 2001 through 2008 were compiled with Massport's PreFlight™ software, an analysis package used to access fleet, day/night splits, and runway use information from radar data. Data prior to 2001 were derived from Massport's original noise monitoring system, supplemented with field records. Note that Logan Airport Noise Rules prevent arrivals to Runway 22R and departures from Runway 4L by jet aircraft.

Table H-8 Summary of Jet Aircraft Runway Use – 1990 to 2017

Runway	4L	4R	9	14[1]	15R	22L	22R	27	32[1]	33L
1990										
Departures	0%[2]	3%	21%	N/A	10%	2%	36%	20%	N/A	7%
Arrivals	1%	25%	0%	N/A	2%	14%	0%	28%	N/A	29%
1992[2]										
Departures	0%	6%	31%	N/A	7%	2%	38%	10%	N/A	6%
Arrivals	1%	37%	0%	N/A	3%	12%	0%	30%	N/A	17%
1993										
Departures	0%	9%	33%	N/A	7%	3%	40%	4%	N/A	4%
Arrivals	2%	44%	0%	N/A	1%	11%	0%	28%	N/A	15%
1994										
Departures	0%	9%	33%	N/A	4%	3%	32%	12%	N/A	5%
Arrivals	3%	42%	0%	N/A	1%	8%	0%	27%	N/A	19%
1995										
Departures	0%	8%	36%	N/A	5%	5%	29%	11%	N/A	5%
Arrivals	3%	41%	0%	N/A	2%	8%	0%	27%	N/A	17%
1996										
Departures	0%	8%	32%	N/A	5%	6%	33%	12%	N/A	5%
Arrivals	2%	38%	0%	N/A	2%	11%	0%	29%	N/A	18%
1997										
Departures	0%	8%	30%	N/A	5%	6%	31%	15%	N/A	5%
Arrivals	2%	36%	0%	N/A	2%	9%	0%	30%	N/A	20%
1998										
Departures	0%	8%	35%	N/A	6%	5%	28%	14%	N/A	5%
Arrivals	2%	41%	0%	N/A	2%	7%	0%	28%	N/A	19%
1999										
Departures	0%	8%	31%	N/A	5%	4%	30%	15%	N/A	6%
Arrivals	3%	37%	0%	N/A	2%	10%	0%	28%	N/A	21%
2000										
Departures	0%	8%	35%	N/A	4%	3%	30%	15%	N/A	6%
Arrivals	4%	40%	0%	N/A	1%	7%	0%	28%	N/A	20%

Table H-8 Summary of Jet Aircraft Runway Use – 1990 to 2017 (Continued)

Runway	4L	4R	9	14[1]	15R	22L	22R	27	32[1]	33L
2001										
Departures	0%	7%	34%	N/A	4%	3%	35%	12%	N/A	5%
Arrivals	5%	36%	0%	N/A	1%	8%	0%	32%	N/A	18%
2002										
Departures	0%	4%	31%	N/A	6%	3%	35%	16%	N/A	6%
Arrivals	6%	31%	0%	N/A	1%	12%	0%	30%	N/A	21%
2003										
Departures	0%	4%	33%	N/A	7%	2%	34%	14%	N/A	6%
Arrivals	7%	33%	0%	N/A	1%	14%	0%	28%	N/A	18%
2004										
Departures	0%	5%	34%	N/A	10%	4%	24%	18%	N/A	6%
Arrivals	6%	34%	0%	N/A	1%	12%	0%	24%	N/A	23%
2005										
Departures	0%	5%	36%	N/A	7%	1%	31%	13%	N/A	7%
Arrivals	8%	33%	0%	N/A	1%	11%	0%	29%	N/A	17%
2006										
Departures	0%	4%	33%	0%	3%	1%	40%	13%	0%	6%
Arrivals	7%	29%	0%	0%	1%	14%	0%	33%	0.2%	16%
2007										
Departures	0%	5%	31%	0%	4%	1%	33%	7%	0%	19%
Arrivals	5%	31%	0%	0%	1%	15%	0%	36%	2%	11%
2008										
Departures	0%	6%	33%	<1%	3%	<1%	36%	6%	0%	16%
Arrivals	6%	30%	0%	0%	2%	17%	0%	33%	2%	11%
2009[3]										
Departures	0%	7%	32%	0%	3%	2%	34%	6%	0%	16%
Arrivals	7%	31%	0%	0%	3%	17%	0%	30%	1%	11%
2010										
Departures	0%	4%	28%	<1%	8%	2%	31%	10%	0%	17%
Arrivals	5%	28%	0%	0%	1%	15%	0%	32%	1%	16%
2011[4]										
Departures	0%	6%	36%	<1%	5%	2%	36%	7%	0%	7%
Arrivals	7%	37%	0%	0%	<1%	16%	0%	28%	1%	11%
2012[4]										
Departures	0%	6%	33%	<1%	5%	3%	38%	6%	0%	9%
Arrivals	6%	34%	0%	0%	1%	16%	0%	33%	<1%	9%
2013										
Departures	<1%	5%	30%	<1%	5%	2%	35%	12%	0%	12%
Arrivals	6%	29%	0%	0%	1%	16%	<1%	32%	1%	15%

Table H-8 Summary of Jet Aircraft Runway Use – 1990 to 2017 (Continued)

Runway	4L	4R	9	14[1]	15R	22L	22R	27	32[1]	33L
2014										
Departures	0%	5%	31%	<1%	5%	2%	28%	13%	0%	17%
Arrivals	5%	30%	0%	0%	2%	25%	<1%	21%	1%	16%
2015										
Departures	0%	4%	29%	<1%	5%	2%	32%	12%	0%	15%
Arrivals	5%	29%	0%	0%	2%	25%	<1%	23%	1%	16%
2016[5]										
Departures	0%	4%	30%	0%	6%	2%	27%	13%	0%	18%
Arrivals	4%	31%	0%	0%	1%	24%	<1%	23%	1%	16%
2017[6]										
Departures	0%	2%	25%	0%	5%	1%	28%	15%	0%	23%
Arrivals	5%	21%	0%	0%	5%	23%	<1%	27%	2%	18%

Source: HMMH 2018, Massport Noise Office.

Notes: These data reflect actual percentages of jet aircraft operations on each runway end. They should not be confused with effective runway use, which is used by the Preferential Runway Advisory System (PRAS) to derive recommendations for use of a particular runway. Effective runway percentages include a factor of 10 applied to nighttime operations so that use of a runway at night more closely reflects its effect on total noise exposure.

Jet aircraft are not able to use Runway 15L or 33R due to its length of only 2,557 feet.

Values may not add to 100 percent due to rounding.

N/A - not available.

1 Runway 14-32 opened in late November 2006. (Runway 14-32 is unidirectional with no arrivals to Runway 14 and no departures from Runway 32.)

2 The *1990 Final Generic Environmental Impact Report* was published and submitted to the Secretary of Environmental Affairs in July 1993. It included modeled operations and resulting noise contours for 1987, 1990, and a 1996-forecast year. The *1993 Annual Update* published in July 1994 included operations and contours for 1992 and 1993. 1991 data are not available.

3 Runway 9-27 had extended weekend closings for resurfacing during 2009.

4 Runway 15R-33L was closed for 3 months in 2011 and in 2012.

5 Runway 4L-22Rwas closed for 31 days in 2016.

6 Runway 4R-22L was closed for 35 days in 2017, with limited availability for Runway 4R arrivals for about 80 additional days.

Since runway use plays such a key role in determining noise the aircraft noise distribution in the Airport's environment, Massport also tracks the level of traffic off each runway end by combining counts of operations that overfly the same general area. The total operations and percentages shown for 2016 and 2017 in **Table H-9** represent the amount of activity experienced off each runway end for a given year.

Table H-9 Runway Usage by Runway End

		2016		2017	
Runway End	**Operation(s)[1]**	**Total Flights**	**% of Total[3]**	**Total Flights**	**% of Total[3]**
04L	R4L A + R22R D	64,921	**16.6%**	68,925	**17.2%**
04R	R4R A + R22L D	60,630	**15.5%**	40,570	**10.1%**
09	R9 A + R27 D	22,719	**5.8%**	27,562	**6.9%**
14	N/A	15	**0.0%**	0	**0.0%**
15L	R15L A + R33R D	78	**0.0%**	578	**0.1%**
15R	R15R A + R33L D	36,667	**9.4%**	55,867	**13.9%**
22L	R22L A + R4R D	56,495	**14.5%**	51,735	**12.9%**
22R	R22R A + R4L D	6,132	**1.6%**	4,799	**1.2%**
27	R27 A + R9 D	95,522	**24.5%**	98,068	**24.5%**
32	R32 A + R14 D	5,760	**1.5%**	6,874	**1.7%**
33L	R33L A + R15R D	39,619	**10.1%**	43,652	**10.9%**
33R	R33R A + R15L D	1,782	**0.5%**	2,043	**0.5%**
All[2]		**390,339**	**100.0%**	**400,672**	**100.0%**

Notes: N/A – not applicable.
Runway 14-32 is unidirectional: there are no arrivals to Runway 14 and no departures from Runway 32. The 15 operations shown in this row for 2016 are non-jet departures which were most likely erroneously associated with Runway 32 by the computer algorithm.

1 A=Arrivals; D=Departures.

2 Helicopter operations not included.

3 Percents are rounded to the nearest tenth.

Flight Tracks

RC for AEDT™ converts each radar track to an AEDT model track and then models the scaled aircraft operation on that track. This method keeps the modeled lateral and vertical dispersion of the aircraft types consistent with the radar data and ensures that anomalies in the departure paths are captured in the RC for AEDT™ system. **Table H-10** lists the number of flight tracks used in the RC for AEDT™ modeling system for 2017 and 2016. A sample of flight tracks from 2017 are displayed in **Figures 6-3** through **6-9** in Chapter 6, *Noise Abatement*.

Table H-10 Total Count of Flight Tracks Modeled in RC for AEDT™ (2017 and 2016)

	Runway											
	4L	**4R**	**9**	**14**	**15L**	**15R**	**22L**	**22R**	**27**	**32**	**33L**	**33R**
2017												
Departures	4,098	4,881	48,580	19	0	9,484	2,093	56,463	27,562	0	47,155	0
Arrivals	12,462	38,477	0	0	578	8,711	46,854	701	49,488	6,855	34,167	2,043
2016												
Departures	5,265	8,294	55,505	8	0	11,272	3,823	52,939	22,719	15	35,305	25
Arrivals	11,982	56,807	0	0	53	1,362	48,201	867	40,017	5,752	28,347	1,782

Source: HMMH, 2017/2018; Harris Noise and Operational Monitoring System (NOMS) data.

Annual Model Results and Status of Mitigation Programs

Noise Exposed Population

Table H-11 presents the noise-exposed population by community through 2017. This table includes population within the DNL 60 to 65 dB contours, although a DNL of 65 dB is the federally-defined noise criterion used as a guideline to identify when residential land use is considered incompatible with aircraft noise.

Table H-11 Noise-Exposed Population by Community

Year	Census Data	80+ dB	75+ dB	70-75 dB DNL	65-70 dB DNL[1]	Total (65+)	60-65 dB DNL
BOSTON[2]							
1990	1980	0	0	1,778	28,970	30,748	N/A
1992	1980	0	0	800	4,316	5,116	N/A
1993	1980	0	0	264	2,820	3,084	N/A
1994	1990	0	106	265	7,698	8,069	30,895
1995	1990	0	106	851	8,815	9,772	33,765
1996	1990	0	106	374	8,775	9,255	40,992
1997	1990	0	106	719	13,857	14,682	54,804
1998	1990	0	58	580	10,877	11,515	52,201
1999 [3]	1990	0	58	364	11,632	12,054	45,948
2000	2000	0	0	234	9,014	9,248	35,785
2001	2000	0	0	315	6,515	6,700	27,778
2002	2000	0	0	132	2,625	2,757	23,225
2003	2000	0	0	164	1,730	1,894	21,763
2004 [4]	2000	0	65	192	4,142	4,399	24,473
2005 [4]	2000	0	65	104	2,020	2,189	17,661
2006 [4]	2000	0	65	99	1,054	1,218	14,866
2007 [4,5]	2000	0	0	169	4,094	4,263	21,446
2008 [4,5]	2000	0	5	0	3,487	3,492	18,890
2009 [4,5]	2000	0	5	67	937	1,009	12,284
2010 [4,5]	2010	0	0	0	689	689	17,646
2011 [4,5]	2010	0	0	0	331	331	11,600
2012 [4,5]	2010	0	0	0	421	421	11,037
2013 [4,5]	2010	0	0	0	612	612	14,835
2014 [4,5]	2010	0	0	34	4,151	4,185	23,343
2015 [4,5]	2010	0	0	110	7,225	7,365	32,309
2016 [4,5]	2010	0	0	0	4,031	4,031	20,806
2017 [4,5]	2010	0	0	14	4,720	4,734	24,595
CHELSEA							
1990	1980	0	0	0	4,813	4,813	N/A
1992	1980	0	0	0	3,952	3,952	N/A
1993	1980	0	0	0	0	0	N/A
1994	1990	0	0	0	0	0	8,510
1995	1990	0	0	0	95	95	9,750
1996	1990	0	0	0	0	0	8,744
1997	1990	0	0	0	0	0	10,001
1998	1990	0	0	0	0	0	9,222
1999	1990	0	0	0	95	95	9,249
2000	2000	0	0	0	0	0	7,361
2001	2000	0	0	0	0	0	4,508
2002	2000	0	0	0	0	0	3,995
2003	2000	0	0	0	0	0	3,591
2004 [4]	2000	0	0	0	0	0	7,756
2005 [4]	2000	0	0	0	0	0	5,772
2006 [4]	2000	0	0	0	0	0	2,477
2007 [4,5]	2000	0	0	0	0	0	9,774
2008 [4,5]	2000	0	0	0	0	0	7,793
2009 [4,5]	2000	0	0	0	0	0	5,462

Table H-11 Noise-Exposed Population by Community (Continued)

Year	Census Data	80+ dB	75+ dB	70-75 dB DNL	65-70 dB DNL[1]	Total (65+)	60-65 dB DNL
CHELSEA							
2010 [4,5]	2010	0	0	0	0	0	4,897
2011 [4,5]	2010	0	0	0	0	0	0
2012 [4,5]	2010	0	0	0	0	0	0
2013 [4,5]	2010	0	0	0	0	0	3,485
2014 [4,5]	2010	0	0	0	0	0	9,236
2015 [4,5]	2010	0	0	0	0	0	0
2016 [4,5]	2010	0	0	0	0	0	12,110
2017 [4,5]	2010	0	0	0	65	65	13,900
EVERETT							
1990	1980	0	0	0	0	0	N/A
1992	1980	0	0	0	0	0	N/A
1993	1980	0	0	0	0	0	N/A
1994	1990	0	0	0	0	0	0
1995	1990	0	0	0	0	0	0
1996	1990	0	0	0	0	0	0
1997	1990	0	0	0	0	0	0
1998	1990	0	0	0	0	0	0
1999	1990	0	0	0	0	0	0
2000	2000	0	0	0	0	0	0
2001	2000	0	0	0	0	0	0
2002	2000	0	0	0	0	0	0
2003	2000	0	0	0	0	0	0
2004 [4]	2000	0	0	0	0	0	0
2005 [4]	2000	0	0	0	0	0	0
2006 [4]	2000	0	0	0	0	0	0
2007 [4,5]	2000	0	0	0	0	0	0
2008 [4,5]	2000	0	0	0	0	0	0
2009 [4,5]	2000	0	0	0	0	0	0
2010 [4,5]	2010	0	0	0	0	0	0
2011 [4,5]	2010	0	0	0	0	0	0
2012 [4,5]	2010	0	0	0	0	0	0
2013 [4,5]	2010	0	0	0	0	0	0
2014 [4,5]	2010	0	0	0	0	0	0
2015 [4,5]	2010	0	0	0	0	0	0
2016 [4,5]	2010	0	0	0	0	0	0
2017 [4,5]	2010	0	0	0	0	0	924
MEDFORD							
1990	1980	0	0	0	0	0	N/A
1992	1980	0	0	0	0	0	N/A
1993	1980	0	0	0	0	0	N/A
1994	1990	0	0	0	0	0	0
1995	1990	0	0	0	0	0	0
1996	1990	0	0	0	0	0	0
1997	1990	0	0	0	0	0	0
1998	1990	0	0	0	0	0	0
1999	1990	0	0	0	0	0	0
2000	2000	0	0	0	0	0	0

Table H-11	Noise-Exposed Population by Community (Continued)						
Year	**Census Data**	**80+ dB**	**75+ dB**	**70-75 dB DNL**	**65-70 dB DNL[1]**	**Total (65+)**	**60-65 dB DNL**
MEDFORD							
2001	2000	0	0	0	0	0	0
2002	2000	0	0	0	0	0	0
2003	2000	0	0	0	0	0	0
2004 [4]	2000	0	0	0	0	0	0
2005 [4]	2000	0	0	0	0	0	0
2006 [4]	2000	0	0	0	0	0	0
2007 [4,5]	2000	0	0	0	0	0	0
2008 [4,5]	2000	0	0	0	0	0	0
2009 [4,5]	2000	0	0	0	0	0	0
2010 [4,5]	2010	0	0	0	0	0	0
2011 [4,5]	2010	0	0	0	0	0	0
2012 [4,5]	2010	0	0	0	0	0	0
2013 [4,5]	2010	0	0	0	0	0	0
2014 [4,5]	2010	0	0	0	0	0	0
2015 [4,5]	2010	0	0	0	0	0	0
2016 [4,5]	2010	0	0	0	0	0	0
2017 [4,5]	2010	0	0	0	0	0	0
QUINCY							
1990	1980	0	0	0	0	0	N/A
1992	1980	0	0	0	0	0	N/A
1993	1980	0	0	0	0	0	N/A
1994	1990	0	0	0	0	0	0
1995	1990	0	0	0	0	0	0
1996	1990	0	0	0	0	0	0
1997	1990	0	0	0	0	0	0
1998	1990	0	0	0	0	0	0
1999	1990	0	0	0	0	0	0
2000	2000	0	0	0	0	0	636
2001	2000	0	0	0	0	0	610
2002	2000	0	0	0	0	0	610
2003	2000	0	0	0	0	0	610
2004 [4]	2000	0	0	0	0	0	610
2005 [4]	2000	0	0	0	0	0	610
2006 [4]	2000	0	0	0	0	0	610
2007 [4,5]	2000	0	0	0	0	0	0
2008 [4,5]	2000	0	0	0	0	0	0
2009 [4,5]	2000	0	0	0	0	0	0
2010 [4,5]	2010	0	0	0	0	0	0
2011 [4,5]	2010	0	0	0	0	0	0
2012 [4,5]	2010	0	0	0	0	0	0
2013 [4,5]	2010	0	0	0	0	0	0
2014 [4,5]	2010	0	0	0	0	0	0
2015 [4,5]	2010	0	0	0	0	0	0
2016 [4,5]	2010	0	0	0	0	0	0
2017 [4,5]	2010	0	0	0	0	0	0

Table H-11 Noise-Exposed Population by Community (Continued)

Year	Census Data	80+ dB	75+ dB	70-75 dB DNL	65-70 dB DNL[1]	Total (65+)	60-65 dB DNL
REVERE							
1990	1980	0	0	0	4,274	4,274	N/A
1992	1980	0	0	0	3,848	3,848	N/A
1993	1980	0	0	0	4,617	4,617	N/A
1994	1990	0	0	0	3,569	3,569	2,099
1995	1990	0	0	0	3,364	3,364	2,304
1996	1990	0	0	172	3,292	3,464	2,505
1997	1990	0	0	0	3,293	3,293	2,047
1998	1990	0	0	0	3,168	3,168	2,132
1999	1990	0	0	128	3,165	3,293	2,047
2000	2000	0	0	0	2,496	2,496	3,100
2001	2000	0	0	0	2,496	2,496	3,100
2002	2000	0	0	0	2,822	2,822	2,399
2003	2000	0	0	0	2,994	2,994	2,227
2004 [4]	2000	0	0	82	2,969	3,051	2,678
2005 [4]	2000	0	0	82	2,540	2,622	2,731
2006 [4]	2000	0	0	82	2,540	2,622	2,698
2007 [4,5]	2000	0	0	0	2,450	2,450	2,853
2008 [4,5]	2000	0	0	0	2,434	2,434	1,802
2009 [4,5]	2000	0	0	0	2,512	2,512	1,452
2010 [4,5]	2010	0	0	0	2,413	2,413	2,473
2011 [4,5]	2010	0	0	0	2,547	2,547	3,123
2012 [4,5]	2010	0	0	0	2,762	2,762	3,191
2013 [4,5]	2010	0	0	0	2,505	2,505	2,791
2014 [4,5]	2010	0	0	0	2,832	2,832	3,829
2015 [4,5]	2010	0	0	0	3,789	3,789	3,385
2016 [4,5]	2010	0	0	0	2,376	2,376	3,508
2017 [4,5]	2010	0	0	0	2,362	2,362	2,899
WINTHROP							
1990	1980	0	676	1,211	2,420	4,307	N/A
1992	1980	0	626	1,146	2,488	4,262	N/A
1993	1980	0	648	1,211	1,773	3,632	N/A
1994	1990	0	417	1,343	5,154	6,914	7,512
1995	1990	0	482	1,611	5,757	7,850	7,077
1996	1990	0	417	1,376	5,930	7,723	7,333
1997	1990	0	417	1,659	6,386	8,462	6,839
1998	1990	0	519	1,522	6,572	8,613	6,507
1999	1990	0	353	1,408	5,946	7,707	7,135
2000	2000	0	247	1,070	4,684	6,001	7,776
2001	2000	0	244	683	4,123	5,050	8,104
2002	2000	0	2	481	2,247	2,730	7,921
2003	2000	0	0	339	1,956	2,295	7,386
2004 [4]	2000	0	2	337	1,649	1,988	6,508
2005 [4]	2000	0	39	347	1,280	1,666	6,353
2006 [4]	2000	0	39	416	1,288	1,743	6,845
2007 [4,5]	2000	0	0	247	1,139	1,386	6,749
2008 [4,5]	2000	0	0	244	1,409	1,653	6,547
2009 [4,5]	2000	0	0	171	643	814	4,221
2010 [4,5]	2010	0	0	130	598	728	3,720

Table H-11 Noise-Exposed Population by Community (Continued)

Year	Census Data	80+ dB	75+ dB	70-75 dB DNL	65-70 dB DNL[1]	Total (65+)	60-65 dB DNL
WINTHROP							
2011 [4,5]	2010	0	0	130	939	1069	4,303
2012 [4,5]	2010	0	0	200	1,186	1,386	5,305
2013 [4,5]	2010	0	0	130	1,060	1,190	5,466
2014 [4,5]	2010	0	0	130	1,775	1,905	6,456
2015 [4,5]	2010	0	0	320	2,623	2,943	6,375
2016 [4,5]	2010	0	0	130	913	1,403	5,062
2017 [4,5]	2010	0	0	125	647	772	4,656
All Communities							
1990	1980	0	676	2,989	40,477	44,142	NA
1992	1980	0	628	2,352	14,604	17,584	NA
1993	1980	0	648	1,475	9,210	11,333	NA
1994	1990	0	523	1,608	16,421	18,552	49,016
1995	1990	0	588	2,462	18,031	21,081	52,896
1996	1990	0	523	1,922	17,997	20,442	59,574
1997	1990	0	523	2,378	23,536	26,437	73,691
1998	1990	0	577	2,102	20,617	23,296	70,062
1999[3]	1990	0	411	1,900	20,838	23,149	64,379
2000	2000	0	247	1,304	16,194	17,745	54,190
2001	2000	0	244	998	13,004	14,246	43,616
2002	2000	0	2	613	7,694	8,309	38,150
2003	2000	0	0	503	6,680	7,183	35,577
2004 [4]	2000	0	67	611	8,760	9,438	41,975
2005 [4]	2000	0	104	533	5,840	6,477	33,127
2006 [4]	2000	0	104	597	4,882	5,583	27,496
2007 [4,5]	2000	0	0	416	7,683	8,099	40,822
2008 [4,5]	2000	0	5	244	7,330	7,579	35,122
2009 [4,5]	2000	0	5	238	4,092	4,335	23,419
2010 [4,5]	2010	0	0	130	3,700	3,830	28,736
2011 [4,5]	2010	0	0	130	3,817	3,947	19,026
2012 [4,5]	2010	0	0	200	4,369	4,569	19,533
2013 [4,5]	2010	0	0	130	4,177	4,307	26,577
2014 [4,5]	2010	0	0	164	8,758	8,922	42,864
2015 [4,5]	2010	0	0	430	13,667	14,097	52,748
2016 [4,5]	2010	0	0	130	7,320	7,450	41,486
2017 [4,5]	2010	0	0	139	7,794	7,933	46,974

Source: Data prepared for Massport by HMMH 2018.

Notes: dB – decibel; DNL - Day-Night Average Sound Level; N/A – not available.
South End is included in Boston totals.

1 65 dB DNL is the federally-defined noise criterion.

2 Boston includes portions of Dorchester, East Boston, Roxbury, South Boston.

3 Boston population by community changed in 1999 due to employment of more accurate hill effects methodology and reporting change.

4 All results from 2004 to 2015 are from the RealContours™ modeling system with INM.
All results from 2016 and 2017 are from AEDT using the RC for AEDT™ pre-processor.

5 2017 noise analysis uses AEDT version 2d, 2016 used AEDT version 2c SP2, 2012 through 2015 used INM version 7.0d, 2011 used INM version 7.0c, 2008 through 2010 used INM version 7.0b, 2007 used INM version 7.01, and 1990 and 2000 used earlier versions of INM.

Cumulative Noise Index (CNI)

Massport reports total annual fleet noise at Logan Airport, defined in the Logan Airport Noise Rules by a metric referred to as the CNI. The CNI is a single number representing the sum of the entire set of single-event noise levels experienced at the Airport over a full year of operation, weighted similarly to DNL so that activity occurring at night is penalized by adding an extra 10 dB to each event. This penalty is mathematically equivalent to multiplying the number of nighttime events by each aircraft by a factor of ten. The Logan Airport Noise Rules define CNI in terms of Effective Perceived Noise Level (EPNL) and require that the index be computed for the fleet of commercial aircraFft operating at Logan Airport throughout the year. In addition, in EDRs and ESPRs, Massport reports partial CNI values of noise at Logan Airport, so that various subsets of the fleet (cargo, night operations, passenger jets, etc.) are identified (see **Table H-12**). The Noise Rules, adopted by Massport following public hearings held in February 1986, established a CNI limit of 156.5 EPNdB. The CNI generally has decreased since 1990, remaining below that cap, with changes from year to year on the order of a few tenths of a decibel. The 2017 CNI remains well below the cap of 156.5 EPNL.

Table H-12 Cumulative Noise Index (EPNL) – 1990 to 2017 (limit 156.5)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Full CNI (Entire Commercial Jet Fleet)	**156.4**	**155.8**	**155.5**	**155.3**	**155.4**	**155.3**	**155.1**	**154.8**	**154.7**	**154.9**
Total Passenger Jets	155.2	154.8	154.6	154.4	154.4	154.2	154.1	153.9	153.7	153.9
Total Cargo Jets	150.1	148.9	148.0	147.9	148.3	148.8	148.6	147.5	147.9	148.0
Total Daytime	152.5	152.1	152.4	152.1	152.1	151.6	151.2	150.8	150.4	150.4
Total Nighttime	154.4	153.4	152.6	152.4	152.6	152.9	152.9	152.5	152.7	153.1
Total Stage 2 Jets	N/A	N/A	N/A	N/A	151.0	150.2	149.4	149.2	147.7	147.1
Total Stage 3 Jets	N/A	N/A	N/A	N/A	153.4	153.8	153.8	153.4	153.8	154.2
Daytime Stage 2	N/A	N/A	N/A	N/A	149.0	148.5	147.6	146.5	145.2	144.1
Nighttime Stage 2	N/A	N/A	N/A	N/A	146.7	145.1	144.8	145.8	144.1	144.0
Daytime Stage 3	N/A	N/A	N/A	N/A	149.1	148.8	148.7	148.8	148.9	149.2
Nighttime Stage 3	N/A	N/A	N/A	N/A	151.4	152.1	152.2	151.5	152.1	152.5
Passenger Jet Stage 2	N/A	N/A	N/A	N/A	150.5	149.9	149.2	148.9	147.5	146.8
Passenger Jet Stage 3	N/A	N/A	N/A	N/A	152.2	152.3	152.3	152.2	152.6	153.0
Cargo Jet Stage 2	N/A	N/A	N/A	N/A	141.5	137.4	136.8	137.4	139.0	134.5
Cargo Jet Stage 3	N/A	N/A	N/A	N/A	147.3	148.5	148.3	147.0	147.3	147.9
Daytime Passenger	N/A	152.0	152.2	152.0	152.0	151.5	151.1	150.6	150.1	150.1
Nighttime Passenger	N/A	151.6	150.9	150.6	150.8	151.0	151.0	151.1	151.2	151.6
Daytime Cargo	137.1	137.1	137.6	135.2	136.1	138.0	136.7	136.2	138.0	138.2
Nighttime Cargo	149.9	148.6	147.6	147.6	148.0	148.4	148.3	147.1	147.5	147.6
Daytime Passenger Stage 2	N/A	N/A	N/A	N/A	148.9	148.4	147.6	146.5	145.0	143.9
Daytime Passenger Stage 3	N/A	N/A	N/A	N/A	149.0	148.5	148.4	148.5	148.6	149.0
Nighttime Passenger Stage 2	N/A	N/A	N/A	N/A	149.0	148.5	148.4	148.5	142.8	143.7
Nighttime Passenger Stage 3	N/A	N/A	N/A	N/A	149.4	149.9	150.1	149.8	150.5	150.8
Daytime Cargo Stage 2	N/A	N/A	N/A	N/A	128.3	126.7	124.6	126.4	131.6	131.5
Daytime Cargo Stage 3	N/A	N/A	N/A	N/A	135.3	137.7	136.4	135.7	136.9	137.1
Nighttime Cargo Stage 2	N/A	N/A	N/A	N/A	141.3	137.0	136.5	137.0	138.2	131.5
Nighttime Cargo Stage 3	N/A	N/A	N/A	N/A	147.0	148.1	148.0	146.6	146.9	147.5

Table H-12 Cumulative Noise Index (EPNL) – 1990 to 2017 (limit 156.5) (Continued)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Full CNI (Entire Commercial Jet Fleet)	**154.7**	**154.1**	**153.2**	**152.7**	**153.4**	**153.2**	**152.6**	**152.7**	**152.9**	**152.3**
Total Passenger Jets	153.6	152.9	151.8	151.3	152.2	152.1	151.4	151.5	151.9	151.1
Total Cargo Jets	148.2	147.8	147.4	147.1	147.0	146.6	146.5	146.4	146.1	145.9
Total Daytime	149.5	149.0	148.5	148.0	148.5	148.2	147.5	147.2	147.6	147.1
Total Nighttime	153.1	152.4	151.3	150.9	151.7	151.6	151.0	151.2	151.4	150.7
Total Stage 2 Jets	124.7	121.5	114.3	114.1	118.1	N/A	N/A	N/A	N/A	N/A
Total Stage 3 Jets	154.7	154.1	153.2	152.7	153.4	153.2	152.0	152.7	152.9	152.3
Daytime Stage 2	122.6	119.3	111.2	113.7	109.4	N/A	N/A	N/A	N/A	N/A
Nighttime Stage 2	120.5	117.3	111.4	103.2	117.5	N/A	N/A	N/A	N/A	N/A
Daytime Stage 3	149.5	149.0	148.5	148.0	148.5	148.2	147.5	147.2	147.6	147.1
Nighttime Stage 3	153.1	152.4	151.3	150.9	151.7	151.6	151.0	151.2	151.4	150.7
Passenger Jet Stage 2	124.2	116.3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Passenger Jet Stage 3	153.6	152.9	151.8	151.3	152.2	152.1	151.4	151.5	151.9	151.1
Cargo Jet Stage 2	114.8	119.9	114.3	114.1	118.1	NA	NA	NA	NA	NA
Cargo Jet Stage 3	148.2	147.8	147.4	147.1	147.0	146.6	146.5	146.4	146.1	145.9
Daytime Passenger	149.3	148.7	148.2	147.7	148.2	147.9	147.2	146.9	147.3	146.8
Nighttime Passenger	151.6	150.8	149.4	148.8	150.0	150.1	149.3	149.7	150.0	149.1
Daytime Cargo	137.5	137.1	137.0	136.2	135.7	135.8	135.5	135.8	135.8	135.2
Nighttime Cargo	147.8	147.4	147.0	146.8	146.7	146.2	146.1	146.0	145.6	145.5
Daytime Passenger Stage 2	122.3	115.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Daytime Passenger Stage 3	149.2	148.7	148.2	147.7	148.2	147.9	147.2	146.9	147.3	146.8
Nighttime Passenger Stage 2	119.8	110.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Nighttime Passenger Stage 3	151.6	150.8	149.4	148.8	150.0	150.1	149.3	149.7	150,.0	149.1
Daytime Cargo Stage 2	111.1	117.3	111.2	113.7	109.4	N/A	N/A	N/A	N/A	N/A
Daytime Cargo Stage 3	137.5	137.0	137.0	136.1	135.7	135.8	135.5	135.8	135.8	135.2
Nighttime Cargo Stage 2	112.3	116.4	111.4	103.2	117.5	N/A	N/A	N/A	N/A	N/A
Nighttime Cargo Stage 3	147.8	147.4	147.0	146.8	146.7	146.2	146.1	146.0	145.6	145.5

Table H-12 Cumulative Noise Index (EPNL) – 1990 to 2017 (limit 156.5) (Continued)

	2010	2011	2012	2013	2014[1]	2015	2016	2017	Change 2016 to 2017
Full CNI (Entire Commercial Jet Fleet)	**151.9**	**152.1**	**152.2**	**152.3**	**152.9**	**152.7**	**152.6**	**153.1**	**0.5**
Total Passenger Jets	150.9	150.6	151.3	151.4	151.7	152.0	152.0	152.6	0.6
Total Cargo Jets	145.1	146.7	144.9	145.1	144.5	144.2	143.8	143.4	(0.4)
Total Daytime	146.8	146.9	147.0	147.0	147.1	147.2	147.0	147.5	0.5
Total Nighttime	150.3	150.6	150.6	150.8	151.0	151.2	151.2	151.7	0.5
Total Stage 2 Jets	113.6	110.8	104.9	111.3	N/A	N/A	N/A	NA	N/A
Total Stage 3 Jets	151.9	152.1	152.2	152.3	152.5	152.7	152.6	153.1	0.5
Daytime Stage 2	103.6	N/A	104.9	101.4	N/A	N/A	N/A	NA	N/A
Nighttime Stage 2	113.1	110.8	N/A	110.8	N/A	N/A	N/A	NA	N/A
Daytime Stage 3	146.8	146.9	147.0	147.0	147.1	147.2	147.0	147.5	0.5
Nighttime Stage 3	150.3	150.6	150.6	150.8	151.0	151.2	151.2	151.7	0.5
Passenger Jet Stage 2	N/A	N/A	104.9	101.4	N/A	N/A	N/A	NA	N/A
Passenger Jet Stage 3	150.9	150.6	151.3	151.4	151.7	152.0	152.0	152.6	0.6
Cargo Jet Stage 2	113.6	110.8	N/A	110.8	N/A	N/A	N/A	NA	N/A
Cargo Jet Stage 3	145.1	146.7	144.9	145.1	144.5	144.2	143.8	143.4	(0.4)
Daytime Passenger	146.6	146.5	146.8	146.8	146.9	147.0	146.8	147.3	0.5
Nighttime Passenger	149.0	148.5	149.4	149.6	150.0	150.3	150.4	151.1	0.7
Daytime Cargo	134.5	136.6	134.0	133.6	134.9	134.4	133.8	133.9	0.1
Nighttime Cargo	144.7	146.3	144.5	144.8	144.0	143.7	143.4	142.8	(0.6)
Daytime Passenger Stage 2	N/A	N/A	104.9	101.4	N/A	N/A	N/A	NA	N/A
Daytime Passenger Stage 3	146.6	146.5	146.8	146.8	146.9	147.0	146.8	147.3	0.5
Nighttime Passenger Stage 2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	NA	N/A
Nighttime Passenger Stage 3	149.0	148.5	149.4	149.6	150.0	150.3	150.4	151.1	0.7
Daytime Cargo Stage 2	103.6	N/A	N/A	N/A	N/A	N/A	N/A	NA	N/A
Daytime Cargo Stage 3	134.4	136.6	134.0	133.6	134.9	134.4	133.8	133.9	0.1
Nighttime Cargo Stage 2	113.1	110.8	N/A	110.8	N/A	N/A	N/A	NA	N/A
Nighttime Cargo Stage 3	144.7	146.3	144.5	144.8	144.0	143.7	143.4	142.8	(0.6)

Source: HMMH, 2018.

Notes: CNI – cumulative noise index; EPNL - Effective Perceived Noise Level; N/A – not available.
General aviation (GA) aircraft and non-jet aircraft are not included in the calculations. Negative numbers are shown in parentheses ( ).

1 The 2014 CNI analysis contained errors which appeared in the *2014 EDR* and *2015 EDR*. The analysis has been corrected and the numbers presented in this table have been updated.

Residential Sound Insulation Program (RSIP)

In 2017, no new dwelling units received sound insulation from Massport, with a total of 5,467 residential buildings and 11,515 dwelling units that have been sound insulated since 1986 when the program was first implemented. **Table H-13** lists the yearly progress of this mitigation effort.

Following FAA's approval of model adjustments based on the effects of terrain (discussed in the *1999 ESPR*), Massport submitted, and the New England Region of FAA approved, a new sound insulation program. The revised contour, approved for a two-year period beginning in 1999, included dwelling units in East Boston, South Boston, and Winthrop that previously had not been eligible for insulation. Massport received notice of FAA funding for $5 million. Subsequently, Massport updated its program contour, first with the *2001 EDR* contour and more recently with the Logan Airside Improvements Project approved contour. These updates have allowed Massport to continue the program with additional funds every year since 1999. The Logan Airside Improvements Project update takes into account runway use changes due to the new Runway 14-32 which opened in late November 2006. The Logan Airside Improvements Project update expands the focus of the sound insulation program into Chelsea to satisfy the mitigation commitments made in the Airside Improvements Program Record of Decision (ROD). Massport has also utilized a program where they have contacted property owners that are still eligible within the RSIP boundaries that had previously declined to participate. Owners have been offered a second chance to participate in the program.

Table H-13 Residential Sound Insulation Program (RSIP) Status (1986-2017)

Construction Year	Residential Buildings[1]	Dwelling Units[2]
1986	4	8
1987	43	51
1988	102	159
1989	94	133
1990	121	200
1991	175	360
1992	197	354
1993	318	654
1994	310	542
1995	372	753
1996	323	577
1997	364	808
1998	328	806
1999	330	718
2000	195	601
2001	260	278
2002	205	354
2003	230	468
2004	320	791
2005	314	471
2006	286	827
2007	160	548
2008	94	388
2009	111	287
2010	56	83
2011	62	114
2012[3]	0	0
2013	45	76
2014	48	106
2015	0	0
2016	0	0
2017	0	0
Total	**5,467**	**11,515**

Source: Massport, 2017.
1 Includes multiple units.
2 Individual units.
3 Federal funding was delayed in 2012.

Table H-14 provides a list of all schools that have been treated under Massport's sound insulation program. To date, Massport has provided sound insulation to 36 schools at a cost of over $8 million.

Table H-14 Schools Treated Under Massport Sound Insulation Program

Boston:	
East Boston	**Winthrop**
East Boston High	Winthrop Jr. High School
St. Mary's Star of the Sea	E. B. Newton
St. Dominic Savio High	A. T. Cummings (Ctr.) School
St. Lazarus	*3 Winthrop Schools*
James Otis	
Samuel Adams	
Curtis Guild	**Revere**
Dante Alighieri	Beachmont School
P.J. Kennedy	*1 Revere School*
Donald McKay	
Hugh Roe O'Donnell	
E Boston Central Catholic	**Chelsea**
Manassah Bradley	Shurtleff School
13 East Boston Schools	Williams School
	St. Rose Elementary
South Boston	St. Stanislaus
St. Augustine	Chelsea High School
Cardinal Cushing	*5 Chelsea Schools*
Patrick Gavin	
St. Bridgid's	**36 Total Schools**
Oliver Hazard Perry	
Condon School	
6 South Boston Schools	
Roxbury and Dorchester	
Samuel Mason	
Dearborn Middle	
Ralph Waldo Emerson	
Lewis Middle	
Nathan Hale Elem.	
Phillis Wheatley Elem.	
Davis Ellis Elem.	
Henry L. Higginson	
8 Roxbury and Dorchester Schools	
27 Total Boston Schools	

Source: Massport, 2015.

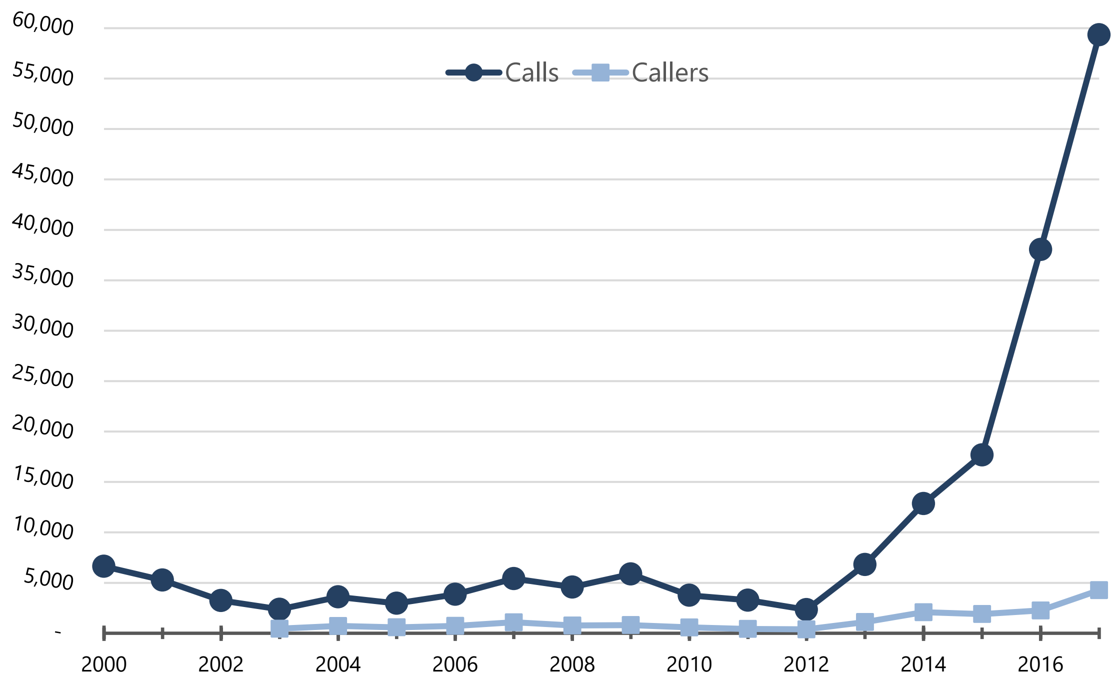
Noise Complaints

Table H-15 presents a detailed list by community of the total noise complaints made in 2017 and 2016, which can be filed either on Massport's Noise Complaint Line, through a form on Massport's website, or through the PublicVue flight track portal. The Noise Complaint Line provides individuals the ability to express their concerns about aviation noise (activities) or to ask questions regarding noise at Logan Airport. Callers ask a range of questions such as "Why is this runway in use?"; "What times do the planes stop flying?"; and "Was that aircraft off-course?"

The Noise Abatement Office (NAO) staff documents noise line complaints by obtaining information from the caller about the nature of the complaint, time of the occurrence, location of caller's residence, and the activity that was disturbed. The NAO uses the collected information to determine the probable activity responsible for the complaint and writes a letter report to the complainant. The letter includes the original complaint, a response that identifies the activity responsible for the call (arrivals, departures, run-up, etc.), meteorological information at the time of the call (a major factor in aviation activities), runways in use at the time of the call, and a notice that FAA will receive a copy of the report.

In 2017, Massport received 59,343 noise complaints from 95 communities (**Figure H-13)**, an increase from 38,045 complaints from 83 communities in 2016. The number of individual complainants increased to 4,269 callers in 2017 from 2,260 callers in 2016. The increase in complaints from 2016 to 2017 is 56 percent, and the increase in number of individual callers is almost 89 percent. In 2016, the average number of complaints per individual caller (the ratio of calls to callers) was 16.8. In 2017, this ratio decreased to an average 13.9 complaints per caller. Massport's website, http://www.massport.com/logan-airport/about-logan/noise-abatement/complaints/), provides for additional general questions and answers regarding the Noise Complaint Line. Part of the explanation of the increase numbers of calls is due to recent technological advances in both Massport's noise complaint phone system, online complaint tracking system and incorporation of third-party complaint applications, which have made it easier for community members to file a complaint and to receive information about particular noise events.

Figure H-13 Noise Complaint Line Calls and Callers by Year



Source: Massport

Table H-15 Noise Complaint Line Summary

	2016		2017		
Town Name	**Calls**	**Callers**	**Calls**	**Callers**	**Change in number of calls**
Acton	0	0	2	2	2
Allston	1	1	0	0	(1)
Andover	0	0	4	2	4
Arlington	1,968	87	2,252	137	284
Belmont	501	63	1,129	102	628
Beverly	4	4	15	4	11
Billerica	1	1	8	5	7
Boston	78	24	186	59	108
Braintree	12	5	29	4	17
Brewster	0	0	1	1	1
Brighton	0	0	2	2	2
Brookline	5	4	4	3	(1)
Burlington	0	0	22	14	22
Cambridge	2,154	128	1,657	211	(497)
Canton	20	6	19	7	(1)
Carlisle	0	0	3	1	3
Charlestown	25	13	31	16	6

Table H-15 Noise Complaint Line Summary (Continued)

	2016		2017		
Town Name	**Calls**	**Callers**	**Calls**	**Callers**	**Change in number of calls**
Chelmsford	1	1	1	1	0
Chelsea	146	39	428	117	282
Cohasset	125	8	214	13	89
Danvers	9	4	0	0	(9)
Dedham	6	4	4	3	(2)
Dorchester	326	36	519	60	193
Dover	0	0	10	3	10
Dunstable	0	0	3	1	3
Duxbury	1	1	1	1	0
East Boston	203	61	312	97	109
Easton	0	0	1	1	1
Essex	1	1	0	0	(1)
Everett	84	25	335	118	251
Framingham	6	2	2	2	(4)
Gloucester	0	0	10	2	10
Groton	0	0	88	1	88
Groveland	1	1	1	1	0
Hamilton	42	15	53	22	11
Hanover	0	0	3	2	3
Hingham	68	18	67	27	(1)
Holbrook	11	2	10	2	(1)
Hull	1,266	220	1,500	175	234
Hyde Park	190	8	132	20	(58)
Ipswich	10	5	104	28	94
Jamaica Plain	434	76	2,016	274	1,582
Lincoln	0	0	114	1	114
Littleton	11	1	0	0	(11)
Lowell	0	0	1	1	1
Lynn	323	15	276	10	(47)
Lynnfield	2	2	1	1	(1)
Malden	10	7	1,987	96	1,977
Manchester	6	2	1	1	(5)
Marblehead	14	4	18	4	4
Marshfield	3	3	13	6	10
Mattapan	2	2	4	2	2
Medfield	1	1	1	1	0
Medford	1,784	177	7,856	745	6,072
Melrose	9	4	5	2	(4)

Table H-15 Noise Complaint Line Summary (Continued)

	2016		2017		
Town Name	**Calls**	**Callers**	**Calls**	**Callers**	**Change in number of calls**
Middleton	3	2	4	2	1
Millis	113	2	132	1	19
Milton	21,796	466	23,940	486	2,144
Nahant	339	12	117	18	(222)
Natick	10	1	1	1	(9)
Needham	51	5	36	8	(15)
Newton	44	19	319	25	275
North End	1	1	0	0	(1)
Norwell	13	1	7	4	(6)
Norwood	0	0	1	1	1
Peabody	72	6	61	6	(11)
Pembroke	4	2	5	1	1
Quincy	28	16	44	33	16
Randolph	7	3	3	2	(4)
Reading	0	0	13	9	13
Rehoboth	1	1	0	0	(1)
Revere	87	33	134	47	47
Roslindale	588	103	2,094	203	1,506
Rowley	1	1	0	0	(1)
Roxbury	286	40	891	36	605
Salem	26	8	6	3	(20)
Saugus	4	1	4	2	0
Scituate	37	10	8	6	(29)
Sharon	2	1	3	3	1
Shirley	0	0	1	1	1
Shrewsbury	1	1	0	0	(1)
Somerville	1,804	153	3,762	309	1,958
South Boston	577	42	1,792	78	1,215
South End	294	40	786	135	492
Stoneham	24	6	2	2	(22)
Stoughton	21	2	21	3	0
Sudbury	116	1	105	1	(11)
Swampscott	0	0	4	3	4
Topsfield	0	0	2	2	2
Waban	0	0	1	1	1
Wakefield	25	2	47	7	22
Waltham	1	1	6	5	5
Watertown	265	38	818	65	553

Table H-15 Noise Complaint Line Summary (Continued)

	2016		2017		
Town Name	**Calls**	**Callers**	**Calls**	**Callers**	**Change in number of calls**
Wellesley	1	1	1	1	0
Wenham	416	9	116	11	(300)
West Roxbury	170	21	1,104	56	934
Weston	1	1	0	0	(1)
Westwood	56	4	157	3	101
Weymouth	125	5	92	5	(33)
Whitman	0	0	2	1	2
Wilmington	1	1	3	3	2
Winchester	489	16	895	111	406
Winthrop	271	96	293	128	22
Woburn[1]	10	5	55	30	45
Total	**38,045**	**2,260**	**59,343**	**4,269**	**21,298**

Source: Massport, HMMH 2017.
Note: Negative numbers are shown in parentheses ( ).
1 Woburn data omitted in *2016 EDR* documentation; included here with totals corrected.

AEDT Correspondence

Massport engaged in an extensive process with FAA New England Region and the FAA Office of Environment and Energy (AEE-100) upon the release of AEDT. This process was to develop and gain concurrence on the use of Logan Airport specific modifications to the AEDT model and inputs. Meetings and discussion were held in 2016 and 2017 to determine what adjustments Massport could make to the AEDT model to account for Logan Airport's unique terrain. The complete set of correspondence which determined the AEDT adjustments for the 2016 DNL contours is provided in the *2016 EDR Appendix H*.

In August 2017, the FAA expressed concurrence, in principal, with two of Massport's four requested adjustments; that response letter is included below. For the 2017 noise modeling, Massport applied the two allowed adjustments, using the same methodology as 2016.

FAA Response (dated August 18, 2017) to AEDT Non-Standard Modeling Request

U.S. Department of Transportation
Federal Aviation Administration

Office of Environment and Energy

800 Independence Ave., S.W.
Washington, D.C. 20591

8/18/2017

Richard Doucette
Airports Division
Federal Aviation Administration, New England Region
1200 District Avenue
Burlington, MA 01803

Dear Richard,

The Office of Environment and Energy (AEE) has received the memo dated July 12th 2017, requesting FAA-AEE concurrence on non-standard AEDT modeling adjustments and inputs for noise modeling at Boston Logan International Airport as submitted by HMMH on behalf of Massachusetts Port Authority (HMMH Project Number 307500.003.004).

As highlighted in the request and understood by FAA-AEE, this memo requests concurrence and not approval for the non-standard modeling elements presented. A specific project requiring FAA review and use of the proposed non-standard elements has not been identified; therefore any findings of concurrence detailed in this response are for reference only as they relate to a level of understanding and capability with AEDT 2c SP2 and at the time of this response.

Any findings of concurrence detailed here are therefore subject to change under future updates to AEDT or any relevant technical or policy updates. Formal approval of any proposed non-standard elements will require additional project specific approval by FAA-AEE.

Section 2.1 Overwater Adjustment: Adjustments to departure Noise-Power-Distance curves for Start-of-Takeoff Roll (STR) noise to emulate acoustic overwater propagation.

AEE **DOES NOT CONCUR** with the proposed process as it is not adequately supported through the presentation of a defensible technical analysis or current research findings and is therefore not suitable for use with AEDT.

Section 2.2 Hill Effects Adjustment: Contour grid adjustments to emulate ground propagation effects in the presence of terrain.

AEE **DOES NOT CONCUR** with the proposed process as it is not adequately supported through the presentation of a defensible technical analysis or current research findings and is therefore not suitable for use with AEDT.

Section 2.3 Stage Length Selection: Modified Stage Lengths Selection Based on US DOT BTS T100 Data

AEE **CONCURS IN PRINCIPAL** with the use of US DOT BTS T100 data as a method to evaluate stage length selections. However, due to the specific nature of matching annual flight operations to T100 data, any approval would still require evaluation on a case by cases basis. AEE agrees that the T100 data is a reasonable reference to complete this review, but cautions that since the data may only provide supporting information for existing conditions that there could be concerns when applying any proposed stage length modification assumptions to future year modeling cases. Further supporting information may therefore be required for proposed use with future case modeling conditions. In order to ensure consistent stage length considerations for all modeling cases, it remains AEEs recommendation to continue use of the industry standard city-pair method.

Section 2.4 Non-standard Weather Data: Average Calendar Year 2015 Weather Data Parameters for Temperature, Pressure and Relative Humidity from the National Climatic Data Center (NCDC) are requested for use with Calendar Year 2015 modeling inputs.

AEE **CONCURS IN PRINCIPAL** with the use of the NCDC data to determine appropriate annual average weather data parameters. Please note however that the format of weather parameter inputs for AEDT has been updated compared with INM. Each of the following parameters, in the units specified, must be provided when a formal review for approval is requested:

Temperature (°F)
Pressure (millibars)
Sea Level Pressure (millibars)
Relative humidity (%)
Dew Point (°F)
[Average] Wind Speed (knots)

As described above please understand that this memo provides a record of concurrence and not approval for the non-standard modeling elements presented; and that a specific project, AEDT model version and timeframe would need to be identified before formal approval could be granted. Findings of concurrence are therefore for reference only as they relate to a level of understanding and capability with AEDT 2c SP2 and at the time of this response.

Sincerely,

Rebecca Cointin
Manager
AEE/Noise Division

cc: Jim Byers, Jean Wolfers-Lawrence (APP)

Flight Track Monitoring Report

As part of its ongoing commitment to mitigate noise at Logan Airport, Massport has undertaken evaluating the flight tracks of turbojet aircraft engaged in the implementation of established FAA noise abatement procedures. As is true for any airport operator, however, Massport has no authority to control where individual aircraft fly. That remains the responsibility of FAA, while the individual pilots are responsible for safely executing FAA's instructions. The flight procedures, which are used by the Air Traffic Control (ATC) staff at Boston Tower to achieve desired noise abatement tracks, are contained in FAA's Tower Order (BOS TWR 7040.1).

This is the sixteenth annual report for flight track monitoring. Prior to 2002, Massport had issued semi-annual reports, an outgrowth of the Flight Track Monitoring Program study. That study was contained in the *Generic Environmental Impact Report* filed with Massachusetts Environmental Policy Act (MEPA) in July 1996 and was the subject of two Community Working Group workshops in September and October 1996. The fifteenth annual flight and monitoring report was published in Appendix H, *Noise Abatement* in the *2016 EDR*. The information for 2016 is repeated in this report for reference. The period covered by this *2017 ESPR* is January 1, 2017 through December 31, 2017.

The purpose of the ongoing monitoring program is to identify any systematic changes in flight tracks that may occur and to reduce flight track dispersion, where appropriate. The next report will cover the period January 1, 2018 through December 31, 2018 and will be included in the next EDR.

FAA Air Traffic Control (ATC) Procedures

FAA Tower Order BOS TWR 7040.1 entitled "Noise Abatement" describes the series of noise abatement policies, rules, regulations, and the procedures to be followed by FAA air traffic controllers in meeting their designated responsibilities to be "a good neighbor, while meeting our operational objectives/ responsibilities to the National Airspace System." Section 7.a.3 of the Order, subtitled "Turbojet Departure Noise Abatement Procedures," states that all turbojet departures shall be issued the Standard Instrument Departure (SID) procedure appropriate for the departure runway. Logan Airport has ten published SIDs; nine area navigation (RNAV) SIDs and one conventional SID.

The conventional SID is for aircraft that are not equipped to fly RNAV procedures. The conventional SID uses terms such as "BOS 2 DME" to indicate where aircraft should turn. Here, BOS refers to an aid to navigation known as the BOSTON VORTAC, a radio beacon physically located on Logan Airport near the eastern shoreline between the ends of Runways 27 and 33L (see **Figure H-14**). DME refers to "Distance Measuring Equipment," a co-located aid to navigation that provides pilots with a cockpit display of the number of nautical miles that the aircraft is from the designated radio beacon. Thus, BOS 2 DME means an aircraft should be two nautical miles away from the BOS. Pilots are then "vectored" or assigned to fly a magnetic heading given by and at the discretion of FAA air traffic controller to maintain the safe separation of aircraft. All altitudes in feet listed below (unless otherwise noted) are in mean sea level (MSL) and i indicate the aircraft altitude used both by the pilot in the cockpit and the air traffic controller on the ground.

During 2010, several of the conventional-only (or radar vector) and RNAV procedures from the *Boston Logan Airport Noise Study Categorical Exclusion* (CATEX)[17] were implemented. There are eight RNAV procedures for departures from Logan Airport. These eight procedures are used by aircraft departing Runways 4R, 9, 15R, 22L, 22R, 27, and 33L (Runways 27 and 33L were added in 2014). These procedures primarily affected departures flying over the North and South shores and were designed to increase the amount of jet traffic crossing back over land above 6,000 feet to minimize noise impacts to communities. A ninth RNAV procedure, which is used by Runway 27, has been modified several times.

Figure H-14 presents the gates used in the analysis for the Flight Track Monitoring Report. These gates are virtual vertical planes, which are used in the analysis to capture the aircraft flight paths. The gates are defined using a geographic coordinate for each end of the gate along with a floor and a ceiling altitude. The gates also capture direction of flights (in or out). The edges of each gate in **Figure H-14** point in the direction that the aircraft is coming from. This information is used to evaluate the performance of the flight procedures off each runway end and is presented below. **Figure H-14** also displays the BOS location, which is used for the distance measurements for the conventional procedures.

The RNAV procedures are still captured by the original flight track monitoring gates. Traffic crossing over the North Shore passes through the Marblehead Gate and traffic passing over the South Shore passes through the Hull 2, Hull 3, and Cohasset Gates. Turbojets departing Runway 27 on the RNAV pass through the Runway 27 gates and the new Runway 33L RNAV flight tracks still pass between the Somerville and Everett gates as expected.

17 Federal Aviation Administration (FAA) *Boston Logan Airport Noise Study Categorical Exclusion Record of Decision* (CATEX ROD), Issued October 16, 2007.

Figure H-14 Logan Airport Flight Track Monitor Gates

Statistical Analyses of Flight Tracks - Runway 4R

The Nahant Gate (**Figure H-14**) monitors aircraft after the first turn at 4 DME. The Swampscott and Marblehead Gates monitor northbound shoreline crossings, while the Hull 2, Hull 3, and Cohasset Gates monitor southbound shoreline crossings.

Tables H-16a and **H-16b** show that Runway 4R departures for 2017 were concentrated, with 99.5 percent "over the Causeway," about 0.1 percent over the south end of the gate, and about 0.5 percent over the north end of the gate, the same percentages observed for 2016.

Table H-16a Runway 4R Nahant Gate Summary for 2016

	Number of Tracks Through Gate Segment	Percentage of Tracks Through Gate Segment
North End of Gate	31	0.5%
Over Causeway	6,814	99.5%
South End of Gate	5	0.1%
Total	**6,850**	**100.0%**

Source: Massport, HMMH 2017.

Table H-16b Runway 4R Nahant Gate Summary for 2017

	Number of Tracks Through Gate Segment	Percentage of Tracks Through Gate Segment
North End of Gate	18	0.5%
Over Causeway	3,798	99.5%
South End of Gate	3	0.1%
Total	**3,819**	**100.0%**

Source: Massport, HMMH 2018.

Table H-17a and **H-17b** show how many of the shoreline crossings from Runway 4R were above 6,000 feet. For 2017, 96.1 percent of the flights were above 6,000 feet compared to 98.3 percent in 2016. The Swampscott gate had the lowest percent of flights above 6,000 feet in 2017, at only 16.9 percent, after showing an unusually high 97.9 percent in 2016. However, the number of flights through the Swampscott gate decreased to 83 in 2017, down from 234 in 2016. The crossing percentage for this gate is historically lower than most gates due to its proximity to the Nahant gate itself. As seen in **Figure H-14**, the Swampscott gate is adjacent to the Nahant gate and aircraft would have to climb very quickly to be above 6,000 feet when crossing the Swampscott gate.

Table H-17a Runway 4R Shoreline Crossings Above 6,000 Feet for 2016

	Number of Tracks Through Gate	Number Above 6,000 ft	Percentage Above 6,000 ft
Swampscott Gate	234	229	97.9%
Marblehead Gate	2,532	2,531	100.0%
Hull 2 Gate	82	18	22.0%
Hull 3 Gate	386	354	91.7%
Cohasset Gate	3,032	3,030	99.9%
Total	**6,266**	**6,162**	**98.3%**

Source: Massport, HMMH 2017.

Table H-17b Runway 4R Shoreline Crossings Above 6,000 Feet for 2017

	Number of Tracks Through Gate	Number Above 6,000 ft	Percentage Above 6,000 ft
Swampscott Gate	83	14	16.9%
Marblehead Gate	1,538	1,509	98.1%
Hull 2 Gate	160	160	100.0%
Hull 3 Gate	608	07	99.8%
Cohasset Gate	124	124	100.0%
Total	**2,513**	**2,414**	**96.1%**

Source: Massport, HMMH 2018.

Statistical Analyses of Flight Tracks - Runway 9

The Winthrop 1 and Winthrop 2 gates (**Figure H-14**) monitor early turns for departures off Runway 9. The Revere, Swampscott, or Marblehead gates monitor northbound shoreline crossings, while the Hull 2, Hull 3, or Cohasset gates monitor southbound shoreline crossings.

Tables H-18a and **H-18b** show how many tracks turned prior to the BOS 2 DME. Northbound turns before BOS 2 DME pass through the Winthrop 1 Gate. Southbound traffic would pass through the Winthrop 2 Gate. In 2016, there were a total of 52 such turns and in 2017, 65 tracks crossed these gates. The compliance rate for avoiding the early turns was 99.9% in 2016 and 99.8% in 2017.

Table H-18a Runway 9 Gate Summary — Winthrop Gates 1 and 2 for 2016

	Number of Tracks Through Gate	Percent Turning Before BOS 2 DME
Winthrop 1 Gate	18	<0.1%
Winthrop 2 Gate	34	0.1%
Neither gate	55,830	99.9%
Total	**55,882**	**100%**

Source: Massport, HMMH 2017.
Note: DME – distance measuring equipment.

Table H-18b Runway 9 Gate Summary — Winthrop Gates 1 and 2 for 2017		
	Number of Tracks Through Gate	**Percent Turning Before BOS 2 DME**
Winthrop 1 Gate	37	0.1%
Winthrop 2 Gate	28	0.1%
Neither gate	43,771	99.8%
Total	**43,836**	**100%**

Source: Massport, HMMH 2018.
Note: DME – distance measuring equipment.

Table H-19a and **H-19b** indicate that 99.5 percent of Runway 9 departures were above 6,000 feet when crossing the shoreline in 2017, compared with 99.4 percent in 2016. In both years, approximately 65 percent of aircraft departing Runway 9 that cross back over the shoreline do so over the South Shore[18], as opposed to about 35 percent over the North Shore.

The percentages above 6,000 feet remained fairly constant from 2016 to 2017, with the Revere gate (36.5 percent in 2016 to 72.7 percent in 2017) appearing to be the most variable, but with only 33 flights through that gate in the entire year (less than one per week, on average).

Table H-19a Runway 9 Shoreline Crossings Above 6,000 Feet for 2016			
	Number of Tracks Through Gate	**Number Above 6,000 ft**	**Percentage Above 6,000 ft**
Revere Gate	63	23	36.5%
Swampscott Gate	537	495	92.2%
Marblehead Gate	12,489	12,471	99.9%
Hull 2 Gate	2,379	2,367	99.5%
Hull 3 Gate	6,052	5,971	98.7%
Cohasset Gate	15,497	15,484	99.9%
Total	**37,017**	**36,811**	**99.4%**

Source: Massport, HMMH 2017.

18 The 2016 EDR erroneously stated “The number of Runway 9 departures crossing back over the South Shore increased from 33,807 in 2015 to 36,811 in 2016.” In reality, only 23,822 of those departures crossed over the south shore: through the Hull or Cohasset gates. In 2015 that number was 21,843.

Table H-19b Runway 9 Shoreline Crossings Above 6,000 Feet for 2017

	Number of Tracks Through Gate	Number Above 6,000 ft	Percentage Above 6,000 ft
Revere Gate	33	24	72.7%
Swampscott Gate	470	435	92.6%
Marblehead Gate	10,645	10,628	99.8%
Hull 2 Gate	1,656	1,648	99.5%
Hull 3 Gate	3,393	3,327	98.1%
Cohasset Gate	15,441	15,427	99.9%
Total	**31,638**	**31,489**	**99.5%**

Source: Massport, HMMH 2018.

Statistical Analyses of Flight Tracks - Runway 15R

After takeoff, Runway 15R departures turn left approximately 30 degrees to avoid Hull, head out over Boston Harbor, and return over the shore through the Swampscott and Marblehead Gates (**Figure H-14**) to the north, or through the Hull 2, Hull 3, and Cohasset Gates to the south. The initial turn and success rate in avoidance of Hull overflights is shown, combined with departures from Runways 22L and 22R, in the next section in **Tables H-22a** and **H-22b**.

Tables H-20a and **H-20b** indicate that over 99 percent of Runway 15R departures were above 6,000 feet when crossing the shoreline in both 2016 and 2017. While compliance at the Swampscott, Marblehead, and Cohasset gates at close to 98 percent or better for both 2016 and 2017, the proportion of flights over 6,000 feet at the Hull 3 gate[19] fell from 92.1 percent in 2016 to 89.1 percent in 2017. Very few departures from Runway 15R cross back over the Hull 2 gate.

Table H-20a Runway 15R Shoreline Crossings Above 6,000 Feet for 2016

	Number of Tracks Through Gate	Number Above 6,000 ft	Percentage Above 6,000 ft
Swampscott Gate	234	229	97.9%
Marblehead Gate	2,532	2,531	100.0%
Hull 2 Gate	16	13	81.3%
Hull 3 Gate	382	352	92.1%
Cohasset Gate	3,015	3,013	99.9%
Total	**6,179**	**6,138**	**99.3%**

Note: This table differs from that included in *2016 EDR* due to removal of gate crossings in opposite direction.
Source: Massport, HMMH 2017.

19 The 2016 EDR contained the text "the proportion of flights over 6,000 feet at the Hull 2 gate fell from 94.3 percent in 2015 to 91.7 percent in 2016, and only 22 percent of flights crossed the Hull 1 gate over 6,000 feet in 26, compared to perfect compliance for 2015" which mis-identified the gate names, accidentally called the year 26 instead of 2016, and included opposite direction gate crossings in its analysis.

Table H-20b Runway 15R Shoreline Crossings Above 6,000 Feet for 2017

	Number of Tracks Through Gate	Number Above 6,000 ft	Percentage Above 6,000 ft
Swampscott Gate	280	277	98.9%
Marblehead Gate	2,771	2,770	100.0%
Hull 2 Gate	16	16	100.0%
Hull 3 Gate	266	237	89.1%
Cohasset Gate	2,246	2,242	99.8%
Total	**5,579**	**5,542**	**99.3%**

Source: Massport, HMMH 2018.

Statistical Analyses of Flight Tracks - Runways 22R and 22L

The Squantum 2 and Hull 1 Gates (**Figure H-14**) are used to monitor the turn to 140 degrees over Boston Harbor and then passage north of Hull. The shoreline gates are used to monitor shoreline crossings, as for Runways 4R, 9, and 15R above.

Tables H-21a and **H-21b** show the dispersion of the jet departures from Runways 22R and 22L as they pass through the Squantum 2 Gate. The first segment of the 27,000-foot wide gate is the northernmost segment and is primarily over Boston Harbor. The subsequent segments extend southward toward Quincy. The percentage of tracks passing through the first two segments of this gate, representing compliance with the noise abatement procedures, increased from 88.8 percent in 2016 to 93.2 percent in 2017.

Table H-21a Runways 22R and 22L Squantum 2 Gate[1] Summary for 2016

	Number of Tracks Through Gate Segment	Percentage of Tracks Through Gate Segment
0 - 12,000 ft	870	1.8%
12,000 - 14,000 ft	41,218	87.0%
14,000 - 21,000 ft	5,247	11.1%
21,000 - 27,000 ft	36	0.1%
Total	**47,371**	**100.0%**

Source: Massport, HMMH 2017.

Notes:

1 The 27,000-foot wide Squantum 2 Gate is divided into four segments, identified in this table by distance from the northernmost point.

Table H-21b Runways 22R and 22L Squantum 2 Gate Summary for 2017

	Number of Tracks Through Gate Segment	Percentage of Tracks Through Gate Segment
0 - 12,000 ft	4,425	8.9%
12,000 - 14,000 ft	42,067	84.3%
14,000 - 21,000 ft	3,361	6.7%
21,000 - 27,000 ft	66	0.1%
Total	**49,919**	**100.0%**

Source: Massport, HMMH 2018.
1 The 27,000-foot wide Squantum 2 Gate is divided into four segments, identified in this table by distance from the northernmost point.

Massport uses the Hull 1 Gate to monitor departures from Runways 22R and 22L as well as from Runway 15R as they make their initial turn over Boston Harbor. **Tables H-22a** and **H-22b** show that the percent of tracks crossing north of the Hull peninsula as they passed through the Hull 1 Gate remained at 98.7 percent for both 2016 and 2017.

Table H-22a Runways 15R, 22R, and 22L Hull 1 Gate Summary for 2016

	Number of Tracks Through Gate Segment	Percentage of Tracks Through Gate Segment
North of Hull Peninsula	57,059	98.7%
Over Hull	775	1.3%
Total	**57,834**	**100.0%**

Source: Massport, HMMH 2017.

Table H-22b Runways 15R, 22R, and 22L Hull 1 Gate Summary for 2017

	Number of Tracks Through Gate Segment	Percentage of Tracks Through Gate Segment
North of Hull Peninsula	58,420	98.7%
Over Hull	764	1.3%
Total	**59,184**	**100.0%**

Source: Massport, HMMH 2018.

Tables H-23a and **H-23b** indicate the percent of Runway 22R and 22L departures that were above 6,000 feet when crossing the shoreline. Compliance was above 97.0 percent for the Swampscott, Marblehead, Hull 3, and Cohasset gates for both years. The Hull 2 gate and the Revere gate which are the closest to the airport on the south and north shores, respectively, have the fewest crossings and also the lowest compliance rates. Overall compliance in crossing back over the shoreline at 6,000 feet altitude or higher was 99.8 percent for both 2016 and 2017.

Table H-23a Runways 22R and 22L Shoreline Crossings Above 6,000 Feet for 2016

	Number of Tracks Through Gate	Number Above 6,000 ft	Percentage Above 6,000 ft
Revere Gate	106	95	89.6%
Swampscott Gate	951	951	100.0%
Marblehead Gate	12,250	12,245	100.0%
Hull 2 Gate	24	21	87.5%
Hull 3 Gate	2,082	2,035	97.7%
Cohasset Gate	18,017	18,006	99.9%
Total	**33,430**	**33,353**	**99.8%**

Source: Massport, HMMH 2017.
Note: This table differs from that included in 2016 EDR due to removal of gate crossings in opposite direction.

Table H-23b Runways 22R and 22L Shoreline Crossings Above 6,000 Feet for 2017

	Number of Tracks Through Gate	Number Above 6,000 ft	Percentage Above 6,000 ft
Revere Gate	58	55	94.8%
Swampscott Gate	797	796	99.9%
Marblehead Gate	12,645	12,639	100.0%
Hull 2 Gate	36	33	91.7%
Hull 3 Gate	1,608	1,565	97.3%
Cohasset Gate	19,978	19,963	99.9%
Total	**35,122**	**35,051**	**99.8%**

Source: Massport, HMMH 2018.

Statistical Analyses of Flight Tracks - Runway 27

On September 15, 1996, FAA implemented a new departure procedure for Runway 27 called the WYLYY RNAV procedure. In accordance with the provisions of the ROD issued for the Runway 27 Environmental Impact Statement, Massport has been providing on-going radar flight track data and analysis to FAA with respect to the procedure.

In 2012, for the first time since 1997 when flight track monitoring began, each gate (Gates A through E) averaged over 68 percent for every month the Airport had all runways open and for the annual average. The percent of flight tracks through all gates (a number tracked but not required per the 1996 ROD) rounded up to 68 percent for the last two months of 2011 and continued for all of 2012. FAA had discussed these data internally and concluded that acceptable flight track dispersion had been achieved and that no subsequent action by FAA is required per the 1996 ROD requirements.[20]

Massport continues to provide **Tables H-24a** and **H-24b** in the subsequent annual reports. **Table H-24a** presents the conformance results for the Runway 27 corridor for 2016 and **Table H-24b** for 2017. Gate A

20 Logan Airport Runway 27 Advisory Committee Meeting - January 23, 2012 meeting minutes.

is closest to the airport, with each subsequently labeled gate further from the runway. The gates increase in width as the distance is increased along the flight path, together forming a noise abatement corridor. A consistent percentage of traffic through each gate means that flights are not entering the corridor late or exiting the corridor too early. The average percentage of tracks through the entire corridor was 80.6 percent for 2016 and 84.9 percent for 2017. The average percent through each gate was 95.0 percent in 2016 and 94.0 percent for 2017.

Table H-24a Runway 27 Corridor Percent of Tracks Through Each Gate for 2016

Month	Total # of Tracks	Total # of Tracks Through All Gates	Percent of Tracks Through All Gates	Gate A	Gate B	Gate C	Gate D	Gate E	Average Percent Through Each Gate
				1,400[1]	2,200[1]	2,900[1]	4,700[1]	6,300[1]	
January	2,345	1,790	76.3%	1,849	2,256	2,297	2,313	2,299	93.9%
February	1,968	1,560	79.3%	1,618	1,908	1,930	1,950	1,930	94.9%
March	1,895	1,509	79.6%	1,569	1,821	1,851	1,856	1,857	94.5%
April	1,148	936	81.5%	972	1,115	1,130	1,127	1,106	94.9%
May	988	809	81.9%	828	944	959	968	969	94.5%
June	1,358	1,048	77.2%	1,085	1,311	1,332	1,370	1,378	95.4%
July	1,823	1,510	82.8%	1,565	1,746	1,782	1,795	1,793	95.2%
August	837	703	84.0%	721	810	825	829	840	96.2%
September	737	614	83.3%	630	708	720	733	742	95.9%
October	2,285	1,808	79.1%	1,860	2,204	2,239	2,246	2,252	94.5%
November	2,703	2,169	80.2%	2,226	2,609	2,645	2,674	2,670	94.9%
December	2,926	2,380	81.3%	2,448	2,808	2,862	2,897	2,886	95.0%
Average	**1,751**	**1,403**	**80.6%**	**1,448**	**1,687**	**1,714**	**1,730**	**1,727**	**95.0%**

Source: Massport, HMMH 2017.

1 The numbers below the gate names indicate the width of each gate, in feet.

Table H-24b Runway 27 Corridor Percent of Tracks Through Each Gate for 2017

Month	Total # of Tracks	Total # of Tracks Through All Gates	Percent of Tracks Through All Gates	Gate A 1,400[1]	Gate B 2,200[1]	Gate C 2,900[1]	Gate D 4,700[1]	Gate E 6,300[1]	Average Percent Through Each Gate
January	2,257	1,811	80.2%	1,843	2,012	2,060	2,079	2,074	89.2%
February	1,883	1,597	84.8%	1,635	1,797	1,844	1,858	1,847	95.4%
March	2,513	2,140	85.2%	2,198	2,428	2,468	2,485	2,467	95.9%
April	1,152	954	82.8%	983	1,063	1,082	1,089	1,082	92.0%
May	2,200	1,894	86.1%	1,925	2,113	2,168	2,183	2,179	96.1%
June	2,412	2,131	88.3%	2,165	2,331	2,381	2,397	2,386	96.7%
July	1,922	1,729	90.0%	1,762	1,860	1,901	1,909	1,898	97.1%
August	2,335	1,956	83.8%	1,994	2,109	2,169	2,186	2,170	91.0%
September	2,377	2,110	88.8%	2,149	2,292	2,348	2,367	2,353	96.8%
October	1,627	1,426	87.6%	1,452	1,569	1,593	1,613	1,605	96.3%
November	2,177	1,762	80.9%	1,795	1,991	2,038	2,048	2,036	91.0%
December	2,776	2,240	80.7%	2,314	2,533	2,589	2,610	2,573	90.9%
Average	**2,136**	**1,813**	**84.9%**	**1,851**	**2,008**	**2,053**	**2,069**	**2,056**	**94.0%**

Source: Massport, HMMH 2018.
1 The numbers below the gate names indicate the width of each gate, in feet.

Statistical Analyses of Flight Tracks — Runway 33L

The Somerville and Everett Gates (**Figure H-14**) extend from BOS 2 DME to BOS 5 DME and are used to monitor the departure procedure for Runway 33L. Turns to the left prior to the BOS 5 DME would pass through the Somerville Gate. Turns to the right prior to the BOS 5 DME would pass through the Everett Gate.

Tables H-25a and **H-25b** indicate that the percentage of tracks below 3,000 feet turning before BOS 5 DME was 1.5 percent in both 2016 and 2017. The total number of jet departure tracks from Runway 33L increased from 29,854 in 2016 to 40,347 in 2017.

Table H-25a Runway 33L Gates — Passages Below 3,000 Feet for 2016

	Number of Tracks Turning Before BOS 5 DME	Percentage of Tracks Turning Before BOS 5 DME
Everett Gate	214	0.7%
Somerville Gate	228	0.8%
Neither gate below 3,000 ft	29,402	98.5%
Total	**29,854**	**100.0%**

Source: Massport, HMMH 2017.
Notes: This table differs slightly from that included in *2016 EDR* due to removal of gate crossings in opposite direction.

Table H-25b Runway 33L Gates — Passages Below 3,000 Feet for 2017

	Number of Tracks Turning Before BOS 5 DME	Percentage of Tracks Turning Before BOS 5 DME
Everett Gate	262	0.6%
Somerville Gate	358	0.9%
Neither gate below 3,000 ft	39,727	98.5%
Total	**40,347**	**100.0%**

Source: Massport, HMMH 2018.

2017 DNL Levels for Census Block Group Locations

Table H-26 reports the DNL value for each Census block group down to the DNL 50 dB computed with AEDT. A Census Block Group represents the outer limits of a group of US Census Blocks. The Average Block DNL provided below is the arithmetic average of the DNL modeled at each US Census Block in that group. The DNL at centroid represents the DNL modeled at the geographic center of the US Census Block Group.

Table H-26 2017 DNL Levels for Census Block Group Locations within DNL 50 dB

U.S. Census 2010 Block Group					
Block Group ID	**Name**	**Population**	**Housing units**	**Average Block DNL**	**DNL at centroid**
250173561001	Arlington	795	368	50.7	50.7
250173561002	Arlington	1,460	681	51.2	51.2
250173561003	Arlington	855	400	50.1	50.3
250173563001	Arlington	1,239	604	50.6	50.2
250173567011	Arlington	1,316	610	51.2	51.3
250173567012	Arlington	1,131	606	50.1	50.2
250173567015	Arlington	621	341	50.0	50.1
250250105002	Back Bay	1,099	744	51.1	51.1
250250105003	Back Bay	992	674	51.5	51.5
250250106001	Back Bay	1,559	1,383	51.2	51.0
250250106002	Back Bay	1,299	942	51.6	51.7
250250107021	Back Bay	663	482	51.0	51.3
250250107022	Back Bay	775	465	50.2	50.2
250250107023	Back Bay	962	696	51.3	51.2
250250108011	Back Bay	664	354	50.8	50.8
250250108012	Back Bay	964	678	50.2	50.2
250250707001	Back Bay	1,161	644	52.7	52.7
250250708003	Back Bay	1,072	612	52.1	52.1
250250201011	Beacon Hill	767	480	51.2	51.2
250250201012	Beacon Hill	896	691	50.7	50.6

Table H-26	2017 DNL Levels for Census Block Group Locations within DNL 50 dB (Continued)				
U.S. Census 2010 Block Group					
Block Group ID	**Name**	**Population**	**Housing units**	**Average Block DNL**	**DNL at centroid**
250250201013	Beacon Hill	1,268	821	51.5	51.6
250250201014	Beacon Hill	1,262	822	51.0	51.0
250250202001	Beacon Hill	1,266	897	51.3	51.4
250250202002	Beacon Hill	1,259	847	51.0	51.0
250250202003	Beacon Hill	1,124	734	50.5	50.4
250250203021	Beacon Hill	1,181	721	52.0	52.1
250250303003	Beacon Hill	1,305	503	53.1	53.0
250250701013	Beacon Hill	494	381	53.8	53.8
250173572001	Belmont	1,083	422	50.0	50.0
250250104042	Brighton	2,548	245	49.9	50.0
250250104051	Brighton	2,591	6	49.8	50.3
250250104053	Brighton	626	355	51.0	51.1
250250105001	Brighton	953	349	49.6	50.1
250250105003	Brighton	992	674	51.5	51.5
250173521012	Cambridge	1,473	1,187	49.2	50.0
250173543003	Cambridge	1,121	555	49.3	50.4
250173544001	Cambridge	812	389	49.9	50.1
250173546001	Cambridge	2,116	1,019	50.2	50.4
250173546003	Cambridge	853	413	50.6	50.9
250173546004	Cambridge	832	392	50.5	50.9
250173547001	Cambridge	1,258	596	50.7	50.7
250173547002	Cambridge	1,251	611	50.3	50.3
250173548001	Cambridge	911	444	52.0	52.0
250173548002	Cambridge	992	533	51.2	51.3
250173549001	Cambridge	1,126	535	51.8	51.9
250173549002	Cambridge	3,201	1,231	51.5	51.6
250173549003	Cambridge	1,731	866	51.8	51.2
250173550001	Cambridge	671	331	51.9	51.9
250173550002	Cambridge	1,183	645	52.2	52.2
250173550003	Cambridge	835	437	52.1	52.2
250250401001	Charlestown	958	555	52.3	52.3
250250401002	Charlestown	1,210	684	51.7	51.8
250250402001	Charlestown	775	304	54.3	54.4
250250402002	Charlestown	831	423	53.1	53.1
250250403001	Charlestown	739	334	53.4	53.4
250250403002	Charlestown	1,247	662	52.4	52.4
250250403003	Charlestown	657	366	52.5	52.6

Table H-26 2017 DNL Levels for Census Block Group Locations within DNL 50 dB (Continued)

U.S. Census 2010 Block Group					
Block Group ID	**Name**	**Population**	**Housing units**	**Average Block DNL**	**DNL at centroid**
250250403004	Charlestown	617	320	53.0	53.0
250250403005	Charlestown	622	355	52.0	52.0
250250404011	Charlestown	1,689	766	51.4	51.3
250250404012	Charlestown	750	456	51.4	51.0
250250406001	Charlestown	863	485	51.8	52.9
250250406002	Charlestown	1,581	843	52.4	52.5
250250408011	Charlestown	1,061	530	53.8	53.8
250250408012	Charlestown	828	263	55.2	56.7
250250408013	Charlestown	2,011	1,296	54.5	54.7
250251601011	Chelsea	1,332	353	62.5	62.4
250251601012	Chelsea	1,372	438	60.5	60.5
250251601013	Chelsea	1,730	568	62.1	63.3
250251601014	Chelsea	2,092	539	59.4	59.4
250251601015	Chelsea	1,025	261	64.0	64.2
250251602001	Chelsea	1,336	357	61.9	61.9
250251602002	Chelsea	1,210	374	63.3	63.3
250251602003	Chelsea	1,497	494	64.4	64.6
250251603001	Chelsea	1,469	913	61.7	61.2
250251603002	Chelsea	596	366	63.1	62.8
250251604001	Chelsea	933	344	60.8	60.9
250251604002	Chelsea	1,783	683	62.2	61.8
250251605011	Chelsea	2,097	646	56.6	56.5
250251605012	Chelsea	1,231	396	56.7	56.9
250251605013	Chelsea	774	233	58.3	58.2
250251605014	Chelsea	754	392	57.2	57.1
250251605015	Chelsea	748	304	55.9	56.1
250251605021	Chelsea	1,703	623	55.0	56.4
250251605022	Chelsea	1,359	477	52.9	55.0
250251605023	Chelsea	1,398	488	56.2	55.9
250251606011	Chelsea	2,158	1,005	53.4	52.9
250251606012	Chelsea	1,905	563	54.6	54.6
250251606021	Chelsea	1,290	470	54.1	53.9
250251606022	Chelsea	795	304	51.8	51.7
250251606023	Chelsea	825	346	50.2	50.3
250251606024	Chelsea	780	271	51.6	51.6
250251606025	Chelsea	985	409	52.6	52.4

Table H-26 2017 DNL Levels for Census Block Group Locations within DNL 50 dB (Continued)

U.S. Census 2010 Block Group					
Block Group ID	Name	Population	Housing units	Average Block DNL	DNL at centroid
250250701011	Chinatown	850	529	57.3	58.2
250250702001	Chinatown	1,460	599	56.1	56.2
250250702003	Chinatown	2,625	647	54.9	54.9
250250801001	Dorchester	2,612	450	56.9	57.3
250250907001	Dorchester	1,218	518	52.9	53.1
250250907002	Dorchester	1,253	644	54.2	54.3
250250907003	Dorchester	1,153	526	53.3	53.3
250250907004	Dorchester	651	302	55.4	56.1
250250909011	Dorchester	1,627	606	52.5	52.3
250250909012	Dorchester	2,103	1,034	53.7	54.7
250250910011	Dorchester	650	248	50.4	50.4
250250910012	Dorchester	743	363	50.4	50.0
250250910013	Dorchester	682	335	50.9	51.9
250250910014	Dorchester	667	369	51.3	51.1
250250911001	Dorchester	1,395	625	51.7	51.7
250250911002	Dorchester	1,007	465	50.9	50.8
250250911003	Dorchester	929	325	51.1	51.1
250250911004	Dorchester	713	254	51.3	51.4
250250911005	Dorchester	817	297	52.1	52.1
250250912001	Dorchester	1,081	451	53.0	53.1
250250912002	Dorchester	1,411	492	52.0	52.0
250250912003	Dorchester	742	296	53.0	53.1
250250913001	Dorchester	1,368	480	54.2	54.2
250250913002	Dorchester	1,131	388	55.3	55.4
250250914001	Dorchester	1,672	584	53.4	53.7
250250915001	Dorchester	1,978	744	51.9	51.7
250250915002	Dorchester	1,494	547	51.8	51.7
250250915003	Dorchester	898	362	50.8	50.6
250250916001	Dorchester	1,205	445	50.0	50.1
250250917002	Dorchester	988	337	50.1	50.1
250250917003	Dorchester	775	244	50.1	50.1
250250918001	Dorchester	1,517	517	51.7	51.7
250250918002	Dorchester	1,002	340	51.3	51.5
250250918003	Dorchester	933	357	51.5	51.6
250250919001	Dorchester	1,042	329	51.3	51.3
250250919002	Dorchester	709	280	50.4	50.4

Table H-26	2017 DNL Levels for Census Block Group Locations within DNL 50 dB (Continued)				
U.S. Census 2010 Block Group					
Block Group ID	**Name**	**Population**	**Housing units**	**Average Block DNL**	**DNL at centroid**
250250919003	Dorchester	1,522	551	50.6	50.7
250250921011	Dorchester	1,113	467	52.0	52.1
250250921013	Dorchester	729	321	51.5	52.8
250251006011	Dorchester	1,094	488	53.3	53.3
250251006012	Dorchester	898	382	51.8	51.7
250251006013	Dorchester	1,218	535	50.1	50.1
250251006031	Dorchester	1,306	556	56.0	56.3
250251006032	Dorchester	598	284	57.8	58.4
250251007001	Dorchester	1,050	484	54.8	54.8
250251007002	Dorchester	1,027	526	56.1	57.2
250251007003	Dorchester	672	290	56.0	56.1
250251007004	Dorchester	856	371	53.6	53.7
250251007005	Dorchester	717	303	52.9	52.9
250251008002	Dorchester	929	378	51.2	51.3
250251008003	Dorchester	899	412	51.4	51.4
250251008004	Dorchester	1,117	666	51.5	52.4
250250203011	Downtown	350	205	50.9	50.5
250250203012	Downtown	1,673	1,209	50.6	50.6
250250203031	Downtown	878	693	51.3	51.3
250250203032	Downtown	1,343	365	51.8	51.3
250250203033	Downtown	1,179	789	50.8	50.8
250250301001	Downtown	1,053	790	53.0	53.0
250250301002	Downtown	901	587	52.7	52.6
250250302001	Downtown	1,665	1,103	52.9	52.9
250250303001	Downtown	1,757	1,283	55.4	56.0
250250303002	Downtown	1,262	696	54.4	54.5
250250303003	Downtown	1,305	503	53.1	53.0
250250303004	Downtown	548	465	54.2	54.6
250250304001	Downtown	1,519	994	53.7	53.5
250250304002	Downtown	932	665	53.6	53.5
250250305001	Downtown	704	442	54.3	53.9
250250305002	Downtown	1,025	687	54.1	54.0
250250305003	Downtown	809	527	53.7	53.7
250250701011	Downtown	850	529	57.3	58.2
250250701012	Downtown	303	90	54.8	54.8
250250701013	Downtown	494	381	53.8	53.8

Table H-26 2017 DNL Levels for Census Block Group Locations within DNL 50 dB (Continued)

U.S. Census 2010 Block Group					
Block Group ID	**Name**	**Population**	**Housing units**	**Average Block DNL**	**DNL at centroid**
250250701014	Downtown	1,887	941	54.1	54.1
250250701015	Downtown	451	161	54.5	54.4
250250701016	Downtown	366	325	54.7	54.7
250250701017	Downtown	1,102	701	55.7	55.8
250250701018	Downtown	449	246	56.0	56.2
250250702002	Downtown	1,133	444	56.6	56.7
250250702003	Downtown	2,625	647	54.9	54.9
250250703001	Downtown	1,065	804	53.5	53.2
250250703002	Downtown	733	449	54.3	54.2
250250501011	Eagle Hill East	1,713	534	62.3	62.8
250250501012	Eagle Hill East	1,472	632	60.8	60.2
250250501013	Eagle Hill East	1,930	684	61.8	61.7
250250502001	Eagle Hill East	2,189	757	60.6	60.7
250250502002	Eagle Hill East	1,151	445	60.2	60.0
250250502003	Eagle Hill East	836	283	63.9	63.9
250250502004	Eagle Hill East	1,055	349	64.3	64.2
250250507001	Eagle Hill East	1,684	617	60.2	60.5
250250507002	Eagle Hill East	1,344	484	62.2	62.1
250250507003	Eagle Hill East	1,476	505	63.6	63.6
250250509011	Eagle Hill East	1,283	420	68.0	69.0
250250509012	Eagle Hill East	1,964	717	65.5	64.9
250250509013	Eagle Hill East	918	309	65.1	66.5
250250503001	East Boston	727	282	57.9	57.2
250250503002	East Boston	1,524	759	57.0	56.6
250250504001	East Boston	637	237	57.9	57.9
250250504002	East Boston	1,735	797	58.5	58.6
250250505001	East Boston	1,857	702	60.4	60.2
250250506001	East Boston	1,248	494	59.3	59.4
250250506002	East Boston	815	312	58.6	58.9
250250507001	East Boston	1,684	617	60.2	60.5
250250510001	East Boston	2,039	855	64.9	64.8
250250510002	East Boston	962	462	60.8	58.8
250250510003	East Boston	1,088	467	64.3	63.9
250250511013	East Boston	1,537	621	61.7	61.5
250259813002	East Boston	389	244	61.4	77.2
250173421011	Everett	1,483	567	51.5	51.7

Table H-26 2017 DNL Levels for Census Block Group Locations within DNL 50 dB (Continued)

U.S. Census 2010 Block Group					
Block Group ID	**Name**	**Population**	**Housing units**	**Average Block DNL**	**DNL at centroid**
250173421012	Everett	1,067	389	52.0	52.2
250173421014	Everett	943	362	51.7	51.6
250173421024	Everett	1,252	452	50.0	50.2
250173422011	Everett	2,830	1,066	51.2	51.1
250173422012	Everett	2,438	996	51.9	51.9
250173423001	Everett	1,327	495	53.9	53.7
250173423002	Everett	1,555	596	54.7	54.7
250173423003	Everett	2,137	858	56.9	56.9
250173423004	Everett	1,807	805	55.5	55.8
250173424001	Everett	1,878	847	58.9	58.8
250173424002	Everett	1,132	480	59.3	59.7
250173424003	Everett	905	346	59.4	58.7
250173424004	Everett	1,348	517	59.9	60.1
250173424005	Everett	792	363	55.7	55.5
250173425001	Everett	2,428	941	52.5	52.7
250173425002	Everett	2,169	870	55.4	55.2
250173425003	Everett	2,200	970	58.1	58.0
250173426001	Everett	1,125	395	54.2	54.2
250173426002	Everett	904	347	55.9	56.2
250173426003	Everett	2,336	941	55.2	55.2
250235011011	Hingham	1,218	483	49.4	50.4
250235001011	Hull	1,502	828	55.7	56.2
250235001012	Hull	819	452	52.3	52.2
250235001013	Hull	1,381	726	51.0	52.0
250235001041	Hull	1,207	626	50.7	55.2
250235001042	Hull	919	488	51.8	55.1
250235001043	Hull	792	470	51.2	51.8
250235001044	Hull	1,464	731	50.7	50.6
250251404007	Hyde Park	1,172	463	50.3	50.3
250250812001	Jamaica Plain	2,130	813	50.3	50.3
250250814003	Jamaica Plain	1,164	548	51.0	51.2
250251201041	Jamaica Plain	516	252	51.4	51.0
250251201042	Jamaica Plain	799	351	50.9	50.9
250251201043	Jamaica Plain	780	457	50.3	50.2
250251202011	Jamaica Plain	1,147	611	51.9	51.9
250251202012	Jamaica Plain	1,841	894	53.0	53.0

Table H-26	2017 DNL Levels for Census Block Group Locations within DNL 50 dB (Continued)				
U.S. Census 2010 Block Group					
Block Group ID	**Name**	**Population**	**Housing units**	**Average Block DNL**	**DNL at centroid**
250251202013	Jamaica Plain	451	221	52.9	52.9
250251203013	Jamaica Plain	1,543	554	53.5	53.7
250251204001	Jamaica Plain	856	424	51.5	51.5
250251204002	Jamaica Plain	676	363	51.6	51.7
250251204003	Jamaica Plain	895	466	50.9	51.0
250251204004	Jamaica Plain	1,862	845	50.1	50.1
250251205001	Jamaica Plain	824	334	51.1	51.1
250251205002	Jamaica Plain	733	270	50.0	50.0
250251205002	Jamaica Plain	733	270	50.0	50.0
250251205003	Jamaica Plain	774	301	50.6	50.5
250259810001	Jamaica Plain	22	5	51.0	50.8
250250512001	Jefferies Point	32	19	61.6	60.1
250250512002	Jefferies Point	1,548	692	60.7	60.4
250250512003	Jefferies Point	799	449	59.5	59.6
250092051001	Lynn	1,192	534	51.0	51.0
250092051002	Lynn	1,077	413	51.6	51.7
250092051003	Lynn	919	361	53.5	53.7
250092051004	Lynn	1,527	556	53.5	53.9
250092051005	Lynn	637	264	54.3	54.5
250092052001	Lynn	806	410	52.3	52.7
250092052002	Lynn	714	277	54.5	54.8
250092052003	Lynn	1,510	564	54.4	54.4
250092052004	Lynn	1,435	511	55.2	55.4
250092052005	Lynn	854	385	52.1	52.9
250092055001	Lynn	2,054	736	51.7	50.8
250092055002	Lynn	2,552	961	56.0	55.9
250092058001	Lynn	1,044	362	51.2	51.7
250092058002	Lynn	1,089	342	51.9	52.0
250092059001	Lynn	1,743	598	51.6	51.7
250092059002	Lynn	1,262	443	50.8	50.7
250092060001	Lynn	1,443	478	55.5	55.7
250092060002	Lynn	1,916	642	54.1	54.5
250092061001	Lynn	1,793	797	55.7	56.0
250092061002	Lynn	2,051	665	56.4	56.6
250092062001	Lynn	1,128	327	53.9	54.0
250092062002	Lynn	2,267	786	55.6	55.8

Table H-26	2017 DNL Levels for Census Block Group Locations within DNL 50 dB (Continued)				
U.S. Census 2010 Block Group					
Block Group ID	**Name**	**Population**	**Housing units**	**Average Block DNL**	**DNL at centroid**
250092062003	Lynn	1,859	573	54.4	54.4
250092063001	Lynn	712	250	51.5	52.1
250092063003	Lynn	1,030	379	50.8	50.8
250092063004	Lynn	1,040	367	52.9	53.0
250092068001	Lynn	1,754	685	50.5	50.4
250092068002	Lynn	1,792	914	52.3	52.3
250092070001	Lynn	963	585	55.5	53.4
250092070002	Lynn	1,235	456	56.7	57.0
250092071001	Lynn	1,446	444	55.0	55.4
250092071002	Lynn	992	307	56.5	56.6
250092071003	Lynn	1,075	342	53.9	54.0
250092072001	Lynn	1,212	391	56.0	58.1
250092072002	Lynn	1,727	789	56.9	57.2
250173411021	Malden	1,346	726	50.3	50.3
250173411024	Malden	557	336	53.1	52.7
250173412001	Malden	1,164	491	52.2	51.6
250173412002	Malden	976	386	53.8	54.0
250173412003	Malden	1,070	451	56.0	56.3
250173412004	Malden	978	383	55.8	55.9
250173412005	Malden	1,693	713	54.8	55.0
250173412006	Malden	976	362	54.0	54.0
250173413002	Malden	922	482	50.7	51.1
250173414001	Malden	1,085	417	50.4	50.3
250173414002	Malden	944	340	51.0	50.9
250173414003	Malden	1,802	702	51.7	51.8
250173414004	Malden	1,612	603	52.6	52.6
250173414005	Malden	769	389	54.7	55.9
250250924004	Mattapan	1,142	413	52.0	52.1
250250924005	Mattapan	721	276	51.9	51.9
250251001001	Mattapan	167	61	51.3	51.6
250251001004	Mattapan	964	298	50.7	50.7
250251001005	Mattapan	622	243	50.1	50.0
250251001006	Mattapan	1,320	492	50.6	50.4
250251011011	Mattapan	775	276	50.3	50.2
250259811002	Mattapan	12	2	49.9	50.2
250259811004	Mattapan	400	128	51.8	51.8

Table H-26 2017 DNL Levels for Census Block Group Locations within DNL 50 dB (Continued)

U.S. Census 2010 Block Group					
Block Group ID	**Name**	**Population**	**Housing units**	**Average Block DNL**	**DNL at centroid**
250173391001	Medford	617	243	51.2	53.4
250173391002	Medford	1,460	603	53.7	53.7
250173391003	Medford	1,169	691	53.9	54.1
250173391004	Medford	1,797	1,041	52.9	53.1
250173391005	Medford	1,399	446	51.9	52.2
250173392004	Medford	1,449	540	50.6	50.7
250173394001	Medford	1,033	529	51.7	51.6
250173394002	Medford	626	251	52.2	52.2
250173394004	Medford	882	420	51.6	51.4
250173395001	Medford	2,710	553	53.1	53.5
250173395002	Medford	1,312	547	54.2	54.3
250173395003	Medford	641	283	53.0	52.9
250173395004	Medford	736	307	53.1	53.1
250173396001	Medford	797	392	54.5	54.3
250173396002	Medford	813	371	54.6	54.6
250173396003	Medford	757	369	54.2	54.3
250173396004	Medford	827	363	54.1	54.2
250173396005	Medford	885	377	53.7	53.7
250173396006	Medford	945	443	53.3	53.4
250173397001	Medford	552	280	55.1	55.9
250173397002	Medford	1,678	670	54.8	55.0
250173397003	Medford	785	357	55.3	55.3
250173397004	Medford	863	377	54.2	54.2
250173398011	Medford	2,101	1,369	58.2	58.6
250173398012	Medford	617	263	57.9	57.9
250173398013	Medford	808	375	57.9	58.0
250173398014	Medford	884	363	57.2	57.2
250173398021	Medford	1,308	586	57.1	57.4
250173398022	Medford	2,498	1,096	56.4	57.0
250173398023	Medford	751	294	55.6	55.6
250173399001	Medford	1,651	719	55.9	56.2
250173399002	Medford	950	380	55.7	55.6
250173399003	Medford	939	425	55.2	55.2
250173399004	Medford	759	346	55.1	55.1
250173399005	Medford	872	342	55.0	55.0
250173400001	Medford	1,033	435	54.7	54.7
250173400002	Medford	848	376	54.3	54.3

Table H-26 2017 DNL Levels for Census Block Group Locations within DNL 50 dB (Continued)

U.S. Census 2010 Block Group

Block Group ID	Name	Population	Housing units	Average Block DNL	DNL at centroid
250173400003	Medford	713	303	54.7	54.7
250173401002	Medford	1,047	389	51.1	51.2
250173401003	Medford	1,611	504	52.8	52.7
250173401004	Medford	1,483	609	54.4	54.5
250173401005	Medford	925	400	51.2	51.5
250173401006	Medford	826	310	53.7	53.9
250173412006	Medford	976	362	54.0	54.0
250214161011	Milton	771	280	51.9	51.8
250214161012	Milton	1,969	732	53.0	53.5
250214161013	Milton	1,818	663	50.1	50.8
250214164001	Milton	789	302	51.5	54.7
250214164005	Milton	1,028	348	53.3	54.1
250214164006	Milton	978	357	51.9	53.8
250214164007	Milton	1,002	386	53.0	55.4
250250511011	Orient Heights	1,602	598	58.7	58.0
250250511012	Orient Heights	1,949	741	57.5	57.2
250250511013	Orient Heights	1,537	621	61.7	61.5
250250511014	Orient Heights	1,005	385	59.5	57.7
250092106003	Peabody	1,194	491	49.2	50.6
250092106004	Peabody	623	250	49.9	51.0
250214172001	Quincy	2,743	1,256	50.5	50.8
250214173001	Quincy	1,781	1,180	51.9	53.6
250214173002	Quincy	900	630	52.2	53.2
250251701002	Revere	1,012	384	50.1	50.1
250251701003	Revere	773	320	50.7	50.8
250251705011	Revere	1,934	1,112	53.4	53.9
250251705012	Revere	1,501	814	54.0	54.2
250251705021	Revere	1,134	550	58.5	58.9
250251705022	Revere	1,684	998	57.7	59.0
250251706012	Revere	1,413	573	51.0	51.5
250251706014	Revere	954	380	50.3	50.2
250251707011	Revere	788	431	54.6	55.3
250251707012	Revere	1,311	622	58.8	59.1
250251707021	Revere	1,146	352	52.7	52.6
250251707022	Revere	1,474	509	54.2	53.9
250251707023	Revere	1,658	547	51.5	51.5
250251707024	Revere	959	358	52.4	52.7

Table H-26 2017 DNL Levels for Census Block Group Locations within DNL 50 dB (Continued)

U.S. Census 2010 Block Group					
Block Group ID	**Name**	**Population**	**Housing units**	**Average Block DNL**	**DNL at centroid**
250251707025	Revere	1,391	553	54.9	54.6
250251708001	Revere	1,815	797	63.7	64.8
250251708002	Revere	1,359	577	62.7	64.8
250251708003	Revere	967	419	61.6	63.0
250251708004	Revere	977	424	62.4	60.6
250259815021	Revere	9	3	58.4	54.4
250251101031	Roslindale	568	325	53.2	53.0
250251101032	Roslindale	733	257	51.8	51.8
250251101033	Roslindale	653	241	52.1	52.0
250251101034	Roslindale	620	289	52.4	52.4
250251101035	Roslindale	1,440	666	52.7	52.6
250251101036	Roslindale	583	271	52.5	52.6
250251101037	Roslindale	863	304	52.1	52.1
250251102011	Roslindale	2,051	874	51.3	51.4
250251103011	Roslindale	1,134	403	52.0	52.0
250251103012	Roslindale	1,271	552	52.4	52.5
250251104011	Roslindale	2,011	733	52.0	52.0
250251104012	Roslindale	1,555	629	51.9	51.9
250251104031	Roslindale	905	426	51.3	51.2
250251104032	Roslindale	783	314	51.4	51.5
250251104033	Roslindale	657	258	50.6	50.7
250251104034	Roslindale	975	377	51.2	51.3
250251104035	Roslindale	989	392	50.6	50.7
250251105011	Roslindale	849	367	50.6	50.5
250251105012	Roslindale	1,498	631	50.6	50.6
250251105013	Roslindale	906	373	50.0	50.0
250251105021	Roslindale	1,311	589	51.1	51.1
250251105022	Roslindale	1,855	810	51.3	51.4
250251105023	Roslindale	640	285	50.9	50.9
250251106071	Roslindale	1,013	519	50.1	50.1
250251106073	Roslindale	1,586	734	51.0	51.1
250251106074	Roslindale	949	273	50.1	50.0
250251401061	Roslindale	1,395	660	50.4	50.4
250251401062	Roslindale	506	238	50.7	50.7
250259803001	Roslindale	338	2	53.8	54.0
250259810001	Roslindale	22	5	51.0	50.8

Table H-26 2017 DNL Levels for Census Block Group Locations within DNL 50 dB (Continued)

U.S. Census 2010 Block Group					
Block Group ID	**Name**	**Population**	**Housing units**	**Average Block DNL**	**DNL at centroid**
250259811003	Roslindale	6	5	52.9	53.2
250250801001	Roxbury	2,612	450	56.9	57.3
250250801002	Roxbury	738	294	56.5	56.5
250250803001	Roxbury	1,769	791	56.1	56.1
250250804011	Roxbury	1,265	526	55.3	55.5
250250804012	Roxbury	1,445	723	53.6	53.7
250250806012	Roxbury	600	220	52.4	52.2
250250806013	Roxbury	459	242	53.5	53.7
250250813001	Roxbury	1,661	806	54.0	54.0
250250813002	Roxbury	1,749	690	52.6	52.7
250250813003	Roxbury	1,350	615	52.4	52.0
250250814001	Roxbury	1,067	558	53.1	53.3
250250814002	Roxbury	772	355	51.7	51.8
250250814003	Roxbury	1,164	548	51.0	51.2
250250815001	Roxbury	788	351	53.5	53.4
250250815002	Roxbury	1,346	554	54.2	54.2
250250817001	Roxbury	619	225	55.5	55.7
250250817002	Roxbury	893	430	55.6	55.7
250250817003	Roxbury	780	291	54.9	54.9
250250817004	Roxbury	887	355	54.9	54.9
250250817005	Roxbury	641	298	54.8	54.8
250250818001	Roxbury	1,157	577	56.0	56.0
250250818002	Roxbury	921	442	56.1	56.1
250250818003	Roxbury	820	369	55.7	55.7
250250819001	Roxbury	906	453	55.3	55.4
250250819002	Roxbury	617	259	54.9	55.1
250250819003	Roxbury	600	257	54.9	54.9
250250819004	Roxbury	992	428	54.8	54.8
250250820001	Roxbury	1,292	566	55.1	55.2
250250820002	Roxbury	682	298	55.2	55.2
250250820003	Roxbury	841	414	55.4	55.4
250250821001	Roxbury	1,228	526	54.7	54.8
250250821002	Roxbury	1,553	579	54.5	54.4
250250821003	Roxbury	2,244	1,012	55.0	55.0
250250901001	Roxbury	1,631	655	53.6	53.6
250250901002	Roxbury	531	237	52.7	52.7

Table H-26 2017 DNL Levels for Census Block Group Locations within DNL 50 dB (Continued)

U.S. Census 2010 Block Group					
Block Group ID	**Name**	**Population**	**Housing units**	**Average Block DNL**	**DNL at centroid**
250250901003	Roxbury	693	303	52.8	52.8
250250901004	Roxbury	1,099	414	51.9	51.8
250250901005	Roxbury	617	249	51.3	51.4
250250902001	Roxbury	673	244	52.7	52.5
250250902002	Roxbury	626	278	53.0	53.4
250250902003	Roxbury	934	308	53.5	53.8
250250903001	Roxbury	891	333	53.8	53.6
250250903002	Roxbury	1,310	513	54.3	53.9
250250903003	Roxbury	978	422	54.6	54.7
250250904001	Roxbury	871	311	55.2	55.2
250250904002	Roxbury	1,155	435	55.0	55.0
250250904003	Roxbury	763	254	55.6	55.6
250250904004	Roxbury	870	294	56.0	56.0
250250906001	Roxbury	1,094	351	56.3	56.3
250250906002	Roxbury	1,254	442	56.3	56.4
250250913002	Roxbury	1,131	388	55.3	55.4
250250914002	Roxbury	1,069	355	54.5	54.4
250250924002	Roxbury	1,089	417	50.6	50.6
250250924003	Roxbury	1,688	711	51.8	51.7
250250924005	Roxbury	721	276	51.9	51.9
250251203011	Roxbury	1,166	443	52.6	52.4
250251203012	Roxbury	855	331	53.7	53.7
250251203013	Roxbury	1,543	554	53.5	53.7
250251203014	Roxbury	1,231	567	52.6	52.5
250259803001	Roxbury	338	2	53.8	54.0
250092047011	Salem	785	328	50.3	51.9
250092081021	Saugus	752	301	45.5	50.8
250173501032	Somerville	1,210	520	55.3	55.4
250173501041	Somerville	2,119	793	53.1	53.2
250173501042	Somerville	2,584	947	54.0	54.0
250173501043	Somerville	1,188	485	52.3	52.6
250173501044	Somerville	1,384	673	52.7	52.8
250173502001	Somerville	1,376	586	51.7	51.8
250173502002	Somerville	603	233	50.7	50.6
250173502003	Somerville	1,385	533	50.7	50.8
250173502004	Somerville	1,410	594	50.8	50.8

Table H-26 2017 DNL Levels for Census Block Group Locations within DNL 50 dB (Continued)

U.S. Census 2010 Block Group					
Block Group ID	**Name**	**Population**	**Housing units**	**Average Block DNL**	**DNL at centroid**
250173502005	Somerville	749	315	51.6	51.6
250173502006	Somerville	1,044	502	51.9	51.9
250173503001	Somerville	965	454	52.3	51.8
250173503002	Somerville	627	304	51.6	51.7
250173503003	Somerville	849	390	52.6	52.6
250173504001	Somerville	1,006	368	53.7	53.9
250173504002	Somerville	1,232	565	52.9	52.9
250173504003	Somerville	1,017	462	52.2	52.2
250173504004	Somerville	1,464	721	52.6	52.7
250173504005	Somerville	849	392	53.3	53.3
250173505001	Somerville	818	390	53.0	53.1
250173505002	Somerville	811	382	53.0	53.0
250173506001	Somerville	1,656	2	53.5	53.5
250173506002	Somerville	939	371	53.0	53.0
250173506003	Somerville	813	231	52.7	52.8
250173506004	Somerville	1,164	487	53.3	53.3
250173507001	Somerville	907	602	51.0	50.7
250173507002	Somerville	974	390	51.6	51.5
250173507003	Somerville	1,007	461	52.1	52.3
250173507004	Somerville	1,375	760	51.9	51.8
250173507005	Somerville	861	460	52.2	52.3
250173507006	Somerville	924	443	52.5	52.5
250173508001	Somerville	971	485	52.6	52.6
250173508002	Somerville	857	435	52.6	52.7
250173509001	Somerville	803	398	51.8	51.9
250173509002	Somerville	1,209	535	51.1	51.2
250173509003	Somerville	1,302	715	52.1	52.2
250173510001	Somerville	1,236	595	50.5	50.6
250173510005	Somerville	1,056	484	51.1	51.2
250173511002	Somerville	912	465	50.3	50.4
250173514031	Somerville	763	309	51.9	51.9
250173514032	Somerville	1,017	391	51.1	51.0
250173514033	Somerville	587	321	51.2	51.2
250173514034	Somerville	1,042	369	51.0	51.0
250173514035	Somerville	619	288	51.0	51.0
250173514041	Somerville	1,147	448	50.1	50.1
250250601011	South Boston	881	441	60.8	60.9

Table H-26 2017 DNL Levels for Census Block Group Locations within DNL 50 dB (Continued)

U.S. Census 2010 Block Group					
Block Group ID	**Name**	**Population**	**Housing units**	**Average Block DNL**	**DNL at centroid**
250250601012	South Boston	633	350	60.1	60.2
250250601013	South Boston	981	496	60.5	60.5
250250601014	South Boston	721	397	59.5	59.6
250250602001	South Boston	821	419	57.7	57.8
250250602002	South Boston	1,095	580	56.9	56.6
250250603011	South Boston	1,285	741	56.0	55.9
250250603012	South Boston	699	345	55.6	55.5
250250603013	South Boston	1,092	561	56.4	56.3
250250604001	South Boston	1,021	542	55.5	55.7
250250604002	South Boston	988	530	55.2	55.3
250250604003	South Boston	842	466	54.9	54.8
250250604004	South Boston	1,093	669	55.0	55.0
250250604005	South Boston	960	336	56.1	56.1
250250605011	South Boston	699	375	57.3	57.2
250250605012	South Boston	868	508	56.7	56.7
250250605013	South Boston	717	431	56.9	56.9
250250605014	South Boston	631	295	58.6	58.3
250250605015	South Boston	656	333	57.4	57.4
250250606001	South Boston	2,357	1,530	59.9	62.9
250250607001	South Boston	741	253	59.3	59.3
250250607002	South Boston	1,152	383	58.8	58.9
250250608001	South Boston	655	333	56.9	56.9
250250608002	South Boston	757	396	57.3	57.3
250250608003	South Boston	886	470	58.1	58.2
250250608004	South Boston	1,666	943	57.6	57.9
250250610001	South Boston	1,033	544	56.0	56.0
250250610002	South Boston	1,164	471	55.7	55.6
250250610003	South Boston	901	393	55.8	55.5
250250611011	South Boston	617	278	55.2	55.3
250250611012	South Boston	1,615	756	54.3	54.1
250250612001	South Boston	1,702	1,158	59.9	59.8
250250612002	South Boston	627	383	56.9	57.9
250250612003	South Boston	911	470	55.9	56.0
250250907004	South Boston	651	302	55.4	56.1
250259812021	South Boston	207	0	61.7	61.8
250250703003	South End	992	707	53.4	53.6
250250703004	South End	1,119	746	54.4	54.4

Table H-26	2017 DNL Levels for Census Block Group Locations within DNL 50 dB (Continued)				
U.S. Census 2010 Block Group					
Block Group ID	**Name**	**Population**	**Housing units**	**Average Block DNL**	**DNL at centroid**
250250704021	South End	1,723	680	55.9	56.8
250250705001	South End	1,700	1,018	55.9	55.9
250250705002	South End	999	524	54.9	55.0
250250705003	South End	1,393	803	55.4	55.4
250250705004	South End	1,368	721	54.8	54.8
250250706001	South End	1,127	667	54.1	54.0
250250706002	South End	1,113	642	53.5	53.4
250250707001	South End	1,161	644	52.7	52.7
250250707002	South End	1,200	722	52.7	52.7
250250708001	South End	1,594	965	52.9	53.0
250250708002	South End	1,040	579	52.3	52.3
250250708003	South End	1,072	612	52.1	52.1
250250709001	South End	2,166	1,231	54.4	54.3
250250709002	South End	1,163	567	53.9	54.0
250250711011	South End	1,498	928	56.6	56.6
250250711012	South End	1,424	750	55.9	56.6
250250711013	South End	831	507	55.8	56.0
250250712011	South End	1,899	819	57.3	57.6
250250712012	South End	1,232	578	56.7	56.9
250250804011	South End	1,265	526	55.3	55.5
250250805001	South End	1,076	460	52.8	52.9
250250805002	South End	2,020	863	53.7	53.9
250250806011	South End	3,212	458	52.1	51.6
250251303001	West Roxbury	848	342	50.1	50.1
250173381002	Winchester	1,534	569	50.3	50.2
250173385001	Winchester	1,433	494	50.5	51.9
250173385004	Winchester	1,350	600	50.7	50.8
250251801011	Winthrop	1,207	584	53.4	53.1
250251801012	Winthrop	1,215	724	51.7	51.8
250251801013	Winthrop	2,344	1,194	54.1	54.4
250251802001	Winthrop	1,471	610	58.2	58.4
250251802002	Winthrop	647	299	56.9	56.9
250251802003	Winthrop	648	336	58.5	58.6
250251802004	Winthrop	1,343	549	59.9	61.4
250251803011	Winthrop	652	258	60.0	59.9
250251803012	Winthrop	778	322	61.7	61.8
250251803013	Winthrop	834	351	61.3	61.5

Table H-26 2017 DNL Levels for Census Block Group Locations within DNL 50 dB (Continued)

U.S. Census 2010 Block Group					
Block Group ID	**Name**	**Population**	**Housing units**	**Average Block DNL**	**DNL at centroid**
250251803014	Winthrop	760	297	62.6	63.3
250251804001	Winthrop	876	435	57.8	57.3
250251804002	Winthrop	839	347	58.8	58.7
250251805001	Winthrop	1,273	613	55.7	55.4
250251805002	Winthrop	572	271	64.5	66.7
250251805003	Winthrop	1,156	671	59.6	59.6
250251805004	Winthrop	882	459	66.1	66.0
250251805004	Winthrop	882	459	66.1	66.0

Source: HMMH, 2019.

Massport and FAA Correspondence Letters

This section provides copies of correspondence between Massport and FAA regarding flight procedures and the RNAV Pilot Project.

Massport and FAA correspondence letter regarding RNAV Pilot Test: Request that FAA adopt the jetBlue Airways RNAV Visual Approach Procedure to Runway 33L dated April 7, 2017.

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Massachusetts Port Authority
One Harborside Drive
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Telephone (617) 568-5000
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April 7, 2017

Todd Friedenberg
Deputy Regional Administrator
Federal Aviation Administration
New England Region
1200 District Avenue
Burlington, MA 01803-5299

Re: FAA\MPA RNAV Pilot Test: Request that FAA adopt the jetBlue RNAV Visual Approach Procedure to Boston Logan Runway 33L

Dear Mr. Friedenberg:

As a follow up to our ongoing work on the joint Massport and FAA RNAV Pilot Test, I'm writing to request that the FAA adopt and refine for public use the existing jetBlue Airways (jetBlue) RNAV Visual to Boston Logan's Runway R33L. We believe that by making this procedure more readily available to all national airspace users, there will be an increase in the utilization of the RNAV Visual to R33L during the late night period, providing greater noise abatement benefits to communities near Boston Logan.

Recall that one outcome of the Boston Logan Overflight Noise Study was the design of a noise abatement approach to R33L that avoids the Town of Hull and other South Shore communities by taking advantage of overflying Boston Harbor during the late night time period. Consistent with this goal, in November 2014, jetBlue published a RNAV Visual procedure and agreed to make this "public" and therefore available to the broader Boston Logan air carrier community.

Massport has been working with the FAA's NextGen Eastern Branch to advocate and encourage air carriers to adopt the JetBlue RNAV Visual procedure. However, the most recent data (March 2017) from Massport shows that only about 26% of R33L jet arrivals from midnight to 5AM took advantage of this noise reduction procedure. We believe that if the FAA adopts this procedure the utilization rate of the RNAV Visual to R33L will increased when demand and weather allow.

Please feel free to contact me with any further questions.

Sincerely,

Flavio Leo
Director, Aviation Planning and Strategy
Massachusetts Port Authority

Cc: Amy Corbett (FAA), Ed Freni (Massport)

Massport and FAA correspondence letter regarding Massport recommended procedural changes to RNAV dated December 20, 2017.

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Telephone (617) 568-5000
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December 20, 2017

Ms. Amy Corbett
Regional Administrator
Federal Aviation Administration
New England Region
1200 District Avenue
Burlington, MA 01803-5299

RE: FAA\MPA RNAV MOU Block 1 Ideas: Request for FAA Review and Implementation for Boston Logan International Airport

Dear Ms. Corbett: Amy

I am writing to request that the Federal Aviation Administration (FAA) review and implement the Block 1 procedure recommendations by the Massachusetts Institute of Technology (MIT) study team as a result of the Memorandum of Understanding (MOU) between the FAA and the Massachusetts Port Authority (Massport). The MOU, executed in September 2016, commits the FAA and Massport to undertake a unique, pilot testing of ideas to reduce noise from the FAA's implementation of Precision Based Navigation (PBN) procedures including RNAV at Boston Logan International Airport (Boston Logan).

Consistent with the MOU, the testing of ideas has involved a technical team of FAA and Massport staff, supported by subject matter experts lead by MIT's International Center for Air Transportation. The work included extensive public outreach, feedback through public hearings, and briefings to and feedback from the Massport Community Advisory Committee (MCAC) and local, state and federal elected officials.

After an initial investigation, the MIT team proposed segregating ideas to be evaluated into two blocks. Block 1 ideas would provide noise benefits while not generating major equity issues (moving noise from one community to another) and would have minimal operational/ technical implementation barriers. Block 2 ideas would result in shifting of noise, or would have substantial technical hurdles and, therefore, require further analysis and review.

MIT has completed its work on Block 1 and issued its final report "Block 1 Procedure Recommendations for Logan Airport Community Noise Reduction" to Massport and the FAA. MIT's technical feasibility analysis of Block 1 includes an examination of flight safety, aircraft performance, navigation and flight management systems (FMS) limitations, pilot workload, Air Traffic Control workload, and procedure design criteria. Representatives from MIT, Massport and the FAA have briefed the public and the MCAC throughout the process, and feasible feedback from the public has been included into MIT's recommendations. On December 7, 2017, the MCAC voted to support and recommend implementation of the Block 1 procedures.

The table below from the MIT report summarizes MIT's recommendations and highlights the primary benefits.

Block 1 Procedure Recommendations

Proc. ID D = Dep. A = Arr.	Procedure	Primary Benefits
1-D1	Restrict target climb speed for jet departures from Runways 33L and 27 to 220 knots or minimum safe airspeed in clean configuration, whichever is higher.	Reduced airframe and total noise during climb below 10,000 ft (beyond immediate airport vicinity)
1-D2	Modify RNAV SID from Runway 15R to move tracks further to the north away from populated areas.	Departure flight paths moved north away from Hull
1-D3	Modify RNAV SID from Runway 22L and 22R to initiate turns sooner after takeoff and move tracks further to the north away from populated areas.	Departure flight paths moved north away from Hull and South Boston
1-D3a	*Option A*: Climb to intercept course (VI-CF) procedure	
1-D3b	*Option B*: Climb to altitude, then direct (VA-DF) procedure	
1-D3c	*Option C*: Heading-based procedure	
1-A1	Implement an overwater RNAV approach procedure with RNP overlay to Runway 33L that follows the ground track of the jetBlue RNAV Visual procedure as closely as possible.	Arrival flight paths moved overwater instead of over the Hull peninsula and points further south
1-A1a	*Option A*: Published instrument approach procedure	
1-A1b	*Option B*: Public distribution of RNAV Visual procedure	

Source: MIT

We understand that the FAA will also need to undertake its own internal review including safety, operational feasibility and environmental impacts. It is our hope that the FAA will be able to adopt these recommendations as expeditiously as possible.

On behalf of Massport, I want to thank the FAA for its commitment to this very important and unique initiative. Please feel free to contact me directly or Flavio Leo, Director of Aviation Planning and Strategy, with any further questions.

Sincerely,

Edward C. Freni
Director of Aviation

cc: Todd Friedenberg (FAA), David Carlon (MCAC), Tom Glynn (Massport), John Hansman (MIT), Liz Becker (Massport), Flavio Leo (Massport)

FAA June 2018 update letter regarding RNAV Pilot Test: Request that FAA adopt the jetBlue Airways RNAV Visual Approach Procedure to Runway 33L dated June 8, 2018.

U.S. Department of Transportation
Federal Aviation Administration

Office of the Regional Administrator
New England Region

1200 District Avenue
Burlington, MA 01803

June 8, 2018

David Carlon
Chairman
Massport Community Advisory Committee
P.O. Box 470614
Brookline, MA 02447

Dear Mr. Carlon:

In a letter dated April 7, 2017, the Massachusetts Port Authority (Massport) requested the Federal Aviation Administration (FAA) modify and adopt the existing JetBlue Airways (JBU) Area Navigation (RNAV) visual approach to Boston-Logan International Airport's (Boston-Logan) Runway 33Left (RWY 33L) for public use. Massport indicated modifying the procedure would likely result in increased nighttime use, and subsequently provide greater noise abatement benefits to communities near Boston-Logan.

Based on Massport's formal request, the FAA began developing this new procedure, which is virtually identical to the current JBU Special RNAV Visual Flight Procedure (RVFP) to RWY 33L that has been in use since 2009. Slight variations were made to ensure flyability and adherence to safety criteria for larger jet aircraft. However, representatives from the aircraft operator/pilot community advised the FAA of a potential risk to implementation that will cause the procedure to miss the anticipated July publication date.

We are reviewing flight data, and have requested additional simulation testing. We notified Massport of the issue, and the FAA will continue to cooperate with Massport in analyzing the data fully. The FAA intends to reschedule publication for September 13, 2018, which is the next date in the 56-day charting cycle. However, publication may be delayed further as simulation testing occurs and risks are better understood, or may even be canceled if the risks cannot be mitigated.

We will keep the Massport CAC updated as changes occur. In the interim, if my office can be of further assistance, please contact Julie Seltsam-Wilps of the Regional Administrator's staff at 781-238-7389.

Sincerely,

Kerry B. Long

Kerry B. Long
Acting Regional Administrator

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Air Quality/Emissions Reduction

This appendix provides the following detailed information and data tables in support of Chapter 7, *Air Quality/Emissions Reduction*:

- Fundamentals of Air Quality
  - Table I-1 National Ambient Air Quality Standards (NAAQS)
  - Table I-2 Airport-Related Sources of Air Emissions
  - Table I-3 Attainment, Nonattainment, and Maintenance Areas
- Aircraft Fleet and Operational Data Used in AEDT 2d
  - Table I-4 2017 Fleet Mix, Annual Landing and Takeoff Cycles (LTOs), and Taxi/Delay Time-in-Mode by Aircraft Type
  - Table I-5 Future Planning Horizon Fleet Mix, Annual Landing and Takeoff Cycles (LTOs), and Taxi/Delay Time-in-Mode (TIM) by Aircraft Type
- Ground Service Equipment (GSE) Time-in-Mode (TIM) Survey
  - Table I-6 Ground Service Equipment (GSE) Time-in-Mode (TIM) (minutes)
- Ground Service Equipment (GSE)/Alternative Fuels Conversion
  - Table I-7 Ground Service Equipment (GSE) Alternative Fuel Conversion Summary (kg/day)
- Motor Vehicle Emissions
  - Table I-8 MOVES2014b Sample Input File for 2017
  - Table I-9 MOVES2014b Sample Output File for 2017
  - Table I-10 MOVES2014b Sample Input File for the Future Planning Horizon
  - Table I-11 MOVES2014b Sample Output File for the Future Planning Horizon
- Fuel Storage and Handling
  - Table I-12 Fuel Throughput by Fuel Category (gallons)

- Stationary Sources
  - Table I-13 Stationary Source Fuel Throughput by Fuel Category (gallons)
- 1993 – 2009 Emissions Inventories
  - Table I-14 Estimated VOC Emissions (in kg/day) at Logan Airport 1993-2001
  - Table I-15 Estimated VOC Emissions (in kg/day) at Logan Airport 2002-2009
  - Table I-16 Estimated NO_X Emissions (in kg/day) at Logan Airport 1993-2001
  - Table I-17 Estimated NO_X Emissions (in kg/day) at Logan Airport 2002-2009
  - Table I-18 Estimated CO Emissions (in kg/day) at Logan Airport 1993-2001
  - Table I-19 Estimated CO Emissions (in kg/day) at Logan Airport 2002-2009
  - Table I-20 Estimated PM_{10}/$PM_{2.5}$ Emissions (in kg/day) at Logan Airport 2005-2009
- Greenhouse Gas (GHG) Emissions Inventory for 2017
  - Table I-21 Logan Airport Greenhouse Gas (GHG) Inventory Input Data and Information for 2017
  - Table I-22 Greenhouse Gas (GHG) Emission Factors for 2017
  - Table I-23 Greenhouse Gas (GHG) Emissions (MMT CO_2eq) for 2017
  - Table I-24 Logan Airport Greenhouse Gas (GHG) Emissions Compared to Massachusetts Totals
  - Table I-25 Comparison of Estimated Total Greenhouse Gas (GHG) Emissions (MMT of CO_2eq) at Logan Airport – 2007 through 2017
- Greenhouse Gas (GHG) Emissions Inventory for the Future Planning Horizon
  - Table I-26 Logan Airport Greenhouse Gas (GHG) Inventory Input Data and Information for the Future Planning Horizon
  - Table I-27 Greenhouse Gas (GHG) Emission (MMT CO_2eq) for the Future Planning Horizon
- Measured NO_2 Concentrations
  - Table I-28 Massport and MassDEP Annual NO_2 Concentration Monitoring Results (μg/m^3)

Fundamentals of Air Quality

This section contains a general summary of air quality and air emissions with a particular emphasis on airport-related emissions where appropriate. This material is intended to supplement and provide background information for the materials contained in Chapter 7, *Air Quality/Emissions Reduction*.

Pollutant Types and Standards

The U.S. Environmental Protection Agency (EPA) has established National Ambient Air Quality Standards (NAAQS) for a select group of "criteria air pollutants" designed to protect public health, the environment, and the quality of life from the detrimental effects of air pollution. Listed alphabetically, these pollutants are briefly described below:

- **Carbon monoxide (CO)** is a colorless, odorless, tasteless gas. It may temporarily accumulate, especially in cool, calm weather conditions, when fuel use reaches a peak and CO is chemically most stable due to the low temperatures. CO from natural sources usually dissipates quickly, posing no threat to human health. Transportation sources (e.g., motor vehicles), energy generation, and open burning are among the predominant anthropogenic (i.e., man-made) sources of CO.

- **Lead (Pb)** in the atmosphere is generated from industrial sources including waste oil and solid waste incineration, iron and steel production, lead smelting, and battery and lead manufacturing. The lead content of motor vehicle emissions, which was the major source of lead in the past, has significantly declined with the widespread use of unleaded fuel. Low-lead fuel used in some general aviation (GA) aircraft is still a source of airport-related lead.

- **Nitrogen dioxide (NO_2)**, nitric oxide (NO), and the nitrate radical (NO_3) are collectively called oxides of nitrogen (NO_x). These three compounds are interrelated, often changing from one form to another in chemical reactions, and NO_2 is the compound commonly measured for comparison to the NAAQS. NO_x is generally emitted as NO, which is oxidized to NO_2. The principal man-made source of NO_x is fuel combustion in motor vehicles and power plants – aircraft engines are also a source. Reactions of NO_x with other atmospheric chemicals can lead to formation of ozone (O_3) and acidic precipitation.

- **Ozone (O_3)** is a secondary pollutant, formed from daytime reactions of NO_x and volatile organic compounds (VOCs) in the presence of sunlight. VOCs, which are a subset of hydrocarbons (HC) and have no NAAQS, are released in industrial processes and from evaporation of gasoline and solvents. Sources of NO_x are discussed above.

- **Particulate matter (PM)** comprises very small particles of dirt, dust, soot, or liquid droplets called aerosols. The NAAQS for PM is segregated by sizes (i.e., less than 10 and less than 2.5 microns as PM_{10} and $PM_{2.5}$, respectively). PM is formed as an exhaust product in the internal combustion engine or can be generated from the breakdown and dispersion of other solid materials (e.g., fugitive dust).

- **Sulfur oxides (SO_x)** are primarily composed of sulfur dioxide (SO_2) which is emitted in natural processes and by man-made sources such as combustion of sulfur-containing fuels and sulfuric acid manufacturing.

The NAAQS for these criteria pollutants are subdivided into the Primary Standards (designed to protect human health) and the Secondary Standards (designed to protect the environment and human welfare) and are listed below in **Table I-1**. Exceedances of these values constitute violations of the NAAQS.

Table I-1 National Ambient Air Quality Standards

Pollutant	Primary/ Secondary	Averaging Time	Standard ppm	Standard µg/m³	Form
Carbon Monoxide (CO)	Primary	1 hour	35	40,000	Not to be exceeded more than once a year.
		8-hour	9	10,000	Not to be exceeded more than once a year.
Lead (Pb)	Primary and Secondary	Rolling 3-Month Average	—	0.15	Not to exceed this level. Final rule October 2008.
Nitrogen Dioxide (NO_2)	Primary	1 hour	0.100	188	The 3-year average of the 98th percentile of the daily maximum 1-hour average at each monitor within an area must not exceed 0.100 ppm.
	Primary and Secondary	Annual	0.053	100	Not to exceed this level.
Ozone (O_3)	Primary and Secondary	8-hour[1]	0.070	—	Annual fourth-highest daily maximum 8-hour concentration, average over 3 years.
Particulate Matter with a diameter ≤10µm (PM_{10})	Primary and Secondary	24-hour	—	150	Not to be exceeded more than once a year on average over 3 years.
Particulate Matter with a diameter ≤2.5µm ($PM_{2.5}$)	Primary and Secondary	24-hour	—	35	The 3-year average of the 98th percentile for each population-oriented monitor within an area is not to exceed this level.
	Primary	Annual	—	12	The 3-year average of the weighted annual mean from single or multiple monitors within an area is not to exceed this level.
	Secondary	Annual	—	15	The 3-year average of the weighted annual mean from single or multiple monitors within an area is not to exceed this level.
Sulfur Dioxide (SO2)	Primary	1 hour	0.075	196	Final rule signed June 2, 2010. The 3-year average of the 99th percentile of the daily maximum 1-hour average at each monitor within an area must not exceed this level.
	Secondary	3-hour	0.5	1,300	Not to be exceeded more than once a year.

Source: EPA, 2019 (https://www.epa.gov/criteria-air-pollutants).
Note: There is no NAAQS standard for NO_x. µg/m³ - micrograms per cubic meter; ppm - parts per million.
1 Final rule signed October 1, 2015, and effective December 28, 2015. The previous (2008) O_3 standard additionally remains in effect in some areas. Revocation of the 2008 standard and transitioning to the new standard will be achieved over the next three years.

Sources of Airport Air Emissions

Almost all large metropolitan airports generate air emissions from the following general source categories: aircraft, ground service equipment (GSE), and motor vehicles traveling to, from, and moving about the airport; fuel storage and transfer facilities; a variety of stationary sources (e.g., steam boilers, back-up generators, snow melters, etc.); an assortment of aircraft maintenance activities (e.g., painting, cleaning, repair, etc.); routine airfield, roadway, and building maintenance activities (e.g., painting, cleaning, repair, etc.); and periodic construction activities for new projects or improvements to existing facilities. **Table I-2** provides a summary listing of these sources of air emissions, the pollutants, and their characteristics.

Table I-2 Airport-related Sources of Air Emissions

Sources	Emissions	Characteristics
Aircraft	CO NO_2 PM SO_2 VOCs	Exhaust products of fuel combustion that vary depending on aircraft engine type, number of engines, power setting, and period of operation. Emissions are also emitted by an aircraft's auxiliary power unit (APU).
Motor vehicles	CO NO_2 PM SO_2 VOCs	Exhaust products of fuel combustion from patron and employee traffic approaching, departing, and moving about the airport site. Emissions vary depending on vehicle type, distance traveled, operating speed, and ambient conditions.
Ground service equipment (GSE)	CO NO_2 PM SO_2 VOCs	Exhaust products of fuel combustion from service trucks, tow tugs, belt loaders, and other portable equipment.
Fuel storage and transfer	VOCs	Formed from the evaporation and vapor displacement of fuel from storage tanks and fuel transfer facilities. Emissions vary with fuel usage, type of storage tank, refueling method, fuel type, vapor recovery, climate, and ambient temperature.
Stationary sources	CO NO_2 PM SO_2 VOCs	Exhaust products of fossil fuel combustion from boilers dedicated to indoor heating requirements and emissions from incinerators used for waste reduction. Emissions are generally well controlled with operational techniques and post-burn collection methods. Sources include boilers and hot water generators, emergency generators, incinerators, paint booth and surface coating operations, welding operations, and firefighting facilities.

Table I-2 Airport-related Sources of Air Emissions (Continued)

Sources	Emissions	Characteristics
Construction Activities	CO NO_2 PM SO_2 VOCs	Construction projects may have associated emissions from dust generated during excavation and land clearing, exhaust emissions from construction equipment and motor vehicles, and evaporative emissions from asphalt paving and painting. The amount of particulate emissions varies with the material type, the amount of area exposed, and meteorology. The construction of airport and airfield improvement projects at airports represents temporary sources of emissions.

Source: KBE, 2019.
Notes: CO - carbon monoxide; NO_2 - nitrogen dioxide; PM - particulate matter; and SO_2 - sulfur dioxide; VOC - volatile organic compounds.

EPA, state, and local air quality agencies maintain outdoor air monitoring networks to measure air quality conditions and gauge compliance with the NAAQS. Based upon the data collected by these agencies, all areas throughout the country are designated by EPA with respect to their compliance with the NAAQS. **Table I-3** provides the definitions of each of these designations.

Table I-3 Attainment, Nonattainment, and Maintenance Areas

Attainment/Nonattainment Designations			
Attainment	**Attainment/Maintenance**	**Nonattainment Area**	**Unclassifiable**
Any area that meets the National Ambient Air Quality Standards (NAAQS) established for all of the criteria air pollutants.	Any area that is in transition from formerly being a nonattainment area to an Attainment area (also called Maintenance).	Any area that does not meet (or that contributes to ambient air quality in a nearby area that does not meet) one or more of the NAAQS.	Any area that cannot be classified on the basis of available information as meeting or not meeting the NAAQS.

Source: EPA, https://www.epa.gov/green-book, 2019.

For O_3, CO, PM_{10}, and $PM_{2.5}$, the Nonattainment designations are further classified by the severity, or degree, of the violation of the NAAQS. For example, in the case of O_3, these classifications range from highest to lowest as extreme, severe, serious, marginal, and moderate.

The Nonattainment designation of an area has a bearing on the emission control measures required and the time periods allotted by which a State Implementation Plan (SIP) must demonstrate Attainment of the NAAQS. It is also important to note that the degree of Nonattainment determines the thresholds of emissions that are considered to be "*de minimis,*" or levels below (i.e., within) which a formal General Conformity determination is not required.

Finally, the boundaries of Nonattainment areas are generally determined based on Core Based Statistical Areas (CBSA) as defined by U.S. census data (air monitoring station locations and contributing emission sources also play a role). However, Nonattainment areas for localized pollutants, such as lead and CO, typically only comprise a partial CBSA or a local "hot-spot." By comparison, regional pollutants such as O_3 can encompass multiple CBSAs and can extend across state lines.

State Implementation Plans (SIP)

For the purposes of this summary explanation of SIPs, it is sufficient to characterize SIPs as the principal instrument by which a state formulates and implements its strategies for bringing Nonattainment or Maintenance areas into compliance with the NAAQS. In equally broad terms, the SIP contains the necessary emission limitations, control measures and timetables for achieving this objective. Therefore, the SIP development process is delegated to state air quality agencies that may in turn rely on regional, county, and local agencies to help prepare emission inventories that include airport-related emissions.

Aircraft Fleet and Operational Data used in AEDT 2d

The Federal Aviation Administration (FAA) Aviation Environmental Design Tool (AEDT), Version 2d, which is the most current, was used in support of the 2017 air quality analysis.

Table I-4 contains the data that were used in AEDT 2d to represent actual conditions at Logan Airport in 2017. These data include aircraft type, engine, landing and takeoff cycles (LTOs), and taxi times. The aircraft are divided into four categories: air carrier (AC), cargo (CA), commuter (CO), and GA.

Table I-4 2017 Fleet Mix, Annual Landing and Takeoff Cycles (LTOs), and Taxi/Delay Time-in-Mode (TIM) by Aircraft Type

Aircraft Type	Engine	LTOs	Description (Airline)	Taxi Times
Air Carrier Aircraft				
Boeing 737-300 Series	CFM56-3-B1	10	AC (CHARTER)	26.57
Boeing 737-400 Series	CFM56-3B-2	29	AC (CHARTER)	26.57
Boeing 737-800 Series	CFM56-7B26	334	AC (CHARTER) AMX	26.57
Boeing 737-800 Series	CFM56-7B26	10	AC (CHARTER) BSK	26.57
Boeing 787-900 Dreamliner	Trent 1000-J2	324	AC (CHARTER) NAX	26.57
Boeing 737-800 Series	CFM56-7B26	53	AC (CHARTER) NAX	26.57
Boeing 737-400 Series	CFM56-3B-2	16	AC (CHARTER) SWQ	26.57
Airbus A330-200 Series	PW4168A	75	AC (CHARTER) TCX	26.57
Airbus A319-100 Series	CFM56-5B6/P	4,291	AC AAL	26.57

Table I-4 2017 Fleet Mix, Annual Landing and Takeoff Cycles (LTOs), and Taxi/Delay Time-in-Mode (TIM) by Aircraft Type (Continued)

Aircraft Type	Engine	LTOs	Description (Airline)	Taxi Times
Air Carrier Aircraft (Continued)				
Airbus A320-200 Series	V2527-A5	720	AC AAL	26.57
Airbus A321-100 Series	V2533-A5	5,477	AC AAL	26.57
Airbus A330-200 Series	PW4168	62	AC AAL	26.57
Airbus A330-300 Series	PW4168A	9	AC AAL	26.57
Boeing 737-800 Series	CFM56-7B26	9,288	AC AAL	26.57
Boeing 757-200 Series	RB211-535E4B	1,337	AC AAL	26.57
Boeing 767-300 Series	CF6-80C2B6	7	AC AAL	26.57
Boeing 777-200 Series	Trent 892	1	AC AAL	26.57
Embraer ERJ190	CF34-10E6	4,453	AC AAL	26.57
Boeing MD-83	JT8D-219	3	AC AAL	26.57
Airbus A319-100 Series	CFM56-5A5	114	AC ACA	26.57
Airbus A320-200 Series	CFM56-5-A1	24	AC ACA	26.57
Airbus A321-100 Series	CFM56-5B3	7	AC ACA	26.57
Embraer ERJ190	CF34-10E5A1	1,829	AC ACA	26.57
Airbus A330-200 Series	CF6-80E1A4	36	AC AEA	26.57
Airbus A330-200 Series	CF6-80E1A3	76	AC AFR	26.57
Airbus A340-300 Series	CFM56-5C2	8	AC AFR	26.57
Boeing 777-200 Series	GE90-90B	233	AC AFR	26.57
Boeing 777-300 ER	GE 90-115B	64	AC AFR	26.57
Boeing 787-900 Dreamliner	GEnx-1B74/75/P1	62	AC AFR	26.57
Boeing 737-800 Series	CFM56-7B24	645	AC ASA	26.57
Boeing 737-900 Series	CFM56-7B27	1,031	AC ASA	26.57
Airbus A319-100 Series	CFM56-5B7	113	AC AVA	26.57
Airbus A330-200 Series	CF6-80E1A4	271	AC AZA	26.57
Boeing 777-200 Series	GE90-94B	3	AC AZA	26.57
Airbus A380-800 Series/Trent 970	TRENT9XX	89	AC BAW	26.57
Boeing 747-400 Series	RB211-524H	440	AC BAW	26.57
Boeing 777-200 Series	GE90-90B	495	AC BAW	26.57

Table I-4 2017 Fleet Mix, Annual Landing and Takeoff Cycles (LTOs), and Taxi/Delay Time-in-Mode (TIM) by Aircraft Type (Continued)

Aircraft Type	Engine	LTOs	Description (Airline)	Taxi Times
Air Carrier Aircraft (Continued)				
Boeing 777-300 ER	GE90-115B	146	AC BAW	26.57
Boeing 787-900 Dreamliner	Trent 1000-J2	92	AC BAW	26.57
Airbus A330-200 Series	JT9D-70	139	AC BER	26.57
B787-8R	GEnx-1B64	46	AC CHH	26.57
Boeing 787-900 Dreamliner	Trent 1000-J2	470	AC CHH	26.57
Boeing 737-700 Series	CFM56-7B24	59	AC CMP	26.57
Boeing 737-800 Series	CFM56-7B26	306	AC CMP	26.57
Boeing 777-300 ER	GE90-115B	326	AC CPA	26.57
Airbus A319-100 Series	CFM56-5A5	3,570	AC DAL	26.57
Airbus A320-200 Series	CFM56-5A3	2,137	AC DAL	26.57
Airbus A321-100 Series	V2533-A5	2,759	AC DAL	26.57
Airbus A330-200 Series	PW4168 Talon II	5	AC DAL	26.57
Airbus A330-300 Series	PW4168A Talon II	586	AC DAL	26.57
Boeing 717-200 Series	BR700-715A1-30	2,750	AC DAL	26.57
Boeing 737-800 Series	CFM56-7B26	2,517	AC DAL	26.57
Boeing 737-900 Series	CFM56-7B26	749	AC DAL	26.57
Boeing 757-200 Series	PW2037	882	AC DAL	26.57
Boeing 757-300 Series	PW2040	2	AC DAL	26.57
Boeing 767-300 Series	CF6-80A2	672	AC DAL	26.57
Boeing 767-400 ER	CF6-80C2B7F	10	AC DAL	26.57
Boeing MD-88	JT8D-219	570	AC DAL	26.57
Boeing MD-90	V2525-D5	751	AC DAL	26.57
Airbus A330-300 Series	PW4168A	172	AC DLH	26.57
Airbus A340-300 Series	CFM56-5C4/P	5	AC DLH	26.57
Airbus A340-600 Series	Trent 556-61	83	AC DLH	26.57
Airbus A350-900 series	Trent 772	248	AC DLH	26.57
Boeing 747-400 Series	CF6-80C2B1F	2	AC DLH	26.57
Boeing 747-800 Freighter	GEnx-2B67	343	AC DLH	26.57

Table I-4 2017 Fleet Mix, Annual Landing and Takeoff Cycles (LTOs), and Taxi/Delay Time-in-Mode (TIM) by Aircraft Type (Continued)

Aircraft Type	Engine	LTOs	Description (Airline)	Taxi Times
Air Carrier Aircraft (Continued)				
Airbus A330-200 Series	CF6-80E1A2	71	AC EIN	26.57
Airbus A330-300 Series	CF6-80E1A4	588	AC EIN	26.57
Boeing 757-200 Series	PW2040	345	AC EIN	26.57
Boeing 767-200 Series	CF6-80A	2	AC EIN	26.57
Boeing 767-300 Series	PW4060	149	AC ELY	26.57
Airbus A330-200 Series	CF6-80E1A4	7	AC IBE	26.57
Airbus A330-300 Series	CF6-80E1A4	218	AC IBE	26.57
Airbus A340-600 Series	Trent 556-61	7	AC IBE	26.57
Boeing 757-200 Series	RB211-535E4	386	AC ICE	26.57
Boeing 757-300 Series	RB211-535E4B	8	AC ICE	26.57
Boeing 767-300 Series	CF6-80C2B6	239	AC ICE	26.57
B787-8R	GEnx-1B64	3	AC JAL	26.57
Boeing 787-900 Dreamliner	Trent 1000-J2	362	AC JAL	26.57
Airbus A320-200 Series	V2527-A5	20,879	AC JBU	26.57
Airbus A321-100 Series	V2533-A5	2,821	AC JBU	26.57
Embraer ERJ190	CF34-10E6	26,742	AC JBU	26.57
Boeing 777-200 Series	GE90-94B	2	AC KLM	26.57
Airbus A319-100 Series	V2522-A5	2,242	AC NKS	26.57
Airbus A320-200 Series	V2527-A5	1,870	AC NKS	26.57
Airbus A321-200 Series	V2533-A5	314	AC NKS	26.57
Airbus A350-900 series	Trent XWB-75	303	AC QTR	26.57
B787-8R	CFM56-5C4	61	AC QTR	26.57
Airbus A310-200 Series	CF6-80C2A2	371	AC RZO	26.57
Airbus A330-200 Series	PW4168A	1	AC RZO	26.57
Airbus A340-300 Series	CFM56-5C4	48	AC RZO	26.57
Boeing 777-200 Series	GE90-92B	2	AC RZO	26.57
Airbus A330-300 Series	Trent 772	42	AC SAS	26.57
Airbus A340-300 Series	CFM56-5C4	16	AC SAS	26.57

Table I-4 2017 Fleet Mix, Annual Landing and Takeoff Cycles (LTOs), and Taxi/Delay Time-in-Mode (TIM) by Aircraft Type (Continued)

Aircraft Type	Engine	LTOs	Description (Airline)	Taxi Times
Air Carrier Aircraft (Continued)				
Boeing 737-700 Series	CFM56-7B22/2	211	AC SAS	26.57
Boeing 737-700 Series	CFM56-7B22	278	AC SCX	26.57
Boeing 737-800 Series	CFM56-7B27	417	AC SCX	26.57
Boeing 737-800 MAX	LEAP-1A35A/33/33B2/32/30	16	AC SWA	26.57
Boeing 737-300 Series	CFM56-3-B1	1,622	AC SWA	26.57
Boeing 737-700 Series	CFM56-7B24	7,457	AC SWA	26.57
Boeing 737-800 Series	CFM56-7B26	2,970	AC SWA	26.57
Airbus A330-300 Series	Trent 772	349	AC SWR	26.57
Airbus A340-300 Series	CFM56-5C4	113	AC SWR	26.57
Airbus A330-200 Series	PW4168A	307	AC TAP	26.57
Airbus A330-300 Series	Trent 772	14	AC TAP	26.57
Airbus A330-200 Series	CF6-80E1A3	1	AC THY	26.57
Airbus A330-300 Series	Trent 772	307	AC THY	26.57
Airbus A380-800 Series/Trent 970	GP7200	1	AC UAE	26.57
Boeing 777-200-LR	GE90-110B1	16	AC UAE	26.57
Boeing 777-300 ER	GE90-115B	500	AC UAE	26.57
Airbus A319-100 Series	V2522-A5	189	AC UAL	26.57
Airbus A320-200 Series	V2527-A5	1,458	AC UAL	26.57
Boeing 737-700 Series	CFM56-7B24	751	AC UAL	26.57
Boeing 737-800 Series	CFM56-7B26	1,874	AC UAL	26.57
Boeing 737-900 Series	CFM56-7B26	5,453	AC UAL	26.57
Boeing 757-200 Series	PW2037	1,131	AC UAL	26.57
Boeing 757-300 Series	RB211-535E4B	1,020	AC UAL	26.57
Boeing 767-300 Series	PW4060	2	AC UAL	26.57
Boeing 767-400	CF6-80C2B8FA	7	AC UAL	26.57
Boeing 777-200 Series	PW4077	424	AC UAL	26.57
Boeing 777-300 ER	PW4090	9	AC UAL	26.57
Airbus A330-300 Series	Trent 772	158	AC VIR	26.57

Table I-4 2017 Fleet Mix, Annual Landing and Takeoff Cycles (LTOs), and Taxi/Delay Time-in-Mode (TIM) by Aircraft Type (Continued)

Aircraft Type	Engine	LTOs	Description (Airline)	Taxi Times
Air Carrier Aircraft (Continued)				
Airbus A340-600 Series	Trent 556-61	8	AC VIR	26.57
Boeing 747-400 Series	CF6-80C2B1F	1	AC VIR	26.57
Boeing 787-900 Dreamliner	Trent 1000-A	215	AC VIR	26.57
Airbus A319-100 Series	CFM56-5B6/P	28	AC VRD	26.57
Airbus A320-200 Series	V2527-A5	1,830	AC VRD	26.57
Airbus A321-200 Series	CFM56-5-A1	19	AC VRD	26.57
Airbus A320-200 Series	V2527-A5	1	AC WOW	26.57
Airbus A321-100 Series	V2533-A5	354	AC WOW	26.57
Airbus A330-300 Series	Trent 772	7	AC WOW	26.57
Total Air Carrier Aircraft LTOs		**140,053**		
Cargo Aircraft				
Airbus A330-200 Series	CF6-80A	38	CA ABX	26.57
Airbus A330-300 Series	PW2037	163	CA ATN	26.57
Boeing 757-200 Series	CF6-80C2A5F	410	CA FDX	26.57
Boeing 767-200 Series	JT9D-7R4E, -7R4E1	112	CA FDX	26.57
Airbus A319-100 Series	RB211-535E4	5	CA FDX	26.57
Airbus A330-200 Series	CF6-80C2B6	968	CA FDX	26.57
Airbus A319-100 Series	CF6-6D	289	CA FDX	26.57
Airbus A320-200 Series	CF6-80C2D1F	93	CA FDX	26.57
Airbus A321-100 Series	CF6-80E1A3	2	CA GTI	26.57
Embraer ERJ190	JT9D-7R4D, -7R4D1	66	CA GTI	26.57
Airbus A330-200 Series	PW4158	603	CA UPS	26.57
Bombardier CRJ-200	PW2040	216	CA UPS	26.57
Boeing 737-800 Series	CF6-80C2B6F	208	CA UPS	26.57
Boeing 737-900 Series	PT6A-114	193	CA WIG	26.57
Total Cargo Aircraft LTOs		**3,366**		

Table I-4 2017 Fleet Mix, Annual Landing and Takeoff Cycles (LTOs), and Taxi/Delay Time-in-Mode (TIM) by Aircraft Type (Continued)

Aircraft Type	Engine	LTOs	Description (Airline)	Taxi Times
Commuter Aircraft				
Bombardier CRJ-700	CF34-8C1	117	CO ASH	26.57
Embraer ERJ175-LR	CF34-8E5	46	CO ASH	26.57
Bombardier CRJ-700	CF34-8C1	761	CO ASQ	26.57
Bombardier CRJ-900	CF34-8C5A2	5	CO ASQ	26.57
Embraer ERJ145	AE3007A1P	1,064	CO ASQ	26.57
Bombardier CRJ-200	CF34-3B	1,864	CO AWI	26.57
Bombardier CRJ-200	CF34-3B	333	CO EDV	26.57
Bombardier CRJ-900	CF34-8C5	3,656	CO EDV	26.57
Bombardier CRJ-700	CF34-8C5	566	CO GJS	26.57
Bombardier CRJ-900	CF34-8C5	1,002	CO GJS	26.57
Bombardier CRJ-200	CF34-3B	2,542	CO JZA	26.57
Bombardier CRJ-900	CF34-8C5	431	CO JZA	26.57
Bombardier de Havilland Dash 8 Q100	PW120A	29	CO JZA	26.57
Bombardier de Havilland Dash 8 Q400	PW150A	11	CO JZA	26.57
Cessna 402	TIO-540-J2B2	16,618	CO KAP	26.57
Embraer ERJ145	AE3007A1	1	CO LOF	26.57
Bombardier de Havilland Dash 8 Q100	PW120A	43	CO PDT	26.57
Embraer ERJ145	AE3007A1E	365	CO PDT	26.57
Saab 340-B-Plus	CT7-9B	1,719	CO PEN	26.57
Bombardier de Havilland Dash 8 Q400	PW150A	1,950	CO POE	26.57
Embraer ERJ170	CF34-8E5	2,353	CO RPA	26.57
Embraer ERJ175-LR	CF34-8E5	186	CO RPA	26.57
Embraer ERJ175	CF34-8E5	3,458	CO RPA	26.57
Embraer ERJ170	CF34-8E5	735	CO SKV	26.57
Bombardier CRJ-900	CF34-8C5	34	CO SKW	26.57
Embraer ERJ175-LR	CF34-8E5	9	CO SKW	26.57

Table I-4 2017 Fleet Mix, Annual Landing and Takeoff Cycles (LTOs), and Taxi/Delay Time-in-Mode (TIM) by Aircraft Type (Continued)

Aircraft Type	Engine	LTOs	Description (Airline)	Taxi Times
Commuter Aircraft (Continued)				
Embraer ERJ170	CF34-8E5	54	CO TCF	26.57
Embraer ERJ175	CF34-8E5A1	155	CO TCF	26.57
Bombardier de Havilland Dash 8 Q400	PW150A	1,569	CO WEN	26.57
Total Commuter Aircraft LTOs		**41,676**		
General Aviation Aircraft				
Saab 340-B	CT7-5	1,795	GA	26.57
Bombardier Challenger 600	CF34-3A	1,187	GA	26.57
Gulfstream G400	TAY Mk611-8	1,182	GA	26.57
Gulfstream G500	SPEY Mk511	946	GA	26.57
Dassault Falcon 2000	CF700-2D	871	GA	26.57
Raytheon Hawker 800	TFE731-3	835	GA	26.57
Cirrus SR22	TIO-540-J2B2	832	GA	26.57
Cessna 402	TIO-540-J2B2	799	GA	26.57
Cessna 560 Citation XLS	JT15D-5, -5A, -5B	768	GA	26.57
Bombardier Global Express	BR700-710A1-10	626	GA	26.57
Raytheon Beechjet 400	JT15D-5, -5A, -5B	46	GA CNS	26.57
Pilatus PC-12	PT6A-67B	759	GA CNS	26.57
Cessna 560 Citation Excel	JT15D-5, -5A, -5B	764	GA EJA	26.57
Cessna 680 Citation Sovereign	PW308C	458	GA EJA	26.57
Embraer 505	PW530	397	GA EJA	26.57
Bombardier Challenger 300	AS907-1-1A	340	GA EJA	26.57
Dassault Falcon 2000	PW308C	278	GA EJA	26.57
Gulfstream G400	TAY Mk611-8	91	GA EJM	26.57
Cessna 560 Citation Excel	JT15D-5, -5A, -5B	73	GA EJM	26.57
Bombardier Challenger 300	AE3007A1	57	GA EJM	26.57
Gulfstream G500	BR700-710A1-10	50	GA EJM	26.57
Bombardier Challenger 600	CF34-3A	47	GA EJM	26.57

Table I-4 2017 Fleet Mix, Annual Landing and Takeoff Cycles (LTOs), and Taxi/Delay Time-in-Mode (TIM) by Aircraft Type (Continued)

Aircraft Type	Engine	LTOs	Description (Airline)	Taxi Times
General Aviation Aircraft (Continued)				
Raytheon Super King Air 300	PT6A-60A	453	GA GAJ	26.57
Cessna 560 Citation XLS	JT15D-5, -5A, -5B	99	GA GAJ	26.57
Dassault Falcon 900	TFE731-3	2	GA GAJ	26.57
Gulfstream G400	TAY Mk611-8	2	GA GAJ	26.57
GULFSTREAM AEROSPACE Gulfstream G650	BR-700-725A1-12	1	GA GAJ	26.57
Cessna 525B CitationJet	JT15D-4series	19	GA GPD	26.57
Cessna 525 CitationJet	JT15D-1 series	2	GA GPD	26.57
Pilatus PC-12	PT6A-67B	520	GA GPD	26.57
Bombardier Challenger 300	AE3007A1	241	GA LXJ	26.57
Gulfstream G400	TAY Mk611-8	42	GA LXJ	26.57
Embraer Legacy	AE3007A1P	29	GA LXJ	26.57
Bombardier Learjet 75	TFE731-3	29	GA LXJ	26.57
Bombardier Challenger 600	CF34-3B	23	GA LXJ	26.57
Cirrus SR22	TIO-540-J2B2	45	GA NGF	26.57
Cessna 182	IO-360-B	44	GA NGF	26.57
Raytheon Beech Bonanza 36	TIO-540-J2B2	37	GA NGF	26.57
Piper PA-24 Comanche	TIO-540-J2B2	34	GA NGF	26.57
Raytheon Beech Bonanza 36	TIO-540-J2B2	31	GA NGF	26.57
Cessna 750 Citation X	AE3007C	6	GA OPT	26.57
Embraer ERJ135	AE3007A1/3	31	GA OPT	26.57
Embraer 505	PW500	141	GA OPT	26.57
Raytheon Beechjet 400	JT15D-5, -5A, -5B	249	GA TMC	26.57
Bombardier Challenger 600	CF34-3B	3	GA TMC	26.57
Raytheon Hawker 800	TFE731-3	99	GA TMC	26.57
Cessna 750 Citation X	AE3007C	106	GA XOJ	26.57
Bombardier Challenger 300	AE3007A1	102	GA XOJ	26.57
Total General Aviation Aircraft LTOs		**15,591**		
Total Fleet LTOs		**200,686**		

Source: KBE, HMMH, and Federal Aviation Administration ASPM, 2019.

Table I-5 contains the data that were used in AEDT 2d to represent future forecast conditions at Logan Airport in the Future Planning Horizon where passengers projected are projected to reach 50 million annual air passengers in the next 10 to 15 years (the Future Planning Horizon), forecast to be accommodated in approximately 486,000 annual aircraft operations. These data include aircraft type, engine, LTOs, and taxi times. The aircraft are divided into four categories: air carrier (AC), cargo (CA), commuter (CO), and GA.

Table I-5 Future Planning Horizon Fleet Mix, Annual Landing and Takeoff Cycles (LTOs), and Taxi/Delay Time-in-Mode (TIM) by Aircraft Type

Aircraft Type	Engine	LTOs	Description (Airline)	Taxi Times
Air Carrier Aircraft				
Airbus A319-100 Series	CFM56-5B6/P	15,238	AC	25.64
Airbus A320-200 Series	V2527-A5	31,430	AC	25.64
Airbus A320-NEO	CFM56-5B4/3	4,444	AC	25.64
Airbus A321-200 Series	V2533-A5	16,031	AC	25.64
Airbus A321-NEO	CFM56-5B2/3	8,733	AC	25.64
ATR 42-500	PW127F	635	AC	25.64
Boeing 717-200 Series	BR700-715A1-30	1,587	AC	25.64
Boeing 737-700 Series	CFM56-7B24	7,619	AC	25.64
Boeing 737-700 MAX	LEAP-1A35A/33/33B2/32/30	1,587	AC	25.64
Boeing 737-800 Series	CFM56-7B26	17,618	AC	25.64
Boeing 737-900 Series	CFM56-7B26	6,667	AC	25.64
Boeing 737-900 MAX	LEAP-1A35A/33/33B2/32/30	2,539	AC	25.64
Bombardier CS-100	PW1524G	11,746	AC	25.64
Bombardier CS-300	CFM56-5B7/3	19,684	AC	25.64
Piper PA-31 Navajo	TIO-540-J2B2	16,509	AC	25.64
Boeing 737-800 MAX	LEAP-1A35A/33/33B2/32/30	10,000	AC	25.64
Boeing 757-300 Series	RB211-535E4B	1,587	AC	25.64
Boeing 777-200 Series	GE90-90B	1,905	AC	25.64
Airbus A319-NEO	CFM56-5B7/3	159	AC	25.64
Airbus A330-200 Series	PW4168A	635	AC	25.64
Airbus A330-300 Series	Trent 772	2858	AC	25.64
Airbus A330-900-NEO	Trent 772	1587	AC	25.64

Table I-5	Future Planning Horizon Fleet Mix, Annual Landing and Takeoff Cycles (LTOs), and Taxi/Delay Time-in-Mode (TIM) by Aircraft Type (Continued)

Aircraft Type	Engine	LTOs	Description (Airline)	Taxi Times
Air Carrier Aircraft				
Airbus A350-900 series	Trent XWB-75	634	AC	25.64
7478	GEnx-2B67	317	AC	25.64
Boeing 777-300 Series	GE90-92B	952	AC	25.64
B787-8R	CFM56-5C4	1269	AC	25.64
Boeing 787-900 Dreamliner	Trent 1000-J2	1905	AC	25.64
Airbus A380-800 Series	TRENT970	317	AC	25.64
Boeing 777-9X	GE90-115	318	AC	25.64
Total Air Carrier Aircraft LTOs		**186,510**		
Cargo Aircraft				
Boeing 767-300 Series	CF6-80C2B6	3,356	CA	25.64
Boeing 757-200 Series	PW2040	650	CA	25.64
Total Cargo Aircraft LTOs		**4,006**		
Commuter Aircraft				
Bombardier CRJ-700	CF34-8C1	952	CO	25.64
Bombardier CRJ-900	CF34-8C5	9,206	CO	25.64
Bombardier de Havilland Dash 8 Q400	PW150A	3,810	CO	25.64
Embraer ERJ140	AE3007A3	2,222	CO	25.64
Embraer ERJ145	AE3007A1P	317	CO	25.64
Embraer ERJ175	CF34-8E5A1	14,603	CO	25.64
Saab 340-B	CT7-5	1,587	CO	25.64
Embraer ERJ170	CF34-8E5	4,127	CO	25.64
Total Commuter Aircraft LTOs		**36,824**		

Table I-5 Future Planning Horizon Fleet Mix, Annual Landing and Takeoff Cycles (LTOs), and Taxi/Delay Time-in-Mode (TIM) by Aircraft Type (Continued)

Aircraft Type	Engine	LTOs	Description (Airline)	Taxi Times
General Aviation Aircraft				
Raytheon Beech Baron 58	TIO-540-J2B2	3,250	GA	25.64
Bombardier Challenger 600	CF34-3A	7,583	GA	25.64
Cirrus SR22	TIO-540-J2B2	3,385	GA	25.64
Pilatus PC-12	PT6A-67B	541	GA	25.64
Cessna 560 Citation Excel	JT15D-5, -5A, -5B	812	GA	25.64
Embraer 505	PW530	271	GA	25.64
Total General Aviation Aircraft LTOs		**15,842**		
Total Fleet LTOs		**243,182**		

Note: AC - air carrier; CA – cargo; CO – commuter; GA – general aviation.

Ground Service Equipment (GSE) Time-in-Mode (TIM) Survey

A GSE time-in-mode (TIM) survey was conducted at Logan Airport on June 27-28, 2017. The purpose of the GSE TIM survey was to provide up-to-date GSE operating times, which directly affects GSE emissions. The last GSE TIM survey was conducted in 2012 in support of the *2011 Environmental Status and Planning Report (ESPR)*. The TIM is the average time that GSE and aircraft auxiliary power units (APUs) operate during a single aircraft LTO cycle. The surveyed TIM is used in place of the default TIM values in AEDT, thus yielding GSE emissions that best reflect the conditions at Logan Airport. The TIM survey focused on the most prevalent airlines (e.g., Southwest, JetBlue, American, Delta, and United) and the most common aircraft types, such as narrow body air carriers (e.g., A320, A321, B737, B757, etc.) and large commuter aircraft (e.g., ERJ170, ERJ190, CRJ700, CRJ900, etc.). The TIMs are provided in **Table I-6**.

Table I-6 Ground Service Equipment (GSE) Time-in-Mode (TIM) (minutes)

GSE Type	Narrow-Body Air Carriers	Large Commuter Aircraft
Aircraft Tractor	6.37	7.13
Baggage Tractor	27.23	17.43
Belt Loader	26.85	14.88
Cabin Service Truck	2.07	0.53
Catering Truck	11.30	13.28
Hydrant Truck	3.73	2.53
Lavatory Truck	4.82	2.45
Service Truck	0.12	0.57
Water Service Truck	1.65	0.75
Auxiliary Power Unit (APU)	16.63	14.70

Source: GSE TIM survey conducted by KBE with assistance from Massport (security escorts) on June 27-28, 2017.

Ground Service Equipment (GSE)/Alternative Fuels Conversion

For the 2017 analyses, GSE emissions were calculated using AEDT emission factors which are based on EPA NONROAD2008 model in combination with the recently updated GSE TIM survey and the GSE fuel types obtained from the Logan Airport Vehicle Aerodrome Permit Application. In this way, the most up-to-date GSE fleet operational, conversion, and emissions characteristics are used (**Table I-7**).

Table I-7 Ground Service Equipment (GSE) Alternative Fuel Conversion Summary (kg/day)

Year	Pollutant	Percent Reduction	Calculated Emissions without Reduction	Reduction from AFVs	Calculated Emissions with Reduction
2000	Volatile Organic Compounds (VOCs)	13.72%	178	24	154
	Oxides of Nitrogen (NO_x)	9.87%	369	36	333
	Carbon Monoxide (CO)	12.88%	6,124	789	5,335
2001	VOCs	13.72%	166	23	143
	NO_x	9.87%	338	33	305
	CO	12.88%	5,960	768	5,193
2002	VOCs	13.6%	286	39	247

Table I-7 Ground Service Equipment (GSE) Alternative Fuel Conversion Summary (kg/day) (Continued)

Year	Pollutant	Percent Reduction	Calculated Emissions without Reduction	Reduction from AFVs	Calculated Emissions with Reduction
	NO_x	8.0%	350	28	322
	CO	16.3%	6,174	1,004	5,170
2003	VOCs	13.8%	263	36	227
	NO_x	8.0%	316	25	291
	CO	16.4%	5,692	934	4,758
2004	VOCs	11.9%	212	25	187
	NO_x	6.6%	357	24	333
	CO	15.4%	4,236	650	3,586
2005	VOCs	12.2%	203	25	178
	NO_x	6.9%	335	23	312
	CO	15.4%	4,175	643	3,531
	$PM_{10}/PM_{2.5}$	9.9%	11	1	10
2006	VOCs	10.7%	86	9	77
	NO_x	7.5%	324	24	300
	CO	13.8%	1,841	255	1,586
	$PM_{10}/PM_{2.5}$	10.8%	10	1	9
2007	VOCs	8.2%	85	7	78
	NO_x	5.1%	315	16	299
	CO	10.4%	2,124	220	1,904
	$PM_{10}/PM_{2.5}$	5.9%	10	<1	10
2008	VOCs	8.3%	72	6	66
	NO_x	4.8%	270	13	257
	CO	10.2%	1,792	183	1,609
	$PM_{10}/PM_{2.5}$	5.6%	16	<1	15

Table I-7	Ground Service Equipment (GSE) Alternative Fuel Conversion Summary (kg/day) (Continued)

Year	Pollutant	Percent Reduction	Calculated Emissions without Reduction	Reduction from AFVs	Calculated Emissions with Reduction
2009	VOCs	8.2%	61	5	56
	NO_x	4.8%	230	11	219
	CO	10.0%	1,516	152	1,364
	$PM_{10}/PM_{2.5}$	3.5%	14	<1	14
2010	VOCs	7.5%	53	4	49
	NO_x	3.9%	206	8	198
	CO	8.5%	1,335	113	1,222
	$PM_{10}/PM_{2.5}$	2.5%	13	<1	13
2011	VOCs	13.2%	38	5	33
	NO_x	7.5%	188	14	173
	CO	16.7%	834	139	694
	$PM_{10}/PM_{2.5}$	5.5%	14	1	13
2012	VOCs	11.8%	34	4	30
	NO_x	6.8%	176	12	164
	CO	16.3%	738	120	618
	$PM_{10}/PM_{2.5}$	4.9%	13	<1	13
2013	VOCs	10.3%	29	3	26
	NO_x	6.5%	155	10	145
	CO	15.9%	634	101	533
	$PM_{10}/PM_{2.5}$	5.0%	12	<1	12
2014	VOCs	11.5%	26	3	23
	NO_x	5.6%	142	8	134
	CO	15.4%	572	88	484
	$PM_{10}/PM_{2.5}$	4.8%	12	<1	12

Table I-7 Ground Service Equipment (GSE) Alternative Fuel Conversion Summary (kg/day) (Continued)

Year	Pollutant	Percent Reduction	Calculated Emissions without Reduction	Reduction from AFVs	Calculated Emissions with Reduction
2015	VOCs	4.5%	22	1	21
	NO_x	5.2%	135	7	128
	CO	15.2%	521	79	442
	$PM_{10}/PM_{2.5}$	14.3%	14	2	12
2016	VOCs	9.0%	26	2	24
	NO_x	3.8%	173	6	167
	CO	13.5%	560	67	493
	$PM_{10}/PM_{2.5}$	2.6%	15	<1	15
2017	VOCs	8.7%	24	2	22
	NO_x	3.6%	148	5	143
	CO	13.7%	548	66	483
	$PM_{10}/PM_{2.5}$	3.8%	14	<1	14

Source: KBE and Massport.
Note: 2000 and 2001 analyses used EDMS v4.03. 2002 and 2003 analyses used EDMS v4.11, which used updated emission factors from the NONROAD2002 Model. 2004 analyses used EDMS v4.21, which again used emission factors from EPA NONROAD2002 Model. 2005 analysis used EDMS v4.5, which used emission factors from EPA NONROAD2002 Model. 2006 analysis used EDMS v5.0.1, which used emission factors from EPA NONROAD2005 Model. 2007 analysis used EDMS v5.0.2, which used emission factors from EPA NONROAD2005 Model. 2008 analysis used EDMS v5.1, which used emission factors from EPA NONROAD2005 Model. 2009 analysis used EDMS v5.1.2, which used emission factors from EPA NONROAD2005 Model. 2010, 2011, and 2012 analysis used EDMS v5.1.3, which used emission factors from EPA NONROAD2005 Model. 2013, 2014, 2015 analysis used EDMS v5.1.4.1, which used emission factors from EPA NONROAD2005. 2016 analysis used AEDT2c SP2, which used emission factors from EPA NONROAD2008 Model. 2017 analysis used AEDT 2d, which used emission factors from EPA NONROAD2008 Model.

Motor Vehicle Emissions

For the 2017 analysis, EPA's most current motor vehicle emission factor model MOVES2014b was used. The resultant emission factors were multiplied by average daily vehicle miles to calculate daily emissions. The on-Airport traffic data are summarized in the vehicle miles traveled (VMT) analyses of Appendix G, *Ground Access to and from Logan Airport.* Due to the new roadway configuration of the Ted Williams Tunnel, through-traffic no longer traverses Airport property. Therefore, as of 2003, emissions from these vehicles are no longer included as part of the Logan Airport emissions inventory. Further, MOVES2014b was used to obtain vehicle emissions at idle to estimate parking and curbside motor vehicle emissions.

Idling emissions are determined for a unit of time and multiplied by total idling time to reach the associated emissions. The input and output files of MOVES2014b for 2017 are included as **Tables I-8** and **I-9.** The input and output files of MOVES2014b for the Future Planning Horizon are included as **Tables I-10** and **I-11.**

Table I-8 MOVES2014b Sample Input File for 2017


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        <fuelsubtype selected="false"/>
        <emissionprocess selected="false"/>
        <onroadoffroad selected="true"/>
        <roadtype selected="false"/>
        <sourceusetype selected="false"/>
        <movesvehicletype selected="false"/>
        <onroadscc selected="false"/>
        <estimateuncertainty selected="false" numberOfIterations="2" keepSampledData="false" keepIterations="false"/>
        <sector selected="false"/>
        <engtechid selected="false"/>
        <hpclass selected="false"/>
        <regclassid selected="false"/>
    </outputemissionsbreakdownselection>
    <outputdatabase servername="" databasename="espr2017w_tb_out_2" description=""/>
    <outputtimestep value="Hour"/>
    <outputvmtdata value="true"/>
    <outputsho value="true"/>
    <outputsh value="true"/>
    <outputshp value="true"/>
    <outputshidling value="true"/>
    <outputstarts value="true"/>
    <outputpopulation value="true"/>
    <scaleinputdatabase servername="localhost" databasename="espr2017w_tb_actual_in" description=""/>
    <pmsize value="0"/>
    <outputfactors>
        <timefactors selected="true" units="Hours"/>
        <distancefactors selected="true" units="Miles"/>
        <massfactors selected="true" units="Grams" energyunits="Million BTU"/>
    </outputfactors>
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        &lt;savedata&gt;

        &lt;/savedata&gt;

        &lt;donotexecute&gt;

        &lt;/donotexecute&gt;

        &lt;generatordatabase shouldsave="false" servername="" databasename="" description=""/&gt;
            &lt;donotperformfinalaggregation selected="false"/&gt;
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&lt;/runspec&gt;
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Source: KBE and Massport, 2019.

Table I-9 MOVES2014b Sample Output File for 2017

MasterKey	MOVESRunID	iterationID	yearID	monthID	dayID	hourID	stateID	countyID	zoneID	linkID	pollutantID	processID	sourceTypeID	regClassId	fuelTypeID	modelYearID	roadTypeID	SCC	emissionQuant	activityTypeID	activity	emissionRate	massUnits	distanceUnits
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2017,0,00	1	1	2017	1	5	7	25	25025	250250	1	122	NULL	0	0	2	2017	0	0	2.43768E-05	1	0.046585601	0.000523269	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2017,0,00	1	1	2017	1	5	7	25	25025	250250	1	121	NULL	0	0	2	2017	0	0	4.25954E-06	1	0.046585601	9.14347E-05	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2017,0,00	1	1	2017	1	5	7	25	25025	250250	1	119	NULL	0	0	2	2017	0	0	0	1	0.046585601	0	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2017,0,00	1	1	2017	1	5	7	25	25025	250250	1	118	NULL	0	0	2	2017	0	0	0.000713675	1	0.046585601	0.015319648	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2017,0,00	1	1	2017	1	5	7	25	25025	250250	1	117	NULL	0	0	2	2017	0	0	0.000179121	1	0.046585601	0.003844986	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2017,0,00	1	1	2017	1	5	7	25	25025	250250	1	116	NULL	0	0	2	2017	0	0	0.00144878	1	0.046585601	0.031099308	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2017,0,00	1	1	2017	1	5	7	25	25025	250250	1	115	NULL	0	0	2	2017	0	0	0.000549345	1	0.046585601	0.011792163	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2017,0,00	1	1	2017	1	5	7	25	25025	250250	1	112	NULL	0	0	2	2017	0	0	7.01035E-05	1	0.046585601	0.001504832	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2017,0,00	1	1	2017	1	5	7	25	25025	250250	1	111	NULL	0	0	2	2017	0	0	0.000121884	1	0.046585601	0.002616345	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2017,0,00	1	1	2017	1	5	7	25	25025	250250	1	110	NULL	0	0	2	2017	0	0	0.000783778	1	0.046585601	0.01682447	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2017,0,00	1	1	2017	1	5	7	25	25025	250250	1	107	NULL	0	0	2	2017	0	0	0.00119415	1	0.046585601	0.025633456	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2017,0,00	1	1	2017	1	5	7	25	25025	250250	1	106	NULL	0	0	2	2017	0	0	0.0115902	1	0.046585601	0.248793604	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2017,0,00	1	1	2017	1	5	7	25	25025	250250	1	100	NULL	0	0	2	2017	0	0	0.000851936	1	0.046585601	0.018287539	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2017,0,00	1	1	2017	1	5	7	25	25025	250250	1	98	NULL	0	0	2	2017	0	0	47.32360077	1	0.046585601	1015.841804	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2017,0,00	1	1	2017	1	5	7	25	25025	250250	1	91	NULL	0	0	2	2017	0	0	0.000608149	1	0.046585601	0.013054437	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2017,0,00	1	1	2017	1	5	7	25	25025	250250	1	90	NULL	0	0	2	2017	0	0	47.26330185	1	0.046585601	1014.547436	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2017,0,00	1	1	2017	1	5	7	25	25025	250250	1	87	NULL	0	0	2	2017	0	0	0.00224148	1	0.046585601	0.048115295	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2017,0,00	1	1	2017	1	5	7	25	25025	250250	1	79	NULL	0	0	2	2017	0	0	0.00171656	1	0.046585601	0.036847437	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2017,0,00	1	1	2017	1	5	7	25	25025	250250	1	66	NULL	0	0	2	2017	0	0	7.71863E-07	1	0.046585601	1.65687E-05	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2017,0,00	1	1	2017	1	5	7	25	25025	250250	1	59	NULL	0	0	2	2017	0	0	3.49803E-06	1	0.046585601	7.50882E-05	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2017,0,00	1	1	2017	1	5	7	25	25025	250250	1	58	NULL	0	0	2	2017	0	0	5.75102E-07	1	0.046585601	1.23451E-05	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2017,0,00	1	1	2017	1	5	7	25	25025	250250	1	57	NULL	0	0	2	2017	0	0	4.78169E-07	1	0.046585601	1.02643E-05	g	mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2017,0,00 1 1 2017 1 5 7 25 25025 250250 1 56 NULL 0 0 2 2017 0 0 8.94774E-08 1 0.046585601 1.92071E-06 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2017,0,00 1 1 2017 1 5 7 25 25025 250250 1 55 NULL 0 0 2 2017 0 0 2.5633E-06 1 0.046585601 5.50234E-05 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2017,0,00 1 1 2017 1 5 7 25 25025 250250 1 54 NULL 0 0 2 2017 0 0 7.48895E-07 1 0.046585601 1.60757E-05 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2017,0,00 1 1 2017 1 5 7 25 25025 250250 1 53 NULL 0 0 2 2017 0 0 2.57534E-07 1 0.046585601 5.52819E-06 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2017,0,00 1 1 2017 1 5 7 25 25025 250250 1 52 NULL 0 0 2 2017 0 0 5.38356E-06 1 0.046585601 0.000115563 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2017,0,00 1 1 2017 1 5 7 25 25025 250250 1 51 NULL 0 0 2 2017 0 0 2.15281E-07 1 0.046585601 4.62119E-06 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2017,0,00 1 1 2017 1 5 7 25 25025 250250 1 36 NULL 0 0 2 2017 0 0 0 1 0.046585601 0 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2017,0,00 1 1 2017 1 5 7 25 25025 250250 1 35 NULL 0 0 2 2017 0 0 0 1 0.046585601 0 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2017,0,00 1 1 2017 1 5 7 25 25025 250250 1 31 NULL 0 0 2 2017 0 0 0.000394039 1 0.046585601 0.008458386 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2017,0,00 1 1 2017 1 5 7 25 25025 250250 1 5 NULL 0 0 2 2017 0 0 0.00241574 1 0.046585601 0.051855936 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2017,0,00 1 1 2017 1 5 7 25 25025 250250 1 3 NULL 0 0 2 2017 0 0 0.044062998 1 0.046585601 0.945850163 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2017,0,00 1 1 2017 1 5 7 25 25025 250250 1 2 NULL 0 0 2 2017 0 0 0.0127928 1 0.046585601 0.27460845 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2017,0,00 1 1 2017 1 5 7 25 25025 250250 1 1 NULL 0 0 2 2017 0 0 0.0041323 1 0.046585601 0.088703378 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2016,0,00 1 1 2017 1 5 7 25 25025 250250 1 122 NULL 0 0 2 2016 0 0 2.37868E-05 1 0.045457602 0.000523274 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2016,0,00 1 1 2017 1 5 7 25 25025 250250 1 121 NULL 0 0 2 2016 0 0 4.15644E-06 1 0.045457602 9.14355E-05 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2016,0,00 1 1 2017 1 5 7 25 25025 250250 1 119 NULL 0 0 2 2016 0 0 0 1 0.045457602 0 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2016,0,00 1 1 2017 1 5 7 25 25025 250250 1 118 NULL 0 0 2 2016 0 0 0.0006964 1 0.045457602 0.01531977 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2016,0,00 1 1 2017 1 5 7 25 25025 250250 1 117 NULL 0 0 2 2016 0 0 0.000174785 1 0.045457602 0.003845012 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2016,0,00 1 1 2017 1 5 7 25 25025 250250 1 116 NULL 0 0 2 2016 0 0 0.00141371 1 0.045457602 0.031099528 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2016,0,00 1 1 2017 1 5 7 25 25025 250250 1 115 NULL 0 0 2 2016 0 0 0.000536048 1 0.045457602 0.011792264 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2016,0,00 1 1 2017 1 5 7 25 25025 250250 1 112 NULL 0 0 2 2016 0 0 6.84066E-05 1 0.045457602 0.001504844 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2016,0,00 1 1 2017 1 5 7 25 25025 250250 1 111 NULL 0 0 2 2016 0 0 0.000118934 1 0.045457602 0.002616372 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2016,0,00 1 1 2017 1 5 7 25 25025 250250 1 110 NULL 0 0 2 2016 0 0 0.000764807 1 0.045457602 0.016824623 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2016,0,00 1 1 2017 1 5 7 25 25025 250250 1 107 NULL 0 0 2 2016 0 0 0.00116524 1 0.045457602 0.025633556 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2016,0,00 1 1 2017 1 5 7 25 25025 250250 1 106 NULL 0 0 2 2016 0 0 0.0113097 1 0.045457602 0.248796674 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2016,0,00 1 1 2017 1 5 7 25 25025 250250 1 100 NULL 0 0 2 2016 0 0 0.000831314 1 0.045457602 0.018287679 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2016,0,00 1 1 2017 1 5 7 25 25025 250250 1 98 NULL 0 0 2 2016 0 0 47.65010071 1 0.045457602 1048.231739 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2016,0,00 1 1 2017 1 5 7 25 25025 250250 1 91 NULL 0 0 2 2016 0 0 0.000612369 1 0.045457602 0.013471202 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2016,0,00 1 1 2017 1 5 7 25 25025 250250 1 90 NULL 0 0 2 2016 0 0 47.59120178 1 0.045457602 1046.936049 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2016,0,00 1 1 2017 1 5 7 25 25025 250250 1 87 NULL 0 0 2 2016 0 0 0.00218723 1 0.045457602 0.048115823 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2016,0,00 1 1 2017 1 5 7 25 25025 250250 1 79 NULL 0 0 2 2016 0 0 0.00167501 1 0.045457602 0.036847742 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2016,0,00 1 1 2017 1 5 7 25 25025 250250 1 66 NULL 0 0 2 2016 0 0 7.5318E-07 1 0.045457602 1.65688E-05 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2016,0,00 1 1 2017 1 5 7 25 25025 250250 1 59 NULL 0 0 2 2016 0 0 3.41336E-06 1 0.045457602 7.50889E-05 g mi

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1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2016,0,00 1 1 2017 1 5 7 25 25025 250250 1 56 NULL 0 0 2 2016 0 0 8.73115E-08 1 0.045457602 1.92072E-06 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2016,0,00 1 1 2017 1 5 7 25 25025 250250 1 55 NULL 0 0 2 2016 0 0 2.50125E-06 1 0.045457602 5.50238E-05 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2016,0,00 1 1 2017 1 5 7 25 25025 250250 1 54 NULL 0 0 2 2016 0 0 7.30768E-07 1 0.045457602 1.60758E-05 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2016,0,00 1 1 2017 1 5 7 25 25025 250250 1 53 NULL 0 0 2 2016 0 0 2.51301E-07 1 0.045457602 5.52825E-06 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2016,0,00 1 1 2017 1 5 7 25 25025 250250 1 52 NULL 0 0 2 2016 0 0 5.25325E-06 1 0.045457602 0.000115564 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2016,0,00 1 1 2017 1 5 7 25 25025 250250 1 51 NULL 0 0 2 2016 0 0 2.1007E-07 1 0.045457602 4.62123E-06 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2016,0,00 1 1 2017 1 5 7 25 25025 250250 1 36 NULL 0 0 2 2016 0 0 0 1 0.045457602 0 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2016,0,00 1 1 2017 1 5 7 25 25025 250250 1 35 NULL 0 0 2 2016 0 0 0 1 0.045457602 0 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2016,0,00 1 1 2017 1 5 7 25 25025 250250 1 31 NULL 0 0 2 2016 0 0 0.000396774 1 0.045457602 0.008728441 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2016,0,00 1 1 2017 1 5 7 25 25025 250250 1 5 NULL 0 0 2 2016 0 0 0.00235727 1 0.045457602 0.051856456 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2016,0,00 1 1 2017 1 5 7 25 25025 250250 1 3 NULL 0 0 2 2016 0 0 0.042996399 1 0.045457602 0.945857187 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2016,0,00 1 1 2017 1 5 7 25 25025 250250 1 2 NULL 0 0 2 2016 0 0 0.0124831 1 0.045457602 0.274609746 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2016,0,00 1 1 2017 1 5 7 25 25025 250250 1 1 NULL 0 0 2 2016 0 0 0.00403227 1 0.045457602 0.088703977 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2015,0,00 1 1 2017 1 5 7 25 25025 250250 1 122 NULL 0 0 2 2015 0 0 6.02211E-05 1 0.115084998 0.000523275 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2015,0,00 1 1 2017 1 5 7 25 25025 250250 1 121 NULL 0 0 2 2015 0 0 1.05229E-05 1 0.115084998 9.14359E-05 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2015,0,00	1	1	2017	1	5	7	25	25025	250250	1	119	NULL	0	0	2	2015	0	0	0	1	0.115084998	0	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2015,0,00	1	1	2017	1	5	7	25	25025	250250	1	118	NULL	0	0	2	2015	0	0	0.00176308	1	0.115084998	0.015319807	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2015,0,00	1	1	2017	1	5	7	25	25025	250250	1	117	NULL	0	0	2	2015	0	0	0.000442504	1	0.115084998	0.003845019	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2015,0,00	1	1	2017	1	5	7	25	25025	250250	1	116	NULL	0	0	2	2015	0	0	0.0035791	1	0.115084998	0.031099622	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2015,0,00	1	1	2017	1	5	7	25	25025	250250	1	115	NULL	0	0	2	2015	0	0	0.00135711	1	0.115084998	0.011792241	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2015,0,00	1	1	2017	1	5	7	25	25025	250250	1	112	NULL	0	0	2	2015	0	0	0.000173185	1	0.115084998	0.001504844	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2015,0,00	1	1	2017	1	5	7	25	25025	250250	1	111	NULL	0	0	2	2015	0	0	0.000301106	1	0.115084998	0.002616379	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2015,0,00	1	1	2017	1	5	7	25	25025	250250	1	110	NULL	0	0	2	2015	0	0	0.00193626	1	0.115084998	0.016824608	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2015,0,00	1	1	2017	1	5	7	25	25025	250250	1	107	NULL	0	0	2	2015	0	0	0.00295004	1	0.115084998	0.025633575	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2015,0,00	1	1	2017	1	5	7	25	25025	250250	1	106	NULL	0	0	2	2015	0	0	0.028632799	1	0.115084998	0.248796973	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2015,0,00	1	1	2017	1	5	7	25	25025	250250	1	100	NULL	0	0	2	2015	0	0	0.00210464	1	0.115084998	0.018287701	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2015,0,00	1	1	2017	1	5	7	25	25025	250250	1	98	NULL	0	0	2	2015	0	0	120.6360016	1	0.115084998	1048.233943	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2015,0,00	1	1	2017	1	5	7	25	25025	250250	1	91	NULL	0	0	2	2015	0	0	0.001550335	1	0.115084998	0.013471216	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2015,0,00	1	1	2017	1	5	7	25	25025	250250	1	90	NULL	0	0	2	2015	0	0	120.4869995	1	0.115084998	1046.93923	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2015,0,00	1	1	2017	1	5	7	25	25025	250250	1	87	NULL	0	0	2	2015	0	0	0.0055374	1	0.115084998	0.048115741	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2015,0,00	1	1	2017	1	5	7	25	25025	250250	1	79	NULL	0	0	2	2015	0	0	0.00424062	1	0.115084998	0.036847721	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2015,0,00	1	1	2017	1	5	7	25	25025	250250	1	66	NULL	0	0	2	2015	0	0	1.90683E-06	1	0.115084998	1.65689E-05	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2015,0,00	1	1	2017	1	5	7	25	25025	250250	1	59	NULL	0	0	2	2015	0	0	8.64161E-06	1	0.115084998	7.50889E-05	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2015,0,00	1	1	2017	1	5	7	25	25025	250250	1	58	NULL	0	0	2	2015	0	0	1.42075E-06	1	0.115084998	1.23452E-05	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2015,0,00	1	1	2017	1	5	7	25	25025	250250	1	57	NULL	0	0	2	2015	0	0	1.18128E-06	1	0.115084998	1.02644E-05	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2015,0,00	1	1	2017	1	5	7	25	25025	250250	1	56	NULL	0	0	2	2015	0	0	2.21047E-07	1	0.115084998	1.92073E-06	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2015,0,00	1	1	2017	1	5	7	25	25025	250250	1	55	NULL	0	0	2	2015	0	0	6.33243E-06	1	0.115084998	5.50239E-05	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2015,0,00	1	1	2017	1	5	7	25	25025	250250	1	54	NULL	0	0	2	2015	0	0	1.85009E-06	1	0.115084998	1.60759E-05	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2015,0,00	1	1	2017	1	5	7	25	25025	250250	1	53	NULL	0	0	2	2015	0	0	6.36218E-07	1	0.115084998	5.52824E-06	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2015,0,00	1	1	2017	1	5	7	25	25025	250250	1	52	NULL	0	0	2	2015	0	0	1.32997E-05	1	0.115084998	0.000115564	g	mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2015,0,00 1 1 2017 1 5 7 25 25025 250250 1 51 NULL 0 0 2 2015 0 0 5.31835E-07 1 0.115084998 4.62124E-06 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2015,0,00 1 1 2017 1 5 7 25 25025 250250 1 36 NULL 0 0 2 2015 0 0 0 1 0.115084998 0 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2015,0,00 1 1 2017 1 5 7 25 25025 250250 1 35 NULL 0 0 2 2015 0 0 0 1 0.115084998 0 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2015,0,00 1 1 2017 1 5 7 25 25025 250250 1 31 NULL 0 0 2 2015 0 0 0.00100451 1 0.115084998 0.008728418 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2015,0,00 1 1 2017 1 5 7 25 25025 250250 1 5 NULL 0 0 2 2015 0 0 0.0059679 1 0.115084998 0.051856456 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2015,0,00 1 1 2017 1 5 7 25 25025 250250 1 3 NULL 0 0 2 2015 0 0 0.108854003 1 0.115084998 0.945857452 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2015,0,00 1 1 2017 1 5 7 25 25025 250250 1 2 NULL 0 0 2 2015 0 0 0.031603601 1 0.115084998 0.274610951 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2015,0,00 1 1 2017 1 5 7 25 25025 250250 1 1 NULL 0 0 2 2015 0 0 0.0102085 1 0.115084998 0.088703999 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2014,0,00 1 1 2017 1 5 7 25 25025 250250 1 122 NULL 0 0 2 2014 0 0 8.98821E-06 1 0.017177001 0.00052327 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2014,0,00 1 1 2017 1 5 7 25 25025 250250 1 121 NULL 0 0 2 2014 0 0 1.57057E-06 1 0.017177001 9.14345E-05 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2014,0,00 1 1 2017 1 5 7 25 25025 250250 1 119 NULL 0 0 2 2014 0 0 0 1 0.017177001 0 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2014,0,00 1 1 2017 1 5 7 25 25025 250250 1 118 NULL 0 0 2 2014 0 0 0.000263145 1 0.017177001 0.015319612 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2014,0,00 1 1 2017 1 5 7 25 25025 250250 1 117 NULL 0 0 2 2014 0 0 6.60453E-05 1 0.017177001 0.003844984 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2014,0,00 1 1 2017 1 5 7 25 25025 250250 1 116 NULL 0 0 2 2014 0 0 0.000534193 1 0.017177001 0.031099318 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2014,0,00 1 1 2017 1 5 7 25 25025 250250 1 115 NULL 0 0 2 2014 0 0 0.000202554 1 0.017177001 0.011792164 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2014,0,00 1 1 2017 1 5 7 25 25025 250250 1 112 NULL 0 0 2 2014 0 0 2.58485E-05 1 0.017177001 0.001504832 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2014,0,00 1 1 2017 1 5 7 25 25025 250250 1 111 NULL 0 0 2 2014 0 0 4.4941E-05 1 0.017177001 0.002616347 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2014,0,00 1 1 2017 1 5 7 25 25025 250250 1 110 NULL 0 0 2 2014 0 0 0.000288994 1 0.017177001 0.016824474 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2014,0,00 1 1 2017 1 5 7 25 25025 250250 1 107 NULL 0 0 2 2014 0 0 0.000440304 1 0.017177001 0.025633346 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2014,0,00 1 1 2017 1 5 7 25 25025 250250 1 106 NULL 0 0 2 2014 0 0 0.00427354 1 0.017177001 0.248794301 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2014,0,00 1 1 2017 1 5 7 25 25025 250250 1 100 NULL 0 0 2 2014 0 0 0.000314125 1 0.017177001 0.018287535 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2014,0,00 1 1 2017 1 5 7 25 25025 250250 1 98 NULL 0 0 2 2014 0 0 18.00530052 1 0.017177001 1048.22145 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2014,0,00 1 1 2017 1 5 7 25 25025 250250 1 91 NULL 0 0 2 2014 0 0 0.000231392 1 0.017177001 0.013471064 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2014,0,00 1 1 2017 1 5 7 25 25025 250250 1 90 NULL 0 0 2 2014 0 0 17.98310089 1 0.017177001 1046.929046 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2014,0,00 1 1 2017 1 5 7 25 25025 250250 1 87 NULL 0 0 2 2014 0 0 0.000826476 1 0.017177001 0.04811527 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2014,0,00 1 1 2017 1 5 7 25 25025 250250 1 79 NULL 0 0 2 2014 0 0 0.000632927 1 0.017177001 0.036847352 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2014,0,00 1 1 2017 1 5 7 25 25025 250250 1 66 NULL 0 0 2 2014 0 0 2.84601E-07 1 0.017177001 1.65687E-05 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2014,0,00 1 1 2017 1 5 7 25 25025 250250 1 59 NULL 0 0 2 2014 0 0 1.28979E-06 1 0.017177001 7.50882E-05 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2014,0,00 1 1 2017 1 5 7 25 25025 250250 1 58 NULL 0 0 2 2014 0 0 2.12051E-07 1 0.017177001 1.23451E-05 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2014,0,00 1 1 2017 1 5 7 25 25025 250250 1 57 NULL 0 0 2 2014 0 0 1.7631E-07 1 0.017177001 1.02643E-05 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2014,0,00 1 1 2017 1 5 7 25 25025 250250 1 56 NULL 0 0 2 2014 0 0 3.2992E-08 1 0.017177001 1.92071E-06 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2014,0,00 1 1 2017 1 5 7 25 25025 250250 1 55 NULL 0 0 2 2014 0 0 9.45136E-07 1 0.017177001 5.50233E-05 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2014,0,00 1 1 2017 1 5 7 25 25025 250250 1 54 NULL 0 0 2 2014 0 0 2.76132E-07 1 0.017177001 1.60757E-05 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2014,0,00 1 1 2017 1 5 7 25 25025 250250 1 53 NULL 0 0 2 2014 0 0 9.49578E-08 1 0.017177001 5.52819E-06 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2014,0,00 1 1 2017 1 5 7 25 25025 250250 1 52 NULL 0 0 2 2014 0 0 1.98502E-06 1 0.017177001 0.000115563 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2014,0,00 1 1 2017 1 5 7 25 25025 250250 1 51 NULL 0 0 2 2014 0 0 7.93782E-08 1 0.017177001 4.62119E-06 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2014,0,00 1 1 2017 1 5 7 25 25025 250250 1 36 NULL 0 0 2 2014 0 0 0 1 0.017177001 0 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2014,0,00 1 1 2017 1 5 7 25 25025 250250 1 35 NULL 0 0 2 2014 0 0 0 1 0.017177001 0 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2014,0,00 1 1 2017 1 5 7 25 25025 250250 1 31 NULL 0 0 2 2014 0 0 0.000149927 1 0.017177001 0.008728357 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2014,0,00 1 1 2017 1 5 7 25 25025 250250 1 5 NULL 0 0 2 2014 0 0 0.000890729 1 0.017177001 0.051855911 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2014,0,00 1 1 2017 1 5 7 25 25025 250250 1 3 NULL 0 0 2 2014 0 0 0.0162469 1 0.017177001 0.945851974 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2014,0,00 1 1 2017 1 5 7 25 25025 250250 1 2 NULL 0 0 2 2014 0 0 0.00471694 1 0.017177001 0.274607909 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2014,0,00 1 1 2017 1 5 7 25 25025 250250 1 1 NULL 0 0 2 2014 0 0 0.00152366 1 0.017177001 0.088703497 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2013,0,00 1 1 2017 1 5 7 25 25025 250250 1 122 NULL 0 0 2 2013 0 0 1.23855E-05 1 0.020039801 0.000618045 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2013,0,00 1 1 2017 1 5 7 25 25025 250250 1 121 NULL 0 0 2 2013 0 0 2.1642E-06 1 0.020039801 0.000107995 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2013,0,00 1 1 2017 1 5 7 25 25025 250250 1 119 NULL 0 0 2 2013 0 0 0 1 0.020039801 0 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2013,0,00 1 1 2017 1 5 7 25 25025 250250 1 118 NULL 0 0 2 2013 0 0 0.000362606 1 0.020039801 0.018094291 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2013,0,00 1 1 2017 1 5 7 25 25025 250250 1 117 NULL 0 0 2 2013 0 0 7.7053E-05 1 0.020039801 0.003844998 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2013,0,00 1 1 2017 1 5 7 25 25025 250250 1 116 NULL 0 0 2 2013 0 0 0.000623226 1 0.020039801 0.031099411 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2013,0,00 1 1 2017 1 5 7 25 25025 250250 1 115 NULL 0 0 2 2013 0 0 0.000279112 1 0.020039801 0.013927883 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2013,0,00 1 1 2017 1 5 7 25 25025 250250 1 112 NULL 0 0 2 2013 0
0 3.56182E-05 1 0.020039801 0.001777373 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2013,0,00 1 1 2017 1 5 7 25 25025 250250 1 111 NULL 0 0 2 2013 0
0 6.19273E-05 1 0.020039801 0.003090215 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2013,0,00 1 1 2017 1 5 7 25 25025 250250 1 110 NULL 0 0 2 2013 0
0 0.000398224 1 0.020039801 0.019871654 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2013,0,00 1 1 2017 1 5 7 25 25025 250250 1 107 NULL 0 0 2 2013 0
0 0.000513689 1 0.020039801 0.025633439 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2013,0,00 1 1 2017 1 5 7 25 25025 250250 1 106 NULL 0 0 2 2013 0
0 0.00498581 1 0.020039801 0.24879538 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2013,0,00 1 1 2017 1 5 7 25 25025 250250 1 100 NULL 0 0 2 2013 0
0 0.000432853 1 0.020039801 0.021599666 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2013,0,00 1 1 2017 1 5 7 25 25025 250250 1 98 NULL 0 0 2 2013 0
0 21.65679932 1 0.020039801 1080.689364 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2013,0,00 1 1 2017 1 5 7 25 25025 250250 1 91 NULL 0 0 2 2013 0
0 0.000278308 1 0.020039801 0.013887788 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2013,0,00 1 1 2017 1 5 7 25 25025 250250 1 90 NULL 0 0 2 2013 0
0 21.62919998 1 0.020039801 1079.312138 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2013,0,00 1 1 2017 1 5 7 25 25025 250250 1 87 NULL 0 0 2 2013 0
0 0.00102377 1 0.020039801 0.051086834 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2013,0,00 1 1 2017 1 5 7 25 25025 250250 1 79 NULL 0 0 2 2013 0
0 0.000784018 1 0.020039801 0.039123045 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2013,0,00 1 1 2017 1 5 7 25 25025 250250 1 66 NULL 0 0 2 2013 0
0 3.32034E-07 1 0.020039801 1.65687E-05 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2013,0,00 1 1 2017 1 5 7 25 25025 250250 1 59 NULL 0 0 2 2013 0
0 1.77729E-06 1 0.020039801 8.8688E-05 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2013,0,00 1 1 2017 1 5 7 25 25025 250250 1 58 NULL 0 0 2 2013 0
0 2.922E-07 1 0.020039801 1.4581E-05 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2013,0,00 1 1 2017 1 5 7 25 25025 250250 1 57 NULL 0 0 2 2013 0
0 2.42949E-07 1 0.020039801 1.21233E-05 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2013,0,00 1 1 2017 1 5 7 25 25025 250250 1 56 NULL 0 0 2 2013 0
0 4.54619E-08 1 0.020039801 2.26858E-06 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2013,0,00 1 1 2017 1 5 7 25 25025 250250 1 55 NULL 0 0 2 2013 0
0 1.30237E-06 1 0.020039801 6.49892E-05 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2013,0,00 1 1 2017 1 5 7 25 25025 250250 1 54 NULL 0 0 2 2013 0
0 3.805E-07 1 0.020039801 1.89872E-05 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2013,0,00 1 1 2017 1 5 7 25 25025 250250 1 53 NULL 0 0 2 2013 0
0 1.30849E-07 1 0.020039801 6.52946E-06 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2013,0,00 1 1 2017 1 5 7 25 25025 250250 1 52 NULL 0 0 2 2013 0
0 2.73529E-06 1 0.020039801 0.000136493 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2013,0,00 1 1 2017 1 5 7 25 25025 250250 1 51 NULL 0 0 2 2013 0
0 1.09381E-07 1 0.020039801 5.45819E-06 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2013,0,00 1 1 2017 1 5 7 25 25025 250250 1 36 NULL 0 0 2 2013 0
0 0 1 0.020039801 0 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2013,0,00 1 1 2017 1 5 7 25 25025 250250 1 35 NULL 0 0 2 2013 0
0 0 1 0.020039801 0 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2013,0,00 1 1 2017 1 5 7 25 25025 250250 1 31 NULL 0 0 2 2013 0
0 0.000180325 1 0.020039801 0.008998343 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2013,0,00 1 1 2017 1 5 7 25 25025 250250 1 5 NULL 0 0 2 2013 0
0 0.00110336 1 0.020039801 0.055058431 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2013,0,00	1	1	2017	1	5	7	25	25025	250250	1	3	NULL	0	0	2	2013	0	0	0.022006599	1	0.020039801	1.098144623	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2013,0,00	1	1	2017	1	5	7	25	25025	250250	1	2	NULL	0	0	2	2013	0	0	0.00584296	1	0.020039801	0.291567771	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2013,0,00	1	1	2017	1	5	7	25	25025	250250	1	1	NULL	0	0	2	2013	0	0	0.00188738	1	0.020039801	0.094181578	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2012,0,00	1	1	2017	1	5	7	25	25025	250250	1	122	NULL	0	0	2	2012	0	0	1.04343E-05	1	0.015945099	0.000654389	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2012,0,00	1	1	2017	1	5	7	25	25025	250250	1	121	NULL	0	0	2	2012	0	0	1.82327E-06	1	0.015945099	0.000114347	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2012,0,00	1	1	2017	1	5	7	25	25025	250250	1	119	NULL	0	0	2	2012	0	0	0	1	0.015945099	0	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2012,0,00	1	1	2017	1	5	7	25	25025	250250	1	118	NULL	0	0	2	2012	0	0	0.000305483	1	0.015945099	0.019158426	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2012,0,00	1	1	2017	1	5	7	25	25025	250250	1	117	NULL	0	0	2	2012	0	0	6.13091E-05	1	0.015945099	0.003845012	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2012,0,00	1	1	2017	1	5	7	25	25025	250250	1	116	NULL	0	0	2	2012	0	0	0.000495885	1	0.015945099	0.031099523	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2012,0,00	1	1	2017	1	5	7	25	25025	250250	1	115	NULL	0	0	2	2012	0	0	0.000235143	1	0.015945099	0.014747039	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2012,0,00	1	1	2017	1	5	7	25	25025	250250	1	112	NULL	0	0	2	2012	0	0	3.00072E-05	1	0.015945099	0.001881907	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2012,0,00	1	1	2017	1	5	7	25	25025	250250	1	111	NULL	0	0	2	2012	0	0	5.21717E-05	1	0.015945099	0.003271958	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2012,0,00	1	1	2017	1	5	7	25	25025	250250	1	110	NULL	0	0	2	2012	0	0	0.00033549	1	0.015945099	0.021040321	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2012,0,00	1	1	2017	1	5	7	25	25025	250250	1	107	NULL	0	0	2	2012	0	0	0.000408729	1	0.015945099	0.02563352	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2012,0,00	1	1	2017	1	5	7	25	25025	250250	1	106	NULL	0	0	2	2012	0	0	0.00396708	1	0.015945099	0.24879618	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2012,0,00	1	1	2017	1	5	7	25	25025	250250	1	100	NULL	0	0	2	2012	0	0	0.000364665	1	0.015945099	0.022870036	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2012,0,00	1	1	2017	1	5	7	25	25025	250250	1	98	NULL	0	0	2	2012	0	0	17.23220062	1	0.015945099	1080.72081	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2012,0,00	1	1	2017	1	5	7	25	25025	250250	1	91	NULL	0	0	2	2012	0	0	0.000221443	1	0.015945099	0.013887855	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2012,0,00	1	1	2017	1	5	7	25	25025	250250	1	90	NULL	0	0	2	2012	0	0	17.20980072	1	0.015945099	1079.315996	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2012,0,00	1	1	2017	1	5	7	25	25025	250250	1	87	NULL	0	0	2	2012	0	0	0.000831964	1	0.015945099	0.052176785	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2012,0,00	1	1	2017	1	5	7	25	25025	250250	1	79	NULL	0	0	2	2012	0	0	0.00063713	1	0.015945099	0.039957732	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2012,0,00	1	1	2017	1	5	7	25	25025	250250	1	66	NULL	0	0	2	2012	0	0	2.64191E-07	1	0.015945099	1.65688E-05	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2012,0,00	1	1	2017	1	5	7	25	25025	250250	1	59	NULL	0	0	2	2012	0	0	1.49731E-06	1	0.015945099	9.39041E-05	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2012,0,00	1	1	2017	1	5	7	25	25025	250250	1	58	NULL	0	0	2	2012	0	0	2.46168E-07	1	0.015945099	1.54385E-05	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2012,0,00	1	1	2017	1	5	7	25	25025	250250	1	57	NULL	0	0	2	2012	0	0	2.04677E-07	1	0.015945099	1.28364E-05	g	mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2012,0,00 1 1 2017 1 5 7 25 25025 250250 1 56 NULL 0 0 2 2012 0 0 3.83001E-08 1 0.015945099 2.402E-06 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2012,0,00 1 1 2017 1 5 7 25 25025 250250 1 55 NULL 0 0 2 2012 0 0 1.0972E-06 1 0.015945099 6.88111E-05 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2012,0,00 1 1 2017 1 5 7 25 25025 250250 1 54 NULL 0 0 2 2012 0 0 3.20559E-07 1 0.015945099 2.01039E-05 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2012,0,00 1 1 2017 1 5 7 25 25025 250250 1 53 NULL 0 0 2 2012 0 0 1.10236E-07 1 0.015945099 6.91347E-06 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2012,0,00 1 1 2017 1 5 7 25 25025 250250 1 52 NULL 0 0 2 2012 0 0 2.30439E-06 1 0.015945099 0.00014452 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2012,0,00 1 1 2017 1 5 7 25 25025 250250 1 51 NULL 0 0 2 2012 0 0 9.21495E-08 1 0.015945099 5.77917E-06 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2012,0,00 1 1 2017 1 5 7 25 25025 250250 1 36 NULL 0 0 2 2012 0 0 0 1 0.015945099 0 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2012,0,00 1 1 2017 1 5 7 25 25025 250250 1 35 NULL 0 0 2 2012 0 0 0 1 0.015945099 0 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2012,0,00 1 1 2017 1 5 7 25 25025 250250 1 31 NULL 0 0 2 2012 0 0 0.00014348 1 0.015945099 0.008998377 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2012,0,00 1 1 2017 1 5 7 25 25025 250250 1 5 NULL 0 0 2 2012 0 0 0.000896644 1 0.015945099 0.056233204 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2012,0,00 1 1 2017 1 5 7 25 25025 250250 1 3 NULL 0 0 2 2012 0 0 0.018400401 1 0.015945099 1.153984716 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2012,0,00 1 1 2017 1 5 7 25 25025 250250 1 2 NULL 0 0 2 2012 0 0 0.00474826 1 0.015945099 0.297788057 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2012,0,00 1 1 2017 1 5 7 25 25025 250250 1 1 NULL 0 0 2 2012 0 0 0.00153377 1 0.015945099 0.096190684 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2011,0,00 1 1 2017 1 5 7 25 25025 250250 1 122 NULL 0 0 2 2011 0 0 1.33517E-05 1 0.017496999 0.000763085 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2011,0,00 1 1 2017 1 5 7 25 25025 250250 1 121 NULL 0 0 2 2011 0 0 2.33304E-06 1 0.017496999 0.000133339 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2011,0,00 1 1 2017 1 5 7 25 25025 250250 1 119 NULL 0 0 2 2011 0 0 0 1 0.017496999 0 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2011,0,00 1 1 2017 1 5 7 25 25025 250250 1 118 NULL 0 0 2 2011 0 0 0.000390894 1 0.017496999 0.022340631 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2011,0,00 1 1 2017 1 5 7 25 25025 250250 1 117 NULL 0 0 2 2011 0 0 6.72758E-05 1 0.017496999 0.003844991 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2011,0,00 1 1 2017 1 5 7 25 25025 250250 1 116 NULL 0 0 2 2011 0 0 0.000544146 1 0.017496999 0.031099389 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2011,0,00 1 1 2017 1 5 7 25 25025 250250 1 115 NULL 0 0 2 2011 0 0 0.000300887 1 0.017496999 0.017196492 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2011,0,00 1 1 2017 1 5 7 25 25025 250250 1 112 NULL 0 0 2 2011 0 0 3.83969E-05 1 0.017496999 0.002194485 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2011,0,00 1 1 2017 1 5 7 25 25025 250250 1 111 NULL 0 0 2 2011 0 0 6.67584E-05 1 0.017496999 0.00381542 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2011,0,00 1 1 2017 1 5 7 25 25025 250250 1 110 NULL 0 0 2 2011 0 0 0.000429291 1 0.017496999 0.02453512 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2011,0,00 1 1 2017 1 5 7 25 25025 250250 1 107 NULL 0 0 2 2011 0 0 0.000448508 1 0.017496999 0.025633425 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2011,0,00 1 1 2017 1 5 7 25 25025 250250 1 106 NULL 0 0 2 2011 0 0 0.00435317 1 0.017496999 0.248795221 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2011,0,00 1 1 2017 1 5 7 25 25025 250250 1 100 NULL 0 0 2 2011 0
0 0.000466622 1 0.017496999 0.026668687 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2011,0,00 1 1 2017 1 5 7 25 25025 250250 1 98 NULL 0 0 2 2011 0
0 18.91090012 1 0.017496999 1080.808185 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2011,0,00 1 1 2017 1 5 7 25 25025 250250 1 91 NULL 0 0 2 2011 0
0 0.000242994 1 0.017496999 0.01388774 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2011,0,00 1 1 2017 1 5 7 25 25025 250250 1 90 NULL 0 0 2 2011 0
0 18.88470078 1 0.017496999 1079.310823 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2011,0,00 1 1 2017 1 5 7 25 25025 250250 1 87 NULL 0 0 2 2011 0
0 0.000974399 1 0.017496999 0.055689491 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2011,0,00 1 1 2017 1 5 7 25 25025 250250 1 79 NULL 0 0 2 2011 0
0 0.000746209 1 0.017496999 0.042647827 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2011,0,00 1 1 2017 1 5 7 25 25025 250250 1 66 NULL 0 0 2 2011 0
0 2.89903E-07 1 0.017496999 1.65687E-05 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2011,0,00 1 1 2017 1 5 7 25 25025 250250 1 59 NULL 0 0 2 2011 0
0 1.91594E-06 1 0.017496999 0.000109501 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2011,0,00 1 1 2017 1 5 7 25 25025 250250 1 58 NULL 0 0 2 2011 0
0 3.14995E-07 1 0.017496999 1.80028E-05 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2011,0,00 1 1 2017 1 5 7 25 25025 250250 1 57 NULL 0 0 2 2011 0
0 2.61902E-07 1 0.017496999 1.49684E-05 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2011,0,00 1 1 2017 1 5 7 25 25025 250250 1 56 NULL 0 0 2 2011 0
0 4.90085E-08 1 0.017496999 2.80097E-06 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2011,0,00 1 1 2017 1 5 7 25 25025 250250 1 55 NULL 0 0 2 2011 0
0 1.40397E-06 1 0.017496999 8.02406E-05 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2011,0,00 1 1 2017 1 5 7 25 25025 250250 1 54 NULL 0 0 2 2011 0
0 4.10185E-07 1 0.017496999 2.34432E-05 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2011,0,00 1 1 2017 1 5 7 25 25025 250250 1 53 NULL 0 0 2 2011 0
0 1.41057E-07 1 0.017496999 8.06178E-06 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2011,0,00 1 1 2017 1 5 7 25 25025 250250 1 52 NULL 0 0 2 2011 0
0 2.94868E-06 1 0.017496999 0.000168525 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2011,0,00 1 1 2017 1 5 7 25 25025 250250 1 51 NULL 0 0 2 2011 0
0 1.17914E-07 1 0.017496999 6.7391E-06 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2011,0,00 1 1 2017 1 5 7 25 25025 250250 1 36 NULL 0 0 2 2011 0
0 0 1 0.017496999 0 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2011,0,00 1 1 2017 1 5 7 25 25025 250250 1 35 NULL 0 0 2 2011 0
0 0 1 0.017496999 0 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2011,0,00 1 1 2017 1 5 7 25 25025 250250 1 31 NULL 0 0 2 2011 0
0 0.000157444 1 0.017496999 0.008998343 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2011,0,00 1 1 2017 1 5 7 25 25025 250250 1 5 NULL 0 0 2 2011 0
0 0.00105015 1 0.017496999 0.060018864 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2011,0,00 1 1 2017 1 5 7 25 25025 250250 1 3 NULL 0 0 2 2011 0
0 0.023341401 1 0.017496999 1.334023056 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2011,0,00 1 1 2017 1 5 7 25 25025 250250 1 2 NULL 0 0 2 2011 0
0 0.00556116 1 0.017496999 0.317835065 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2011,0,00 1 1 2017 1 5 7 25 25025 250250 1 1 NULL 0 0 2 2011 0
0 0.00179636 1 0.017496999 0.102666747 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2010,0,00 1 1 2017 1 5 7 25 25025 250250 1 122 NULL 0 0 2 2010 0
0 2.32481E-05 1 0.030465901 0.000763086 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2010,0,00 1 1 2017 1 5 7 25 25025 250250 1 121 NULL 0 0 2 2010 0
0 4.06231E-06 1 0.030465901 0.00013334 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2010,0,00 1 1 2017 1 5 7 25 25025 250250 1 119 NULL 0 0 2 2010 0 0 0 1 0.030465901 0 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2010,0,00 1 1 2017 1 5 7 25 25025 250250 1 118 NULL 0 0 2 2010 0 0 0.000680629 1 0.030465901 0.022340682 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2010,0,00 1 1 2017 1 5 7 25 25025 250250 1 117 NULL 0 0 2 2010 0 0 0.000117142 1 0.030465901 0.00384502 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2010,0,00 1 1 2017 1 5 7 25 25025 250250 1 116 NULL 0 0 2 2010 0 0 0.000947476 1 0.030465901 0.031099557 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2010,0,00 1 1 2017 1 5 7 25 25025 250250 1 115 NULL 0 0 2 2010 0 0 0.000523908 1 0.030465901 0.017196537 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2010,0,00 1 1 2017 1 5 7 25 25025 250250 1 112 NULL 0 0 2 2010 0 0 6.68574E-05 1 0.030465901 0.002194499 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2010,0,00 1 1 2017 1 5 7 25 25025 250250 1 111 NULL 0 0 2 2010 0 0 0.000116241 1 0.030465901 0.003815446 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2010,0,00 1 1 2017 1 5 7 25 25025 250250 1 110 NULL 0 0 2 2010 0 0 0.000747486 1 0.030465901 0.024535169 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2010,0,00 1 1 2017 1 5 7 25 25025 250250 1 107 NULL 0 0 2 2010 0 0 0.000780949 1 0.030465901 0.025633544 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2010,0,00 1 1 2017 1 5 7 25 25025 250250 1 106 NULL 0 0 2 2010 0 0 0.00757981 1 0.030465901 0.248796516 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2010,0,00 1 1 2017 1 5 7 25 25025 250250 1 100 NULL 0 0 2 2010 0 0 0.000812488 1 0.030465901 0.026668767 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2010,0,00 1 1 2017 1 5 7 25 25025 250250 1 98 NULL 0 0 2 2010 0 0 32.92789841 1 0.030465901 1080.811577 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2010,0,00 1 1 2017 1 5 7 25 25025 250250 1 91 NULL 0 0 2 2010 0 0 0.000423105 1 0.030465901 0.013887808 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2010,0,00 1 1 2017 1 5 7 25 25025 250250 1 90 NULL 0 0 2 2010 0 0 32.88219833 1 0.030465901 1079.311537 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2010,0,00 1 1 2017 1 5 7 25 25025 250250 1 87 NULL 0 0 2 2010 0 0 0.00169664 1 0.030465901 0.055689804 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2010,0,00 1 1 2017 1 5 7 25 25025 250250 1 79 NULL 0 0 2 2010 0 0 0.00129931 1 0.030465901 0.042648009 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2010,0,00 1 1 2017 1 5 7 25 25025 250250 1 66 NULL 0 0 2 2010 0 0 5.04783E-07 1 0.030465901 1.65688E-05 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2010,0,00 1 1 2017 1 5 7 25 25025 250250 1 59 NULL 0 0 2 2010 0 0 3.33606E-06 1 0.030465901 0.000109501 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2010,0,00 1 1 2017 1 5 7 25 25025 250250 1 58 NULL 0 0 2 2010 0 0 5.48473E-07 1 0.030465901 1.80028E-05 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2010,0,00 1 1 2017 1 5 7 25 25025 250250 1 57 NULL 0 0 2 2010 0 0 4.56028E-07 1 0.030465901 1.49685E-05 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2010,0,00 1 1 2017 1 5 7 25 25025 250250 1 56 NULL 0 0 2 2010 0 0 8.53342E-08 1 0.030465901 2.80097E-06 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2010,0,00 1 1 2017 1 5 7 25 25025 250250 1 55 NULL 0 0 2 2010 0 0 2.44461E-06 1 0.030465901 8.02409E-05 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2010,0,00 1 1 2017 1 5 7 25 25025 250250 1 54 NULL 0 0 2 2010 0 0 7.14218E-07 1 0.030465901 2.34432E-05 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2010,0,00 1 1 2017 1 5 7 25 25025 250250 1 53 NULL 0 0 2 2010 0 0 2.45609E-07 1 0.030465901 8.06177E-06 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2010,0,00 1 1 2017 1 5 7 25 25025 250250 1 52 NULL 0 0 2 2010 0 0 5.13428E-06 1 0.030465901 0.000168525 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2010,0,00 1 1 2017 1 5 7 25 25025 250250 1 51 NULL 0 0 2 2010 0 0 2.05313E-07 1 0.030465901 6.73911E-06 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2010,0,00 1 1 2017 1 5 7 25 25025 250250 1 36 NULL 0 0 2 2010 0 0 0 1 0.030465901 0 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2010,0,00 1 1 2017 1 5 7 25 25025 250250 1 35 NULL 0 0 2 2010 0 0 0 1 0.030465901 0 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2010,0,00 1 1 2017 1 5 7 25 25025 250250 1 31 NULL 0 0 2 2010 0 0 0.000274143 1 0.030465901 0.008998356 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2010,0,00 1 1 2017 1 5 7 25 25025 250250 1 5 NULL 0 0 2 2010 0 0 0.00182855 1 0.030465901 0.060019561 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2010,0,00 1 1 2017 1 5 7 25 25025 250250 1 3 NULL 0 0 2 2010 0 0 0.040642399 1 0.030465901 1.334029132 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2010,0,00 1 1 2017 1 5 7 25 25025 250250 1 2 NULL 0 0 2 2010 0 0 0.00968322 1 0.030465901 0.317837958 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2010,0,00 1 1 2017 1 5 7 25 25025 250250 1 1 NULL 0 0 2 2010 0 0 0.00312785 1 0.030465901 0.102667238 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2009,0,00 1 1 2017 1 5 7 25 25025 250250 1 122 NULL 0 0 2 2009 0 0 2.30509E-05 1 0.024857501 0.000927322 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2009,0,00 1 1 2017 1 5 7 25 25025 250250 1 121 NULL 0 0 2 2009 0 0 4.02784E-06 1 0.024857501 0.000162037 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2009,0,00 1 1 2017 1 5 7 25 25025 250250 1 119 NULL 0 0 2 2009 0 0 0 1 0.024857501 0 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2009,0,00 1 1 2017 1 5 7 25 25025 250250 1 118 NULL 0 0 2 2009 0 0 0.000674854 1 0.024857501 0.027148907 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2009,0,00 1 1 2017 1 5 7 25 25025 250250 1 117 NULL 0 0 2 2009 0 0 9.5577E-05 1 0.024857501 0.003844996 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2009,0,00 1 1 2017 1 5 7 25 25025 250250 1 116 NULL 0 0 2 2009 0 0 0.000773055 1 0.024857501 0.031099467 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2009,0,00 1 1 2017 1 5 7 25 25025 250250 1 115 NULL 0 0 2 2009 0 0 0.000519463 1 0.024857501 0.020897635 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2009,0,00 1 1 2017 1 5 7 25 25025 250250 1 112 NULL 0 0 2 2009 0 0 6.62898E-05 1 0.024857501 0.002666793 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2009,0,00 1 1 2017 1 5 7 25 25025 250250 1 111 NULL 0 0 2 2009 0 0 0.000115254 1 0.024857501 0.004636588 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2009,0,00 1 1 2017 1 5 7 25 25025 250250 1 110 NULL 0 0 2 2009 0 0 0.000741144 1 0.024857501 0.029815709 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2009,0,00 1 1 2017 1 5 7 25 25025 250250 1 107 NULL 0 0 2 2009 0 0 0.000637183 1 0.024857501 0.025633431 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2009,0,00 1 1 2017 1 5 7 25 25025 250250 1 106 NULL 0 0 2 2009 0 0 0.00618444 1 0.024857501 0.248795734 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2009,0,00 1 1 2017 1 5 7 25 25025 250250 1 100 NULL 0 0 2 2009 0 0 0.000805594 1 0.024857501 0.032408489 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2009,0,00 1 1 2017 1 5 7 25 25025 250250 1 98 NULL 0 0 2 2009 0 0 26.89749908 1 0.024857501 1082.067725 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2009,0,00 1 1 2017 1 5 7 25 25025 250250 1 91 NULL 0 0 2 2009 0 0 0.000345216 1 0.024857501 0.013887793 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2009,0,00 1 1 2017 1 5 7 25 25025 250250 1 90 NULL 0 0 2 2009 0 0 26.82900047 1 0.024857501 1079.312073 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2009,0,00 1 1 2017 1 5 7 25 25025 250250 1 87 NULL 0 0 2 2009 0 0 0.00254344 1 0.024857501 0.10232083 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2009,0,00 1 1 2017 1 5 7 25 25025 250250 1 79 NULL 0 0 2 2009 0 0 0.0019478 1 0.024857501 0.078358644 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2009,0,00 1 1 2017 1 5 7 25 25025 250250 1 66 NULL 0 0 2 2009 0 0 4.11858E-07 1 0.024857501 1.65688E-05 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2009,0,00 1 1 2017 1 5 7 25 25025 250250 1 59 NULL 0 0 2 2009 0 0 3.30775E-06 1 0.024857501 0.000133068 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2009,0,00 1 1 2017 1 5 7 25 25025 250250 1 58 NULL 0 0 2 2009 0 0 5.43819E-07 1 0.024857501 2.18775E-05 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2009,0,00 1 1 2017 1 5 7 25 25025 250250 1 57 NULL 0 0 2 2009 0 0 4.52158E-07 1 0.024857501 1.819E-05 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2009,0,00 1 1 2017 1 5 7 25 25025 250250 1 56 NULL 0 0 2 2009 0 0 8.46102E-08 1 0.024857501 3.40381E-06 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2009,0,00 1 1 2017 1 5 7 25 25025 250250 1 55 NULL 0 0 2 2009 0 0 2.42386E-06 1 0.024857501 9.75102E-05 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2009,0,00 1 1 2017 1 5 7 25 25025 250250 1 54 NULL 0 0 2 2009 0 0 7.08158E-07 1 0.024857501 2.84887E-05 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2009,0,00 1 1 2017 1 5 7 25 25025 250250 1 53 NULL 0 0 2 2009 0 0 2.43525E-07 1 0.024857501 9.79684E-06 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2009,0,00 1 1 2017 1 5 7 25 25025 250250 1 52 NULL 0 0 2 2009 0 0 5.09071E-06 1 0.024857501 0.000204796 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2009,0,00 1 1 2017 1 5 7 25 25025 250250 1 51 NULL 0 0 2 2009 0 0 2.03571E-07 1 0.024857501 8.18952E-06 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2009,0,00 1 1 2017 1 5 7 25 25025 250250 1 36 NULL 0 0 2 2009 0 0 0 1 0.024857501 0 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2009,0,00 1 1 2017 1 5 7 25 25025 250250 1 35 NULL 0 0 2 2009 0 0 0 1 0.024857501 0 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2009,0,00 1 1 2017 1 5 7 25 25025 250250 1 31 NULL 0 0 2 2009 0 0 0.000223677 1 0.024857501 0.00899837 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2009,0,00 1 1 2017 1 5 7 25 25025 250250 1 5 NULL 0 0 2 2009 0 0 0.00274118 1 0.024857501 0.110275765 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2009,0,00 1 1 2017 1 5 7 25 25025 250250 1 3 NULL 0 0 2 2009 0 0 0.115455002 1 0.024857501 4.644674603 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2009,0,00 1 1 2017 1 5 7 25 25025 250250 1 2 NULL 0 0 2 2009 0 0 0.0145162 1 0.024857501 0.583976651 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2009,0,00 1 1 2017 1 5 7 25 25025 250250 1 1 NULL 0 0 2 2009 0 0 0.00468899 1 0.024857501 0.188634808 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2008,0,00 1 1 2017 1 5 7 25 25025 250250 1 122 NULL 0 0 2 2008 0 0 2.0454E-05 1 0.022057001 0.000927325 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2008,0,00 1 1 2017 1 5 7 25 25025 250250 1 121 NULL 0 0 2 2008 0 0 3.57407E-06 1 0.022057001 0.000162038 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2008,0,00 1 1 2017 1 5 7 25 25025 250250 1 119 NULL 0 0 2 2008 0 0 0 1 0.022057001 0 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2008,0,00 1 1 2017 1 5 7 25 25025 250250 1 118 NULL 0 0 2 2008 0 0 0.000598825 1 0.022057001 0.027148977 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2008,0,00 1 1 2017 1 5 7 25 25025 250250 1 117 NULL 0 0 2 2008 0 0 8.48094E-05 1 0.022057001 0.00384501 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2008,0,00 1 1 2017 1 5 7 25 25025 250250 1 116 NULL 0 0 2 2008 0 0 0.000685963 1 0.022057001 0.031099561 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2008,0,00 1 1 2017 1 5 7 25 25025 250250 1 115 NULL 0 0 2 2008 0 0 0.00046094 1 0.022057001 0.020897674 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2008,0,00 1 1 2017 1 5 7 25 25025 250250 1 112 NULL 0 0 2 2008 0 0 5.88218E-05 1 0.022057001 0.002666809 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2008,0,00 1 1 2017 1 5 7 25 25025 250250 1 111 NULL 0 0 2 2008 0 0 0.00010227 1 0.022057001 0.004636623 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2008,0,00 1 1 2017 1 5 7 25 25025 250250 1 110 NULL 0 0 2 2008 0 0 0.000657647 1 0.022057001 0.029815794 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2008,0,00 1 1 2017 1 5 7 25 25025 250250 1 107 NULL 0 0 2 2008 0 0 0.000565399 1 0.022057001 0.02563354 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2008,0,00 1 1 2017 1 5 7 25 25025 250250 1 106 NULL 0 0 2 2008 0 0 0.00548771 1 0.022057001 0.248796737 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2008,0,00 1 1 2017 1 5 7 25 25025 250250 1 100 NULL 0 0 2 2008 0 0 0.000714836 1 0.022057001 0.032408577 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2008,0,00 1 1 2017 1 5 7 25 25025 250250 1 98 NULL 0 0 2 2008 0 0 23.86720085 1 0.022057001 1082.069196 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2008,0,00 1 1 2017 1 5 7 25 25025 250250 1 91 NULL 0 0 2 2008 0 0 0.000306323 1 0.022057001 0.013887794 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2008,0,00 1 1 2017 1 5 7 25 25025 250250 1 90 NULL 0 0 2 2008 0 0 23.8064003 1 0.022057001 1079.312677 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2008,0,00 1 1 2017 1 5 7 25 25025 250250 1 87 NULL 0 0 2 2008 0 0 0.0022569 1 0.022057001 0.102321259 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2008,0,00 1 1 2017 1 5 7 25 25025 250250 1 79 NULL 0 0 2 2008 0 0 0.00172836 1 0.022057001 0.078358794 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2008,0,00 1 1 2017 1 5 7 25 25025 250250 1 66 NULL 0 0 2 2008 0 0 3.65459E-07 1 0.022057001 1.65688E-05 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2008,0,00 1 1 2017 1 5 7 25 25025 250250 1 59 NULL 0 0 2 2008 0 0 2.9351E-06 1 0.022057001 0.000133069 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2008,0,00 1 1 2017 1 5 7 25 25025 250250 1 58 NULL 0 0 2 2008 0 0 4.82553E-07 1 0.022057001 2.18775E-05 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2008,0,00 1 1 2017 1 5 7 25 25025 250250 1 57 NULL 0 0 2 2008 0 0 4.01218E-07 1 0.022057001 1.81901E-05 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2008,0,00 1 1 2017 1 5 7 25 25025 250250 1 56 NULL 0 0 2 2008 0 0 7.5078E-08 1 0.022057001 3.40382E-06 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2008,0,00 1 1 2017 1 5 7 25 25025 250250 1 55 NULL 0 0 2 2008 0 0 2.15079E-06 1 0.022057001 9.75105E-05 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2008,0,00 1 1 2017 1 5 7 25 25025 250250 1 54 NULL 0 0 2 2008 0 0 6.28378E-07 1 0.022057001 2.84888E-05 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2008,0,00 1 1 2017 1 5 7 25 25025 250250 1 53 NULL 0 0 2 2008 0 0 2.1609E-07 1 0.022057001 9.79689E-06 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2008,0,00 1 1 2017 1 5 7 25 25025 250250 1 52 NULL 0 0 2 2008 0 0 4.5172E-06 1 0.022057001 0.000204797 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2008,0,00 1 1 2017 1 5 7 25 25025 250250 1 51 NULL 0 0 2 2008 0 0 1.80637E-07 1 0.022057001 8.18955E-06 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2008,0,00 1 1 2017 1 5 7 25 25025 250250 1 36 NULL 0 0 2 2008 0 0 0 1 0.022057001 0 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2008,0,00 1 1 2017 1 5 7 25 25025 250250 1 35 NULL 0 0 2 2008 0 0 0 1 0.022057001 0 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2008,0,00 1 1 2017 1 5 7 25 25025 250250 1 31 NULL 0 0 2 2008 0 0 0.000198477 1 0.022057001 0.008998368 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2008,0,00 1 1 2017 1 5 7 25 25025 250250 1 5 NULL 0 0 2 2008 0 0 0.00243236 1 0.022057001 0.110276104 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2008,0,00	1	1	2017	1	5	7	25	25025	250250	1	3	NULL	0	0	2	2008	0	0	0.102448002	1	0.022057001	4.644693248	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2008,0,00	1	1	2017	1	5	7	25	25025	250250	1	2	NULL	0	0	2	2008	0	0	0.0128808	1	0.022057001	0.583977874	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2008,0,00	1	1	2017	1	5	7	25	25025	250250	1	1	NULL	0	0	2	2008	0	0	0.00416073	1	0.022057001	0.188635357	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2007,0,00	1	1	2017	1	5	7	25	25025	250250	1	122	NULL	0	0	2	2007	0	0	9.04689E-05	1	0.088779598	0.001019028	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2007,0,00	1	1	2017	1	5	7	25	25025	250250	1	121	NULL	0	0	2	2007	0	0	1.58083E-05	1	0.088779598	0.000178062	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2007,0,00	1	1	2017	1	5	7	25	25025	250250	1	119	NULL	0	0	2	2007	0	0	0	1	0.088779598	0	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2007,0,00	1	1	2017	1	5	7	25	25025	250250	1	118	NULL	0	0	2	2007	0	0	0.00264864	1	0.088779598	0.029833881	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2007,0,00	1	1	2017	1	5	7	25	25025	250250	1	117	NULL	0	0	2	2007	0	0	0.000341357	1	0.088779598	0.003844994	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2007,0,00	1	1	2017	1	5	7	25	25025	250250	1	116	NULL	0	0	2	2007	0	0	0.00276099	1	0.088779598	0.031099375	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2007,0,00	1	1	2017	1	5	7	25	25025	250250	1	115	NULL	0	0	2	2007	0	0	0.00203876	1	0.088779598	0.022964286	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2007,0,00	1	1	2017	1	5	7	25	25025	250250	1	112	NULL	0	0	2	2007	0	0	0.000260172	1	0.088779598	0.002930538	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2007,0,00	1	1	2017	1	5	7	25	25025	250250	1	111	NULL	0	0	2	2007	0	0	0.000452345	1	0.088779598	0.005095146	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2007,0,00	1	1	2017	1	5	7	25	25025	250250	1	110	NULL	0	0	2	2007	0	0	0.00290881	1	0.088779598	0.032764397	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2007,0,00	1	1	2017	1	5	7	25	25025	250250	1	107	NULL	0	0	2	2007	0	0	0.00227572	1	0.088779598	0.025633367	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2007,0,00	1	1	2017	1	5	7	25	25025	250250	1	106	NULL	0	0	2	2007	0	0	0.0220879	1	0.088779598	0.248794772	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2007,0,00	1	1	2017	1	5	7	25	25025	250250	1	100	NULL	0	0	2	2007	0	0	0.00316176	1	0.088779598	0.035613588	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2007,0,00	1	1	2017	1	5	7	25	25025	250250	1	98	NULL	0	0	2	2007	0	0	96.09629822	1	0.088779598	1082.414202	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2007,0,00	1	1	2017	1	5	7	25	25025	250250	1	91	NULL	0	0	2	2007	0	0	0.001232949	1	0.088779598	0.01388775	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2007,0,00	1	1	2017	1	5	7	25	25025	250250	1	90	NULL	0	0	2	2007	0	0	95.82050323	1	0.088779598	1079.307689	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2007,0,00	1	1	2017	1	5	7	25	25025	250250	1	87	NULL	0	0	2	2007	0	0	0.0102355	1	0.088779598	0.115291123	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2007,0,00	1	1	2017	1	5	7	25	25025	250250	1	79	NULL	0	0	2	2007	0	0	0.00783849	1	0.088779598	0.088291573	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2007,0,00	1	1	2017	1	5	7	25	25025	250250	1	66	NULL	0	0	2	2007	0	0	1.47097E-06	1	0.088779598	1.65688E-05	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2007,0,00	1	1	2017	1	5	7	25	25025	250250	1	59	NULL	0	0	2	2007	0	0	1.29821E-05	1	0.088779598	0.000146228	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2007,0,00	1	1	2017	1	5	7	25	25025	250250	1	58	NULL	0	0	2	2007	0	0	2.13436E-06	1	0.088779598	2.40411E-05	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2007,0,00	1	1	2017	1	5	7	25	25025	250250	1	57	NULL	0	0	2	2007	0	0	1.77461E-06	1	0.088779598	1.99889E-05	g	mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2007,0,00	1	1	2017	1	5	7	25	25025	250250	1	56	NULL	0	0	2	2007	0	0	3.32074E-07	1	0.088779598	3.74043E-06	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2007,0,00	1	1	2017	1	5	7	25	25025	250250	1	55	NULL	0	0	2	2007	0	0	9.51307E-06	1	0.088779598	0.000107154	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2007,0,00	1	1	2017	1	5	7	25	25025	250250	1	54	NULL	0	0	2	2007	0	0	2.77935E-06	1	0.088779598	3.13062E-05	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2007,0,00	1	1	2017	1	5	7	25	25025	250250	1	53	NULL	0	0	2	2007	0	0	9.55778E-07	1	0.088779598	1.07657E-05	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2007,0,00	1	1	2017	1	5	7	25	25025	250250	1	52	NULL	0	0	2	2007	0	0	1.99798E-05	1	0.088779598	0.000225049	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2007,0,00	1	1	2017	1	5	7	25	25025	250250	1	51	NULL	0	0	2	2007	0	0	7.98965E-07	1	0.088779598	8.99942E-06	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2007,0,00	1	1	2017	1	5	7	25	25025	250250	1	36	NULL	0	0	2	2007	0	0	0	1	0.088779598	0	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2007,0,00	1	1	2017	1	5	7	25	25025	250250	1	35	NULL	0	0	2	2007	0	0	0	1	0.088779598	0	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2007,0,00	1	1	2017	1	5	7	25	25025	250250	1	31	NULL	0	0	2	2007	0	0	0.000798867	1	0.088779598	0.008998318	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2007,0,00	1	1	2017	1	5	7	25	25025	250250	1	5	NULL	0	0	2	2007	0	0	0.0110312	1	0.088779598	0.124253774	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2007,0,00	1	1	2017	1	5	7	25	25025	250250	1	3	NULL	0	0	2	2007	0	0	0.412349999	1	0.088779598	4.644648163	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2007,0,00	1	1	2017	1	5	7	25	25025	250250	1	2	NULL	0	0	2	2007	0	0	0.058416799	1	0.088779598	0.657998005	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2007,0,00	1	1	2017	1	5	7	25	25025	250250	1	1	NULL	0	0	2	2007	0	0	0.0188697	1	0.088779598	0.212545452	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2006,0,00	1	1	2017	1	5	7	25	25025	250250	1	122	NULL	0	0	2	2006	0	0	0.000533036	1	0.0195402	0.027278944	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2006,0,00	1	1	2017	1	5	7	25	25025	250250	1	121	NULL	0	0	2	2006	0	0	0.000199804	1	0.0195402	0.010225279	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2006,0,00	1	1	2017	1	5	7	25	25025	250250	1	119	NULL	0	0	2	2006	0	0	0	1	0.0195402	0	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2006,0,00	1	1	2017	1	5	7	25	25025	250250	1	118	NULL	0	0	2	2006	0	0	0.00373907	1	0.0195402	0.191352694	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2006,0,00	1	1	2017	1	5	7	25	25025	250250	1	117	NULL	0	0	2	2006	0	0	7.51318E-05	1	0.0195402	0.003844986	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2006,0,00	1	1	2017	1	5	7	25	25025	250250	1	116	NULL	0	0	2	2006	0	0	0.000607687	1	0.0195402	0.031099323	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2006,0,00	1	1	2017	1	5	7	25	25025	250250	1	115	NULL	0	0	2	2006	0	0	6.71011E-05	1	0.0195402	0.003434003	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2006,0,00	1	1	2017	1	5	7	25	25025	250250	1	112	NULL	0	0	2	2006	0	0	0.00307766	1	0.0195402	0.157504017	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2006,0,00	1	1	2017	1	5	7	25	25025	250250	1	111	NULL	0	0	2	2006	0	0	0.00266518	1	0.0195402	0.136394715	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2006,0,00	1	1	2017	1	5	7	25	25025	250250	1	110	NULL	0	0	2	2006	0	0	0.00681673	1	0.0195402	0.348856711	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2006,0,00	1	1	2017	1	5	7	25	25025	250250	1	107	NULL	0	0	2	2006	0	0	0.000500881	1	0.0195402	0.025633361	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2006,0,00	1	1	2017	1	5	7	25	25025	250250	1	106	NULL	0	0	2	2006	0	0	0.0048615	1	0.0195402	0.248794798	g	mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2006,0,00 1 1 2017 1 5 7 25 25025 250250 1 100 NULL 0 0 2 2006 0 0 0.00740951 1 0.0195402 0.379193161 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2006,0,00 1 1 2017 1 5 7 25 25025 250250 1 98 NULL 0 0 2 2006 0 0 21.09140015 1 0.0195402 1079.38507 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2006,0,00 1 1 2017 1 5 7 25 25025 250250 1 91 NULL 0 0 2 2006 0 0 0.000271369 1 0.0195402 0.013887754 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2006,0,00 1 1 2017 1 5 7 25 25025 250250 1 90 NULL 0 0 2 2006 0 0 21.08989906 1 0.0195402 1079.308249 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2006,0,00 1 1 2017 1 5 7 25 25025 250250 1 87 NULL 0 0 2 2006 0 0 0.023287391 1 0.0195402 1.191768318 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2006,0,00 1 1 2017 1 5 7 25 25025 250250 1 79 NULL 0 0 2 2006 0 0 0.0199738 1 0.0195402 1.02219013 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2006,0,00 1 1 2017 1 5 7 25 25025 250250 1 66 NULL 0 0 2 2006 0 0 4.70917E-06 1 0.0195402 0.000240999 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2006,0,00 1 1 2017 1 5 7 25 25025 250250 1 59 NULL 0 0 2 2006 0 0 2.34352E-05 1 0.0195402 0.001199333 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2006,0,00 1 1 2017 1 5 7 25 25025 250250 1 58 NULL 0 0 2 2006 0 0 1.07546E-05 1 0.0195402 0.000550383 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2006,0,00 1 1 2017 1 5 7 25 25025 250250 1 57 NULL 0 0 2 2006 0 0 4.01572E-05 1 0.0195402 0.002055107 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2006,0,00 1 1 2017 1 5 7 25 25025 250250 1 56 NULL 0 0 2 2006 0 0 1.59187E-06 1 0.0195402 8.14664E-05 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2006,0,00 1 1 2017 1 5 7 25 25025 250250 1 55 NULL 0 0 2 2006 0 0 6.37322E-05 1 0.0195402 0.003261594 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2006,0,00 1 1 2017 1 5 7 25 25025 250250 1 54 NULL 0 0 2 2006 0 0 2.10034E-06 1 0.0195402 0.000107488 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2006,0,00 1 1 2017 1 5 7 25 25025 250250 1 53 NULL 0 0 2 2006 0 0 3.5754E-06 1 0.0195402 0.000182977 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2006,0,00 1 1 2017 1 5 7 25 25025 250250 1 52 NULL 0 0 2 2006 0 0 6.35783E-06 1 0.0195402 0.000325372 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2006,0,00 1 1 2017 1 5 7 25 25025 250250 1 51 NULL 0 0 2 2006 0 0 2.34797E-05 1 0.0195402 0.00120161 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2006,0,00 1 1 2017 1 5 7 25 25025 250250 1 36 NULL 0 0 2 2006 0 0 6.5687E-05 1 0.0195402 0.003361634 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2006,0,00 1 1 2017 1 5 7 25 25025 250250 1 35 NULL 0 0 2 2006 0 0 3.30783E-05 1 0.0195402 0.001692833 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2006,0,00 1 1 2017 1 5 7 25 25025 250250 1 31 NULL 0 0 2 2006 0 0 0.00018923 1 0.0195402 0.009684139 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2006,0,00 1 1 2017 1 5 7 25 25025 250250 1 5 NULL 0 0 2 2006 0 0 6.24466E-05 1 0.0195402 0.0031958 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2006,0,00 1 1 2017 1 5 7 25 25025 250250 1 3 NULL 0 0 2 2006 0 0 0.18269451 1 0.0195402 9.349674493 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2006,0,00 1 1 2017 1 5 7 25 25025 250250 1 2 NULL 0 0 2 2006 0 0 0.062876098 1 0.0195402 3.217781692 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2006,0,00 1 1 2017 1 5 7 25 25025 250250 1 1 NULL 0 0 2 2006 0 0 0.0200339 1 0.0195402 1.025265846 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2005,0,00 1 1 2017 1 5 7 25 25025 250250 1 122 NULL 0 0 2 2005 0 0 0.00246265 1 0.090276703 0.027278909 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2005,0,00 1 1 2017 1 5 7 25 25025 250250 1 121 NULL 0 0 2 2005 0 0 0.000923104 1 0.090276703 0.010225274 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2005,0,00	1	1	2017	1	5	7	25	25025	250250	1	119	NULL	0	0	2	2005	0	0	0	1	0.090276703	0	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2005,0,00	1	1	2017	1	5	7	25	25025	250250	1	118	NULL	0	0	2	2005	0	0	0.0172747	1	0.090276703	0.191352802	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2005,0,00	1	1	2017	1	5	7	25	25025	250250	1	117	NULL	0	0	2	2005	0	0	0.000347115	1	0.090276703	0.003845012	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2005,0,00	1	1	2017	1	5	7	25	25025	250250	1	116	NULL	0	0	2	2005	0	0	0.00280756	1	0.090276703	0.031099495	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2005,0,00	1	1	2017	1	5	7	25	25025	250250	1	115	NULL	0	0	2	2005	0	0	0.00031001	1	0.090276703	0.003433998	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2005,0,00	1	1	2017	1	5	7	25	25025	250250	1	112	NULL	0	0	2	2005	0	0	0.014219	1	0.090276703	0.157504644	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2005,0,00	1	1	2017	1	5	7	25	25025	250250	1	111	NULL	0	0	2	2005	0	0	0.0123133	1	0.090276703	0.136395098	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2005,0,00	1	1	2017	1	5	7	25	25025	250250	1	110	NULL	0	0	2	2005	0	0	0.031493701	1	0.090276703	0.348857456	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2005,0,00	1	1	2017	1	5	7	25	25025	250250	1	107	NULL	0	0	2	2005	0	0	0.00231411	1	0.090276703	0.025633524	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2005,0,00	1	1	2017	1	5	7	25	25025	250250	1	106	NULL	0	0	2	2005	0	0	0.0224605	1	0.090276703	0.24879619	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2005,0,00	1	1	2017	1	5	7	25	25025	250250	1	100	NULL	0	0	2	2005	0	0	0.0342324	1	0.090276703	0.379194179	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2005,0,00	1	1	2017	1	5	7	25	25025	250250	1	98	NULL	0	0	2	2005	0	0	97.44380188	1	0.090276703	1079.390345	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2005,0,00	1	1	2017	1	5	7	25	25025	250250	1	91	NULL	0	0	2	2005	0	0	0.001253744	1	0.090276703	0.013887791	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2005,0,00	1	1	2017	1	5	7	25	25025	250250	1	90	NULL	0	0	2	2005	0	0	97.4367981	1	0.090276703	1079.312764	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2005,0,00	1	1	2017	1	5	7	25	25025	250250	1	87	NULL	0	0	2	2005	0	0	0.107588761	1	0.090276703	1.19176661	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2005,0,00	1	1	2017	1	5	7	25	25025	250250	1	79	NULL	0	0	2	2005	0	0	0.092279799	1	0.090276703	1.022188405	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2005,0,00	1	1	2017	1	5	7	25	25025	250250	1	66	NULL	0	0	2	2005	0	0	2.17568E-05	1	0.090276703	0.000241001	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2005,0,00	1	1	2017	1	5	7	25	25025	250250	1	59	NULL	0	0	2	2005	0	0	0.000108272	1	0.090276703	0.001199335	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2005,0,00	1	1	2017	1	5	7	25	25025	250250	1	58	NULL	0	0	2	2005	0	0	4.96868E-05	1	0.090276703	0.000550383	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2005,0,00	1	1	2017	1	5	7	25	25025	250250	1	57	NULL	0	0	2	2005	0	0	0.000185528	1	0.090276703	0.002055104	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2005,0,00	1	1	2017	1	5	7	25	25025	250250	1	56	NULL	0	0	2	2005	0	0	7.35453E-06	1	0.090276703	8.14665E-05	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2005,0,00	1	1	2017	1	5	7	25	25025	250250	1	55	NULL	0	0	2	2005	0	0	0.000294445	1	0.090276703	0.003261583	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2005,0,00	1	1	2017	1	5	7	25	25025	250250	1	54	NULL	0	0	2	2005	0	0	9.70367E-06	1	0.090276703	0.000107488	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2005,0,00	1	1	2017	1	5	7	25	25025	250250	1	53	NULL	0	0	2	2005	0	0	1.65185E-05	1	0.090276703	0.000182976	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2005,0,00	1	1	2017	1	5	7	25	25025	250250	1	52	NULL	0	0	2	2005	0	0	2.93735E-05	1	0.090276703	0.000325372	g	mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2005,0,00 1 1 2017 1 5 7 25 25025 250250 1 51 NULL 0 0 2 2005 0 0 0.000108477 1 0.090276703 0.001201606 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2005,0,00 1 1 2017 1 5 7 25 25025 250250 1 36 NULL 0 0 2 2005 0 0 0.000303477 1 0.090276703 0.003361631 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2005,0,00 1 1 2017 1 5 7 25 25025 250250 1 35 NULL 0 0 2 2005 0 0 0.000152823 1 0.090276703 0.001692829 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2005,0,00 1 1 2017 1 5 7 25 25025 250250 1 31 NULL 0 0 2 2005 0 0 0.000874257 1 0.090276703 0.009684193 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2005,0,00 1 1 2017 1 5 7 25 25025 250250 1 5 NULL 0 0 2 2005 0 0 0.000288506 1 0.090276703 0.003195796 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2005,0,00 1 1 2017 1 5 7 25 25025 250250 1 3 NULL 0 0 2 2005 0 0 0.844065249 1 0.090276703 9.349757121 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2005,0,00 1 1 2017 1 5 7 25 25025 250250 1 2 NULL 0 0 2 2005 0 0 0.290491939 1 0.090276703 3.217795158 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2005,0,00 1 1 2017 1 5 7 25 25025 250250 1 1 NULL 0 0 2 2005 0 0 0.092557997 1 0.090276703 1.025270011 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2004,0,00 1 1 2017 1 5 7 25 25025 250250 1 122 NULL 0 0 2 2004 0 0 0.00498346 1 0.182684004 0.027279127 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2004,0,00 1 1 2017 1 5 7 25 25025 250250 1 121 NULL 0 0 2 2004 0 0 0.00186801 1 0.182684004 0.010225362 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2004,0,00 1 1 2017 1 5 7 25 25025 250250 1 119 NULL 0 0 2 2004 0 0 0 1 0.182684004 0 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2004,0,00 1 1 2017 1 5 7 25 25025 250250 1 118 NULL 0 0 2 2004 0 0 0.034957301 1 0.182684004 0.191353923 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2004,0,00 1 1 2017 1 5 7 25 25025 250250 1 117 NULL 0 0 2 2004 0 0 0.000702425 1 0.182684004 0.003845028 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2004,0,00 1 1 2017 1 5 7 25 25025 250250 1 116 NULL 0 0 2 2004 0 0 0.00568141 1 0.182684004 0.031099658 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2004,0,00 1 1 2017 1 5 7 25 25025 250250 1 115 NULL 0 0 2 2004 0 0 0.000627342 1 0.182684004 0.003434028 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2004,0,00 1 1 2017 1 5 7 25 25025 250250 1 112 NULL 0 0 2 2004 0 0 0.0287739 1 0.182684004 0.157506401 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2004,0,00 1 1 2017 1 5 7 25 25025 250250 1 111 NULL 0 0 2 2004 0 0 0.024917301 1 0.182684004 0.136395635 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2004,0,00 1 1 2017 1 5 7 25 25025 250250 1 110 NULL 0 0 2 2004 0 0 0.063731201 1 0.182684004 0.348860324 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2004,0,00 1 1 2017 1 5 7 25 25025 250250 1 107 NULL 0 0 2 2004 0 0 0.00468285 1 0.182684004 0.025633608 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2004,0,00 1 1 2017 1 5 7 25 25025 250250 1 106 NULL 0 0 2 2004 0 0 0.045451298 1 0.182684004 0.248797362 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2004,0,00 1 1 2017 1 5 7 25 25025 250250 1 100 NULL 0 0 2 2004 0 0 0.069273204 1 0.182684004 0.379196875 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2004,0,00 1 1 2017 1 5 7 25 25025 250250 1 98 NULL 0 0 2 2004 0 0 197.1880035 1 0.182684004 1079.39392 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2004,0,00 1 1 2017 1 5 7 25 25025 250250 1 91 NULL 0 0 2 2004 0 0 0.002537088 1 0.182684004 0.013887851 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2004,0,00 1 1 2017 1 5 7 25 25025 250250 1 90 NULL 0 0 2 2004 0 0 197.173996 1 0.182684004 1079.317244 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2004,0,00 1 1 2017 1 5 7 25 25025 250250 1 87 NULL 0 0 2 2004 0 0 0.217718154 1 0.182684004 1.191774589 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2004,0,00 1 1 2017 1 5 7 25 25025 250250 1 79 NULL 0 0 2 2004 0 0 0.186737999 1 0.182684004 1.022191297 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2004,0,00 1 1 2017 1 5 7 25 25025 250250 1 66 NULL 0 0 2 2004 0 0 4.40271E-05 1 0.182684004 0.000241001 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2004,0,00 1 1 2017 1 5 7 25 25025 250250 1 59 NULL 0 0 2 2004 0 0 0.0002191 1 0.182684004 0.001199339 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2004,0,00 1 1 2017 1 5 7 25 25025 250250 1 58 NULL 0 0 2 2004 0 0 0.000100547 1 0.182684004 0.000550388 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2004,0,00 1 1 2017 1 5 7 25 25025 250250 1 57 NULL 0 0 2 2004 0 0 0.000375438 1 0.182684004 0.002055122 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2004,0,00 1 1 2017 1 5 7 25 25025 250250 1 56 NULL 0 0 2 2004 0 0 1.48827E-05 1 0.182684004 8.14669E-05 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2004,0,00 1 1 2017 1 5 7 25 25025 250250 1 55 NULL 0 0 2 2004 0 0 0.000595845 1 0.182684004 0.003261616 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2004,0,00 1 1 2017 1 5 7 25 25025 250250 1 54 NULL 0 0 2 2004 0 0 1.96365E-05 1 0.182684004 0.000107489 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2004,0,00 1 1 2017 1 5 7 25 25025 250250 1 53 NULL 0 0 2 2004 0 0 3.34271E-05 1 0.182684004 0.000182978 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2004,0,00 1 1 2017 1 5 7 25 25025 250250 1 52 NULL 0 0 2 2004 0 0 5.94406E-05 1 0.182684004 0.000325374 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2004,0,00 1 1 2017 1 5 7 25 25025 250250 1 51 NULL 0 0 2 2004 0 0 0.000219516 1 0.182684004 0.001201616 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2004,0,00 1 1 2017 1 5 7 25 25025 250250 1 36 NULL 0 0 2 2004 0 0 0.000614121 1 0.182684004 0.003361657 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2004,0,00 1 1 2017 1 5 7 25 25025 250250 1 35 NULL 0 0 2 2004 0 0 0.000309256 1 0.182684004 0.001692847 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2004,0,00 1 1 2017 1 5 7 25 25025 250250 1 31 NULL 0 0 2 2004 0 0 0.00176916 1 0.182684004 0.009684264 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2004,0,00 1 1 2017 1 5 7 25 25025 250250 1 5 NULL 0 0 2 2004 0 0 0.000583823 1 0.182684004 0.003195806 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2004,0,00 1 1 2017 1 5 7 25 25025 250250 1 3 NULL 0 0 2 2004 0 0 1.708056331 1 0.182684004 9.349785917 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2004,0,00 1 1 2017 1 5 7 25 25025 250250 1 2 NULL 0 0 2 2004 0 0 0.587842882 1 0.182684004 3.21781255 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2004,0,00 1 1 2017 1 5 7 25 25025 250250 1 1 NULL 0 0 2 2004 0 0 0.187300995 1 0.182684004 1.025273098 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2003,0,00 1 1 2017 1 5 7 25 25025 250250 1 122 NULL 0 0 2 2003 0 0 0.000193071 1 0.00707769 0.027278815 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2003,0,00 1 1 2017 1 5 7 25 25025 250250 1 121 NULL 0 0 2 2003 0 0 7.23712E-05 1 0.00707769 0.010225257 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2003,0,00 1 1 2017 1 5 7 25 25025 250250 1 119 NULL 0 0 2 2003 0 0 0 1 0.00707769 0 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2003,0,00 1 1 2017 1 5 7 25 25025 250250 1 118 NULL 0 0 2 2003 0 0 0.00135433 1 0.00707769 0.191351973 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2003,0,00 1 1 2017 1 5 7 25 25025 250250 1 117 NULL 0 0 2 2003 0 0 2.72137E-05 1 0.00707769 0.003844997 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2003,0,00 1 1 2017 1 5 7 25 25025 250250 1 116 NULL 0 0 2 2003 0 0 0.000220112 1 0.00707769 0.03109941 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2003,0,00 1 1 2017 1 5 7 25 25025 250250 1 115 NULL 0 0 2 2003 0 0 2.43048E-05 1 0.00707769 0.003434002 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2003,0,00 1 1 2017 1 5 7 25 25025 250250 1 112 NULL 0 0 2 2003 0
0 0.00111476 1 0.00707769 0.157503353 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2003,0,00 1 1 2017 1 5 7 25 25025 250250 1 111 NULL 0 0 2 2003 0
0 0.000965357 1 0.00707769 0.136394356 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2003,0,00 1 1 2017 1 5 7 25 25025 250250 1 110 NULL 0 0 2 2003 0
0 0.0024691 1 0.00707769 0.348856757 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2003,0,00 1 1 2017 1 5 7 25 25025 250250 1 107 NULL 0 0 2 2003 0
0 0.000181425 1 0.00707769 0.025633363 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2003,0,00 1 1 2017 1 5 7 25 25025 250250 1 106 NULL 0 0 2 2003 0
0 0.00176089 1 0.00707769 0.248794445 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2003,0,00 1 1 2017 1 5 7 25 25025 250250 1 100 NULL 0 0 2 2003 0
0 0.00268381 1 0.00707769 0.379192911 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2003,0,00 1 1 2017 1 5 7 25 25025 250250 1 98 NULL 0 0 2 2003 0
0 7.639570236 1 0.00707769 1079.387485 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2003,0,00 1 1 2017 1 5 7 25 25025 250250 1 91 NULL 0 0 2 2003 0
0 9.82934E-05 1 0.00707769 0.013887775 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2003,0,00 1 1 2017 1 5 7 25 25025 250250 1 90 NULL 0 0 2 2003 0
0 7.639019966 1 0.00707769 1079.309737 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2003,0,00 1 1 2017 1 5 7 25 25025 250250 1 87 NULL 0 0 2 2003 0
0 0.008434937 1 0.00707769 1.191764132 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2003,0,00 1 1 2017 1 5 7 25 25025 250250 1 79 NULL 0 0 2 2003 0
0 0.00723471 1 0.00707769 1.022185146 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2003,0,00 1 1 2017 1 5 7 25 25025 250250 1 66 NULL 0 0 2 2003 0
0 1.70572E-06 1 0.00707769 0.000241 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2003,0,00 1 1 2017 1 5 7 25 25025 250250 1 59 NULL 0 0 2 2003 0
0 8.48848E-06 1 0.00707769 0.001199329 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2003,0,00 1 1 2017 1 5 7 25 25025 250250 1 58 NULL 0 0 2 2003 0
0 3.89544E-06 1 0.00707769 0.000550383 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2003,0,00 1 1 2017 1 5 7 25 25025 250250 1 57 NULL 0 0 2 2003 0
0 1.45454E-05 1 0.00707769 0.002055105 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2003,0,00 1 1 2017 1 5 7 25 25025 250250 1 56 NULL 0 0 2 2003 0
0 5.76594E-07 1 0.00707769 8.14664E-05 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2003,0,00 1 1 2017 1 5 7 25 25025 250250 1 55 NULL 0 0 2 2003 0
0 2.30845E-05 1 0.00707769 0.003261587 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2003,0,00 1 1 2017 1 5 7 25 25025 250250 1 54 NULL 0 0 2 2003 0
0 7.60766E-07 1 0.00707769 0.000107488 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2003,0,00 1 1 2017 1 5 7 25 25025 250250 1 53 NULL 0 0 2 2003 0
0 1.29505E-06 1 0.00707769 0.000182976 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2003,0,00 1 1 2017 1 5 7 25 25025 250250 1 52 NULL 0 0 2 2003 0
0 2.30287E-06 1 0.00707769 0.00032537 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2003,0,00 1 1 2017 1 5 7 25 25025 250250 1 51 NULL 0 0 2 2003 0
0 8.50459E-06 1 0.00707769 0.001201605 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2003,0,00 1 1 2017 1 5 7 25 25025 250250 1 36 NULL 0 0 2 2003 0
0 2.37925E-05 1 0.00707769 0.003361619 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2003,0,00 1 1 2017 1 5 7 25 25025 250250 1 35 NULL 0 0 2 2003 0
0 1.19813E-05 1 0.00707769 0.001692826 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2003,0,00 1 1 2017 1 5 7 25 25025 250250 1 31 NULL 0 0 2 2003 0
0 6.85416E-05 1 0.00707769 0.009684177 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2003,0,00 1 1 2017 1 5 7 25 25025 250250 1 5 NULL 0 0 2 2003 0
0 2.26188E-05 1 0.00707769 0.003195793 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2003,0,00	1	1	2017	1	5	7	25	25025	250250	1	3	NULL	0	0	2	2003	0	0	0.06617441	1	0.00707769	9.34971838	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2003,0,00	1	1	2017	1	5	7	25	25025	250250	1	2	NULL	0	0	2	2003	0	0	0.022774469	1	0.00707769	3.217782697	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2003,0,00	1	1	2017	1	5	7	25	25025	250250	1	1	NULL	0	0	2	2003	0	0	0.00725652	1	0.00707769	1.025266685	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2002,0,00	1	1	2017	1	5	7	25	25025	250250	1	122	NULL	0	0	2	2002	0	0	0.000450392	1	0.0149212	0.030184702	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2002,0,00	1	1	2017	1	5	7	25	25025	250250	1	121	NULL	0	0	2	2002	0	0	0.000168826	1	0.0149212	0.011314505	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2002,0,00	1	1	2017	1	5	7	25	25025	250250	1	119	NULL	0	0	2	2002	0	0	0	1	0.0149212	0	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2002,0,00	1	1	2017	1	5	7	25	25025	250250	1	118	NULL	0	0	2	2002	0	0	0.00315935	1	0.0149212	0.211735646	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2002,0,00	1	1	2017	1	5	7	25	25025	250250	1	117	NULL	0	0	2	2002	0	0	5.73719E-05	1	0.0149212	0.003844992	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2002,0,00	1	1	2017	1	5	7	25	25025	250250	1	116	NULL	0	0	2	2002	0	0	0.00046404	1	0.0149212	0.031099374	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2002,0,00	1	1	2017	1	5	7	25	25025	250250	1	115	NULL	0	0	2	2002	0	0	5.66975E-05	1	0.0149212	0.003799795	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2002,0,00	1	1	2017	1	5	7	25	25025	250250	1	112	NULL	0	0	2	2002	0	0	0.00260049	1	0.0149212	0.174281561	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2002,0,00	1	1	2017	1	5	7	25	25025	250250	1	111	NULL	0	0	2	2002	0	0	0.00225196	1	0.0149212	0.150923521	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2002,0,00	1	1	2017	1	5	7	25	25025	250250	1	110	NULL	0	0	2	2002	0	0	0.00575984	1	0.0149212	0.386017192	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2002,0,00	1	1	2017	1	5	7	25	25025	250250	1	107	NULL	0	0	2	2002	0	0	0.000382481	1	0.0149212	0.025633393	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2002,0,00	1	1	2017	1	5	7	25	25025	250250	1	106	NULL	0	0	2	2002	0	0	0.00371232	1	0.0149212	0.248794996	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2002,0,00	1	1	2017	1	5	7	25	25025	250250	1	100	NULL	0	0	2	2002	0	0	0.00626071	1	0.0149212	0.419584862	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2002,0,00	1	1	2017	1	5	7	25	25025	250250	1	98	NULL	0	0	2	2002	0	0	16.10569954	1	0.0149212	1079.383631	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2002,0,00	1	1	2017	1	5	7	25	25025	250250	1	91	NULL	0	0	2	2002	0	0	0.000207222	1	0.0149212	0.01388777	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2002,0,00	1	1	2017	1	5	7	25	25025	250250	1	90	NULL	0	0	2	2002	0	0	16.10460091	1	0.0149212	1079.310002	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2002,0,00	1	1	2017	1	5	7	25	25025	250250	1	87	NULL	0	0	2	2002	0	0	0.02507912	1	0.0149212	1.680770928	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2002,0,00	1	1	2017	1	5	7	25	25025	250250	1	79	NULL	0	0	2	2002	0	0	0.021510599	1	0.0149212	1.441613176	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2002,0,00	1	1	2017	1	5	7	25	25025	250250	1	66	NULL	0	0	2	2002	0	0	3.59601E-06	1	0.0149212	0.000241	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2002,0,00	1	1	2017	1	5	7	25	25025	250250	1	59	NULL	0	0	2	2002	0	0	1.98017E-05	1	0.0149212	0.001327085	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2002,0,00	1	1	2017	1	5	7	25	25025	250250	1	58	NULL	0	0	2	2002	0	0	9.08717E-06	1	0.0149212	0.000609011	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2002,0,00	1	1	2017	1	5	7	25	25025	250250	1	57	NULL	0	0	2	2002	0	0	3.39311E-05	1	0.0149212	0.00227402	g	mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2002,0,00 1 1 2017 1 5 7 25 25025 250250 1 56 NULL 0 0 2 2002 0 0 1.34506E-06 1 0.0149212 9.01442E-05 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2002,0,00 1 1 2017 1 5 7 25 25025 250250 1 55 NULL 0 0 2 2002 0 0 5.38509E-05 1 0.0149212 0.003609019 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2002,0,00 1 1 2017 1 5 7 25 25025 250250 1 54 NULL 0 0 2 2002 0 0 1.77469E-06 1 0.0149212 0.000118937 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2002,0,00 1 1 2017 1 5 7 25 25025 250250 1 53 NULL 0 0 2 2002 0 0 3.02106E-06 1 0.0149212 0.000202468 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2002,0,00 1 1 2017 1 5 7 25 25025 250250 1 52 NULL 0 0 2 2002 0 0 5.37209E-06 1 0.0149212 0.000360031 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2002,0,00 1 1 2017 1 5 7 25 25025 250250 1 51 NULL 0 0 2 2002 0 0 1.98393E-05 1 0.0149212 0.001329605 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2002,0,00 1 1 2017 1 5 7 25 25025 250250 1 36 NULL 0 0 2 2002 0 0 5.55026E-05 1 0.0149212 0.003719714 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2002,0,00 1 1 2017 1 5 7 25 25025 250250 1 35 NULL 0 0 2 2002 0 0 2.79497E-05 1 0.0149212 0.001873154 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2002,0,00 1 1 2017 1 5 7 25 25025 250250 1 31 NULL 0 0 2 2002 0 0 0.0001445 1 0.0149212 0.009684207 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2002,0,00 1 1 2017 1 5 7 25 25025 250250 1 5 NULL 0 0 2 2002 0 0 4.62744E-05 1 0.0149212 0.003101249 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2002,0,00 1 1 2017 1 5 7 25 25025 250250 1 3 NULL 0 0 2 2002 0 0 0.242621377 1 0.0149212 16.26017811 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2002,0,00 1 1 2017 1 5 7 25 25025 250250 1 2 NULL 0 0 2 2002 0 0 0.115804128 1 0.0149212 7.761046348 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2002,0,00 1 1 2017 1 5 7 25 25025 250250 1 1 NULL 0 0 2 2002 0 0 0.0215551 1 0.0149212 1.44459554 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2001,0,00 1 1 2017 1 5 7 25 25025 250250 1 122 NULL 0 0 2 2001 0 0 0.000527649 1 0.017480699 0.030184663 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2001,0,00 1 1 2017 1 5 7 25 25025 250250 1 121 NULL 0 0 2 2001 0 0 0.000197785 1 0.017480699 0.011314479 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2001,0,00 1 1 2017 1 5 7 25 25025 250250 1 119 NULL 0 0 2 2001 0 0 0 1 0.017480699 0 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2001,0,00 1 1 2017 1 5 7 25 25025 250250 1 118 NULL 0 0 2 2001 0 0 0.00370128 1 0.017480699 0.211735242 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2001,0,00 1 1 2017 1 5 7 25 25025 250250 1 117 NULL 0 0 2 2001 0 0 6.72132E-05 1 0.017480699 0.003844995 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2001,0,00 1 1 2017 1 5 7 25 25025 250250 1 116 NULL 0 0 2 2001 0 0 0.00054364 1 0.017480699 0.031099442 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2001,0,00 1 1 2017 1 5 7 25 25025 250250 1 115 NULL 0 0 2 2001 0 0 6.6423E-05 1 0.017480699 0.003799791 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2001,0,00 1 1 2017 1 5 7 25 25025 250250 1 112 NULL 0 0 2 2001 0 0 0.00304656 1 0.017480699 0.174281363 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2001,0,00 1 1 2017 1 5 7 25 25025 250250 1 111 NULL 0 0 2 2001 0 0 0.00263825 1 0.017480699 0.150923589 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2001,0,00 1 1 2017 1 5 7 25 25025 250250 1 110 NULL 0 0 2 2001 0 0 0.00674785 1 0.017480699 0.386017177 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2001,0,00 1 1 2017 1 5 7 25 25025 250250 1 107 NULL 0 0 2 2001 0 0 0.00044809 1 0.017480699 0.025633414 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2001,0,00 1 1 2017 1 5 7 25 25025 250250 1 106 NULL 0 0 2 2001 0 0 0.00434912 1 0.017480699 0.248795536 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2001,0,00	1	1	2017	1	5	7	25	25025	250250	1	100	NULL	0	0	2	2001	0	0	0.00733464	1	0.017480699	0.419585031	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2001,0,00	1	1	2017	1	5	7	25	25025	250250	1	98	NULL	0	0	2	2001	0	0	18.86840057	1	0.017480699	1079.384766	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2001,0,00	1	1	2017	1	5	7	25	25025	250250	1	91	NULL	0	0	2	2001	0	0	0.000242768	1	0.017480699	0.013887784	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2001,0,00	1	1	2017	1	5	7	25	25025	250250	1	90	NULL	0	0	2	2001	0	0	18.86709976	1	0.017480699	1079.310352	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2001,0,00	1	1	2017	1	5	7	25	25025	250250	1	87	NULL	0	0	2	2001	0	0	0.029381009	1	0.017480699	1.6807685	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2001,0,00	1	1	2017	1	5	7	25	25025	250250	1	79	NULL	0	0	2	2001	0	0	0.0252003	1	0.017480699	1.441607079	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2001,0,00	1	1	2017	1	5	7	25	25025	250250	1	66	NULL	0	0	2	2001	0	0	4.21285E-06	1	0.017480699	0.000241	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2001,0,00	1	1	2017	1	5	7	25	25025	250250	1	59	NULL	0	0	2	2001	0	0	2.31984E-05	1	0.017480699	0.001327086	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2001,0,00	1	1	2017	1	5	7	25	25025	250250	1	58	NULL	0	0	2	2001	0	0	1.06459E-05	1	0.017480699	0.000609009	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2001,0,00	1	1	2017	1	5	7	25	25025	250250	1	57	NULL	0	0	2	2001	0	0	3.97514E-05	1	0.017480699	0.002274017	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2001,0,00	1	1	2017	1	5	7	25	25025	250250	1	56	NULL	0	0	2	2001	0	0	1.57579E-06	1	0.017480699	9.01446E-05	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2001,0,00	1	1	2017	1	5	7	25	25025	250250	1	55	NULL	0	0	2	2001	0	0	6.30881E-05	1	0.017480699	0.003609014	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2001,0,00	1	1	2017	1	5	7	25	25025	250250	1	54	NULL	0	0	2	2001	0	0	2.07911E-06	1	0.017480699	0.000118937	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2001,0,00	1	1	2017	1	5	7	25	25025	250250	1	53	NULL	0	0	2	2001	0	0	3.53927E-06	1	0.017480699	0.000202467	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2001,0,00	1	1	2017	1	5	7	25	25025	250250	1	52	NULL	0	0	2	2001	0	0	6.29358E-06	1	0.017480699	0.00036003	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2001,0,00	1	1	2017	1	5	7	25	25025	250250	1	51	NULL	0	0	2	2001	0	0	2.32424E-05	1	0.017480699	0.001329604	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2001,0,00	1	1	2017	1	5	7	25	25025	250250	1	36	NULL	0	0	2	2001	0	0	6.50232E-05	1	0.017480699	0.003719714	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2001,0,00	1	1	2017	1	5	7	25	25025	250250	1	35	NULL	0	0	2	2001	0	0	3.2744E-05	1	0.017480699	0.001873152	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2001,0,00	1	1	2017	1	5	7	25	25025	250250	1	31	NULL	0	0	2	2001	0	0	0.000169286	1	0.017480699	0.009684166	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2001,0,00	1	1	2017	1	5	7	25	25025	250250	1	5	NULL	0	0	2	2001	0	0	5.4212E-05	1	0.017480699	0.003101247	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2001,0,00	1	1	2017	1	5	7	25	25025	250250	1	3	NULL	0	0	2	2001	0	0	0.284240961	1	0.017480699	16.260274	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2001,0,00	1	1	2017	1	5	7	25	25025	250250	1	2	NULL	0	0	2	2001	0	0	0.135669068	1	0.017480699	7.761077793	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2001,0,00	1	1	2017	1	5	7	25	25025	250250	1	1	NULL	0	0	2	2001	0	0	0.025252599	1	0.017480699	1.444598913	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2000,0,00	1	1	2017	1	5	7	25	25025	250250	1	122	NULL	0	0	2	2000	0	0	0.000385234	1	0.0127626	0.030184602	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2000,0,00	1	1	2017	1	5	7	25	25025	250250	1	121	NULL	0	0	2	2000	0	0	0.000144402	1	0.0127626	0.011314466	g	mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2000,0,00 1 1 2017 1 5 7 25 25025 250250 1 119 NULL 0 0 2 2000 0 0 0 1 0.0127626 0 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2000,0,00 1 1 2017 1 5 7 25 25025 250250 1 118 NULL 0 0 2 2000 0 0 0.00270229 1 0.0127626 0.211735073 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2000,0,00 1 1 2017 1 5 7 25 25025 250250 1 117 NULL 0 0 2 2000 0 0 4.90722E-05 1 0.0127626 0.003845 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2000,0,00 1 1 2017 1 5 7 25 25025 250250 1 116 NULL 0 0 2 2000 0 0 0.00039691 1 0.0127626 0.031099464 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2000,0,00 1 1 2017 1 5 7 25 25025 250250 1 115 NULL 0 0 2 2000 0 0 4.84952E-05 1 0.0127626 0.00379979 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2000,0,00 1 1 2017 1 5 7 25 25025 250250 1 112 NULL 0 0 2 2000 0 0 0.00222429 1 0.0127626 0.174281895 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2000,0,00 1 1 2017 1 5 7 25 25025 250250 1 111 NULL 0 0 2 2000 0 0 0.00192617 1 0.0127626 0.150923011 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2000,0,00 1 1 2017 1 5 7 25 25025 250250 1 110 NULL 0 0 2 2000 0 0 0.00492658 1 0.0127626 0.386016967 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2000,0,00 1 1 2017 1 5 7 25 25025 250250 1 107 NULL 0 0 2 2000 0 0 0.000327149 1 0.0127626 0.025633414 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2000,0,00 1 1 2017 1 5 7 25 25025 250250 1 106 NULL 0 0 2 2000 0 0 0.00317528 1 0.0127626 0.248795712 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2000,0,00 1 1 2017 1 5 7 25 25025 250250 1 100 NULL 0 0 2 2000 0 0 0.00535499 1 0.0127626 0.419584563 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2000,0,00 1 1 2017 1 5 7 25 25025 250250 1 98 NULL 0 0 2 2000 0 0 13.77569962 1 0.0127626 1079.380379 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2000,0,00 1 1 2017 1 5 7 25 25025 250250 1 91 NULL 0 0 2 2000 0 0 0.000177244 1 0.0127626 0.013887742 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2000,0,00 1 1 2017 1 5 7 25 25025 250250 1 90 NULL 0 0 2 2000 0 0 13.7748003 1 0.0127626 1079.309914 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2000,0,00 1 1 2017 1 5 7 25 25025 250250 1 87 NULL 0 0 2 2000 0 0 0.021451069 1 0.0127626 1.680775835 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2000,0,00 1 1 2017 1 5 7 25 25025 250250 1 79 NULL 0 0 2 2000 0 0 0.0183987 1 0.0127626 1.441610708 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2000,0,00 1 1 2017 1 5 7 25 25025 250250 1 66 NULL 0 0 2 2000 0 0 3.07578E-06 1 0.0127626 0.000240999 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2000,0,00 1 1 2017 1 5 7 25 25025 250250 1 59 NULL 0 0 2 2000 0 0 1.6937E-05 1 0.0127626 0.001327081 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2000,0,00 1 1 2017 1 5 7 25 25025 250250 1 58 NULL 0 0 2 2000 0 0 7.77255E-06 1 0.0127626 0.00060901 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2000,0,00 1 1 2017 1 5 7 25 25025 250250 1 57 NULL 0 0 2 2000 0 0 2.90223E-05 1 0.0127626 0.002274012 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2000,0,00 1 1 2017 1 5 7 25 25025 250250 1 56 NULL 0 0 2 2000 0 0 1.15047E-06 1 0.0127626 9.01439E-05 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2000,0,00 1 1 2017 1 5 7 25 25025 250250 1 55 NULL 0 0 2 2000 0 0 4.60603E-05 1 0.0127626 0.003609006 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2000,0,00 1 1 2017 1 5 7 25 25025 250250 1 54 NULL 0 0 2 2000 0 0 1.51795E-06 1 0.0127626 0.000118937 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2000,0,00 1 1 2017 1 5 7 25 25025 250250 1 53 NULL 0 0 2 2000 0 0 2.58401E-06 1 0.0127626 0.000202467 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2000,0,00 1 1 2017 1 5 7 25 25025 250250 1 52 NULL 0 0 2 2000 0 0 4.59491E-06 1 0.0127626 0.000360029 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2000,0,00 1 1 2017 1 5 7 25 25025 250250 1 51 NULL 0 0 2 2000 0
0 1.69692E-05 1 0.0127626 0.001329604 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2000,0,00 1 1 2017 1 5 7 25 25025 250250 1 36 NULL 0 0 2 2000 0
0 4.74732E-05 1 0.0127626 0.003719712 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2000,0,00 1 1 2017 1 5 7 25 25025 250250 1 35 NULL 0 0 2 2000 0
0 2.39063E-05 1 0.0127626 0.001873153 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2000,0,00 1 1 2017 1 5 7 25 25025 250250 1 31 NULL 0 0 2 2000 0
0 0.000123595 1 0.0127626 0.009684156 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2000,0,00 1 1 2017 1 5 7 25 25025 250250 1 5 NULL 0 0 2 2000 0
0 3.95799E-05 1 0.0127626 0.003101242 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2000,0,00 1 1 2017 1 5 7 25 25025 250250 1 3 NULL 0 0 2 2000 0
0 0.207523316 1 0.0127626 16.26027003 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2000,0,00 1 1 2017 1 5 7 25 25025 250250 1 2 NULL 0 0 2 2000 0
0 0.09905114 1 0.0127626 7.76104737 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,2000,0,00 1 1 2017 1 5 7 25 25025 250250 1 1 NULL 0 0 2 2000 0
0 0.018436899 1 0.0127626 1.44460376 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1999,0,00 1 1 2017 1 5 7 25 25025 250250 1 122 NULL 0 0 2 1999 0
0 0.000157297 1 0.0052112 0.030184411 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1999,0,00 1 1 2017 1 5 7 25 25025 250250 1 121 NULL 0 0 2 1999 0
0 5.89616E-05 1 0.0052112 0.011314399 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1999,0,00 1 1 2017 1 5 7 25 25025 250250 1 119 NULL 0 0 2 1999 0
0 0 1 0.0052112 0 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1999,0,00 1 1 2017 1 5 7 25 25025 250250 1 118 NULL 0 0 2 1999 0
0 0.00110339 1 0.0052112 0.211734339 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1999,0,00 1 1 2017 1 5 7 25 25025 250250 1 117 NULL 0 0 2 1999 0
0 2.0037E-05 1 0.0052112 0.003844988 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1999,0,00 1 1 2017 1 5 7 25 25025 250250 1 116 NULL 0 0 2 1999 0
0 0.000162065 1 0.0052112 0.031099362 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1999,0,00 1 1 2017 1 5 7 25 25025 250250 1 115 NULL 0 0 2 1999 0
0 1.98014E-05 1 0.0052112 0.003799777 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1999,0,00 1 1 2017 1 5 7 25 25025 250250 1 112 NULL 0 0 2 1999 0
0 0.000908215 1 0.0052112 0.174281353 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1999,0,00 1 1 2017 1 5 7 25 25025 250250 1 111 NULL 0 0 2 1999 0
0 0.000786487 1 0.0052112 0.150922436 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1999,0,00 1 1 2017 1 5 7 25 25025 250250 1 110 NULL 0 0 2 1999 0
0 0.0020116 1 0.0052112 0.386014721 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1999,0,00 1 1 2017 1 5 7 25 25025 250250 1 107 NULL 0 0 2 1999 0
0 0.000133581 1 0.0052112 0.025633442 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1999,0,00 1 1 2017 1 5 7 25 25025 250250 1 106 NULL 0 0 2 1999 0
0 0.00129652 1 0.0052112 0.248794899 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1999,0,00 1 1 2017 1 5 7 25 25025 250250 1 100 NULL 0 0 2 1999 0
0 0.00218653 1 0.0052112 0.419582821 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1999,0,00 1 1 2017 1 5 7 25 25025 250250 1 98 NULL 0 0 2 1999 0
0 5.624879837 1 0.0052112 1079.382816 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1999,0,00 1 1 2017 1 5 7 25 25025 250250 1 91 NULL 0 0 2 1999 0
0 7.23718E-05 1 0.0052112 0.013887742 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1999,0,00 1 1 2017 1 5 7 25 25025 250250 1 90 NULL 0 0 2 1999 0
0 5.624489784 1 0.0052112 1079.307967 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1999,0,00 1 1 2017 1 5 7 25 25025 250250 1 87 NULL 0 0 2 1999 0
0 0.008758813 1 0.0052112 1.680766997 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1999,0,00 1 1 2017 1 5 7 25 25025 250250 1 79 NULL 0 0 2 1999 0 0 0.0075125 1 0.0052112 1.441606521 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1999,0,00 1 1 2017 1 5 7 25 25025 250250 1 66 NULL 0 0 2 1999 0 0 1.2559E-06 1 0.0052112 0.000241 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1999,0,00 1 1 2017 1 5 7 25 25025 250250 1 59 NULL 0 0 2 1999 0 0 6.91566E-06 1 0.0052112 0.001327076 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1999,0,00 1 1 2017 1 5 7 25 25025 250250 1 58 NULL 0 0 2 1999 0 0 3.17365E-06 1 0.0052112 0.000609006 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1999,0,00 1 1 2017 1 5 7 25 25025 250250 1 57 NULL 0 0 2 1999 0 0 1.18503E-05 1 0.0052112 0.002274006 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1999,0,00 1 1 2017 1 5 7 25 25025 250250 1 56 NULL 0 0 2 1999 0 0 4.69757E-07 1 0.0052112 9.01437E-05 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1999,0,00 1 1 2017 1 5 7 25 25025 250250 1 55 NULL 0 0 2 1999 0 0 1.88072E-05 1 0.0052112 0.003608996 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1999,0,00 1 1 2017 1 5 7 25 25025 250250 1 54 NULL 0 0 2 1999 0 0 6.19804E-07 1 0.0052112 0.000118937 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1999,0,00 1 1 2017 1 5 7 25 25025 250250 1 53 NULL 0 0 2 1999 0 0 1.05509E-06 1 0.0052112 0.000202466 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1999,0,00 1 1 2017 1 5 7 25 25025 250250 1 52 NULL 0 0 2 1999 0 0 1.87618E-06 1 0.0052112 0.000360028 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1999,0,00 1 1 2017 1 5 7 25 25025 250250 1 51 NULL 0 0 2 1999 0 0 6.92878E-06 1 0.0052112 0.001329594 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1999,0,00 1 1 2017 1 5 7 25 25025 250250 1 36 NULL 0 0 2 1999 0 0 1.9384E-05 1 0.0052112 0.003719681 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1999,0,00 1 1 2017 1 5 7 25 25025 250250 1 35 NULL 0 0 2 1999 0 0 9.76132E-06 1 0.0052112 0.001873142 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1999,0,00 1 1 2017 1 5 7 25 25025 250250 1 31 NULL 0 0 2 1999 0 0 5.04661E-05 1 0.0052112 0.009684161 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1999,0,00 1 1 2017 1 5 7 25 25025 250250 1 5 NULL 0 0 2 1999 0 0 1.61612E-05 1 0.0052112 0.003101249 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1999,0,00 1 1 2017 1 5 7 25 25025 250250 1 3 NULL 0 0 2 1999 0 0 0.084735155 1 0.0052112 16.26019986 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1999,0,00 1 1 2017 1 5 7 25 25025 250250 1 2 NULL 0 0 2 1999 0 0 0.04044443 1 0.0052112 7.761058718 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1999,0,00 1 1 2017 1 5 7 25 25025 250250 1 1 NULL 0 0 2 1999 0 0 0.00752808 1 0.0052112 1.444596253 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1998,0,00 1 1 2017 1 5 7 25 25025 250250 1 122 NULL 0 0 2 1998 0 0 6.67761E-05 1 0.00221225 0.030184699 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1998,0,00 1 1 2017 1 5 7 25 25025 250250 1 121 NULL 0 0 2 1998 0 0 2.50304E-05 1 0.00221225 0.011314454 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1998,0,00 1 1 2017 1 5 7 25 25025 250250 1 119 NULL 0 0 2 1998 0 0 0 1 0.00221225 0 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1998,0,00 1 1 2017 1 5 7 25 25025 250250 1 118 NULL 0 0 2 1998 0 0 0.000468412 1 0.00221225 0.211735575 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1998,0,00 1 1 2017 1 5 7 25 25025 250250 1 117 NULL 0 0 2 1998 0 0 8.5061E-06 1 0.00221225 0.003845 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1998,0,00 1 1 2017 1 5 7 25 25025 250250 1 116 NULL 0 0 2 1998 0 0 6.87998E-05 1 0.00221225 0.031099472 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1998,0,00 1 1 2017 1 5 7 25 25025 250250 1 115 NULL 0 0 2 1998 0 0 8.40609E-06 1 0.00221225 0.003799792 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1998,0,00	1	1	2017	1	5	7	25	25025	250250	1	112	NULL	0	0	2	1998	0	0	0.000385554	1	0.00221225	0.174281401	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1998,0,00	1	1	2017	1	5	7	25	25025	250250	1	111	NULL	0	0	2	1998	0	0	0.00033388	1	0.00221225	0.150923269	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1998,0,00	1	1	2017	1	5	7	25	25025	250250	1	110	NULL	0	0	2	1998	0	0	0.000853966	1	0.00221225	0.386016963	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1998,0,00	1	1	2017	1	5	7	25	25025	250250	1	107	NULL	0	0	2	1998	0	0	5.67076E-05	1	0.00221225	0.025633451	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1998,0,00	1	1	2017	1	5	7	25	25025	250250	1	106	NULL	0	0	2	1998	0	0	0.000550398	1	0.00221225	0.24879559	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1998,0,00	1	1	2017	1	5	7	25	25025	250250	1	100	NULL	0	0	2	1998	0	0	0.000928227	1	0.00221225	0.419585044	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1998,0,00	1	1	2017	1	5	7	25	25025	250250	1	98	NULL	0	0	2	1998	0	0	2.387870073	1	0.00221225	1079.38532	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1998,0,00	1	1	2017	1	5	7	25	25025	250250	1	91	NULL	0	0	2	1998	0	0	3.07232E-05	1	0.00221225	0.013887765	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1998,0,00	1	1	2017	1	5	7	25	25025	250250	1	90	NULL	0	0	2	1998	0	0	2.387700081	1	0.00221225	1079.308478	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1998,0,00	1	1	2017	1	5	7	25	25025	250250	1	87	NULL	0	0	2	1998	0	0	0.003718267	1	0.00221225	1.680762626	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1998,0,00	1	1	2017	1	5	7	25	25025	250250	1	79	NULL	0	0	2	1998	0	0	0.00318918	1	0.00221225	1.441600263	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1998,0,00	1	1	2017	1	5	7	25	25025	250250	1	66	NULL	0	0	2	1998	0	0	5.33152E-07	1	0.00221225	0.000241	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1998,0,00	1	1	2017	1	5	7	25	25025	250250	1	59	NULL	0	0	2	1998	0	0	2.93584E-06	1	0.00221225	0.001327083	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1998,0,00	1	1	2017	1	5	7	25	25025	250250	1	58	NULL	0	0	2	1998	0	0	1.34728E-06	1	0.00221225	0.000609009	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1998,0,00	1	1	2017	1	5	7	25	25025	250250	1	57	NULL	0	0	2	1998	0	0	5.0307E-06	1	0.00221225	0.00227402	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1998,0,00	1	1	2017	1	5	7	25	25025	250250	1	56	NULL	0	0	2	1998	0	0	1.99422E-07	1	0.00221225	9.01444E-05	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1998,0,00	1	1	2017	1	5	7	25	25025	250250	1	55	NULL	0	0	2	1998	0	0	7.98404E-06	1	0.00221225	0.003609014	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1998,0,00	1	1	2017	1	5	7	25	25025	250250	1	54	NULL	0	0	2	1998	0	0	2.6312E-07	1	0.00221225	0.000118938	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1998,0,00	1	1	2017	1	5	7	25	25025	250250	1	53	NULL	0	0	2	1998	0	0	4.47908E-07	1	0.00221225	0.000202467	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1998,0,00	1	1	2017	1	5	7	25	25025	250250	1	52	NULL	0	0	2	1998	0	0	7.96477E-07	1	0.00221225	0.00036003	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1998,0,00	1	1	2017	1	5	7	25	25025	250250	1	51	NULL	0	0	2	1998	0	0	2.94141E-06	1	0.00221225	0.001329601	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1998,0,00	1	1	2017	1	5	7	25	25025	250250	1	36	NULL	0	0	2	1998	0	0	8.22894E-06	1	0.00221225	0.003719715	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1998,0,00	1	1	2017	1	5	7	25	25025	250250	1	35	NULL	0	0	2	1998	0	0	4.14389E-06	1	0.00221225	0.001873156	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1998,0,00	1	1	2017	1	5	7	25	25025	250250	1	31	NULL	0	0	2	1998	0	0	2.14238E-05	1	0.00221225	0.009684168	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1998,0,00	1	1	2017	1	5	7	25	25025	250250	1	5	NULL	0	0	2	1998	0	0	6.86071E-06	1	0.00221225	0.003101236	g	mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1998,0,00	1	1	2017	1	5	7	25	25025	250250	1	3	NULL	0	0	2	1998	0	0	0.038175035	1	0.00221225	17.25620381	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1998,0,00	1	1	2017	1	5	7	25	25025	250250	1	2	NULL	0	0	2	1998	0	0	0.01716944	1	0.00221225	7.76107623	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1998,0,00	1	1	2017	1	5	7	25	25025	250250	1	1	NULL	0	0	2	1998	0	0	0.00319581	1	0.00221225	1.444597145	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1997,0,00	1	1	2017	1	5	7	25	25025	250250	1	122	NULL	0	0	2	1997	0	0	3.52041E-05	1	0.00106755	0.032976533	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1997,0,00	1	1	2017	1	5	7	25	25025	250250	1	121	NULL	0	0	2	1997	0	0	1.3196E-05	1	0.00106755	0.012361013	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1997,0,00	1	1	2017	1	5	7	25	25025	250250	1	119	NULL	0	0	2	1997	0	0	0	1	0.00106755	0	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1997,0,00	1	1	2017	1	5	7	25	25025	250250	1	118	NULL	0	0	2	1997	0	0	0.000246945	1	0.00106755	0.231319379	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1997,0,00	1	1	2017	1	5	7	25	25025	250250	1	117	NULL	0	0	2	1997	0	0	4.10474E-06	1	0.00106755	0.00384501	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1997,0,00	1	1	2017	1	5	7	25	25025	250250	1	116	NULL	0	0	2	1997	0	0	3.32004E-05	1	0.00106755	0.031099618	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1997,0,00	1	1	2017	1	5	7	25	25025	250250	1	115	NULL	0	0	2	1997	0	0	4.43166E-06	1	0.00106755	0.004151243	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1997,0,00	1	1	2017	1	5	7	25	25025	250250	1	112	NULL	0	0	2	1997	0	0	0.00026433	1	0.00106755	0.247604329	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1997,0,00	1	1	2017	1	5	7	25	25025	250250	1	111	NULL	0	0	2	1997	0	0	0.00017602	1	0.00106755	0.164882197	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1997,0,00	1	1	2017	1	5	7	25	25025	250250	1	110	NULL	0	0	2	1997	0	0	0.000511275	1	0.00106755	0.478923708	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1997,0,00	1	1	2017	1	5	7	25	25025	250250	1	107	NULL	0	0	2	1997	0	0	2.73651E-05	1	0.00106755	0.025633553	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1997,0,00	1	1	2017	1	5	7	25	25025	250250	1	106	NULL	0	0	2	1997	0	0	0.000265603	1	0.00106755	0.24879678	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1997,0,00	1	1	2017	1	5	7	25	25025	250250	1	100	NULL	0	0	2	1997	0	0	0.000555736	1	0.00106755	0.520571395	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1997,0,00	1	1	2017	1	5	7	25	25025	250250	1	98	NULL	0	0	2	1997	0	0	1.1523	1	0.00106755	1079.387344	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1997,0,00	1	1	2017	1	5	7	25	25025	250250	1	91	NULL	0	0	2	1997	0	0	1.48259E-05	1	0.00106755	0.013887822	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1997,0,00	1	1	2017	1	5	7	25	25025	250250	1	90	NULL	0	0	2	1997	0	0	1.152220011	1	0.00106755	1079.312416	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1997,0,00	1	1	2017	1	5	7	25	25025	250250	1	87	NULL	0	0	2	1997	0	0	0.001794311	1	0.00106755	1.680774379	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1997,0,00	1	1	2017	1	5	7	25	25025	250250	1	79	NULL	0	0	2	1997	0	0	0.00153899	1	0.00106755	1.441609193	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1997,0,00	1	1	2017	1	5	7	25	25025	250250	1	66	NULL	0	0	2	1997	0	0	2.57281E-07	1	0.00106755	0.000241001	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1997,0,00	1	1	2017	1	5	7	25	25025	250250	1	59	NULL	0	0	2	1997	0	0	1.54777E-06	1	0.00106755	0.001449834	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1997,0,00	1	1	2017	1	5	7	25	25025	250250	1	58	NULL	0	0	2	1997	0	0	7.10283E-07	1	0.00106755	0.000665339	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1997,0,00	1	1	2017	1	5	7	25	25025	250250	1	57	NULL	0	0	2	1997	0	0	2.65216E-06	1	0.00106755	0.002484343	g	mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1997,0,00 1 1 2017 1 5 7 25 25025 250250 1 56 NULL 0 0 2 1997 0
0 1.05134E-07 1 0.00106755 9.84816E-05 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1997,0,00 1 1 2017 1 5 7 25 25025 250250 1 55 NULL 0 0 2 1997 0
0 4.20916E-06 1 0.00106755 0.003942822 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1997,0,00 1 1 2017 1 5 7 25 25025 250250 1 54 NULL 0 0 2 1997 0
0 1.38716E-07 1 0.00106755 0.000129939 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1997,0,00 1 1 2017 1 5 7 25 25025 250250 1 53 NULL 0 0 2 1997 0
0 2.36136E-07 1 0.00106755 0.000221194 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1997,0,00 1 1 2017 1 5 7 25 25025 250250 1 52 NULL 0 0 2 1997 0
0 4.199E-07 1 0.00106755 0.000393331 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1997,0,00 1 1 2017 1 5 7 25 25025 250250 1 51 NULL 0 0 2 1997 0
0 1.5507E-06 1 0.00106755 0.001452578 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1997,0,00 1 1 2017 1 5 7 25 25025 250250 1 36 NULL 0 0 2 1997 0
0 4.33827E-06 1 0.00106755 0.004063763 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1997,0,00 1 1 2017 1 5 7 25 25025 250250 1 35 NULL 0 0 2 1997 0
0 2.18464E-06 1 0.00106755 0.002046405 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1997,0,00 1 1 2017 1 5 7 25 25025 250250 1 31 NULL 0 0 2 1997 0
0 1.03384E-05 1 0.00106755 0.00968423 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1997,0,00 1 1 2017 1 5 7 25 25025 250250 1 5 NULL 0 0 2 1997 0
0 3.31074E-06 1 0.00106755 0.003101248 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1997,0,00 1 1 2017 1 5 7 25 25025 250250 1 3 NULL 0 0 2 1997 0
0 0.025908284 1 0.00106755 24.26891758 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1997,0,00 1 1 2017 1 5 7 25 25025 250250 1 2 NULL 0 0 2 1997 0
0 0.008285378 1 0.00106755 7.761114525 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1997,0,00 1 1 2017 1 5 7 25 25025 250250 1 1 NULL 0 0 2 1997 0
0 0.00154219 1 0.00106755 1.444606734 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1996,0,00 1 1 2017 1 5 7 25 25025 250250 1 122 NULL 0 0 2 1996 0
0 0.000824295 1 0.024996599 0.032976285 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1996,0,00 1 1 2017 1 5 7 25 25025 250250 1 121 NULL 0 0 2 1996 0
0 0.00030898 1 0.024996599 0.012360882 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1996,0,00 1 1 2017 1 5 7 25 25025 250250 1 119 NULL 0 0 2 1996 0
0 0 1 0.024996599 0 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1996,0,00 1 1 2017 1 5 7 25 25025 250250 1 118 NULL 0 0 2 1996 0
0 0.00578216 1 0.024996599 0.231317866 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1996,0,00 1 1 2017 1 5 7 25 25025 250250 1 117 NULL 0 0 2 1996 0
0 9.61119E-05 1 0.024996599 0.003844999 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1996,0,00 1 1 2017 1 5 7 25 25025 250250 1 116 NULL 0 0 2 1996 0
0 0.000777382 1 0.024996599 0.03109951 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1996,0,00 1 1 2017 1 5 7 25 25025 250250 1 115 NULL 0 0 2 1996 0
0 0.000103766 1 0.024996599 0.004151205 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1996,0,00 1 1 2017 1 5 7 25 25025 250250 1 112 NULL 0 0 2 1996 0
0 0.00618927 1 0.024996599 0.24760448 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1996,0,00 1 1 2017 1 5 7 25 25025 250250 1 111 NULL 0 0 2 1996 0
0 0.00412147 1 0.024996599 0.164881221 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1996,0,00 1 1 2017 1 5 7 25 25025 250250 1 110 NULL 0 0 2 1996 0
0 0.0119714 1 0.024996599 0.478921154 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1996,0,00 1 1 2017 1 5 7 25 25025 250250 1 107 NULL 0 0 2 1996 0
0 0.000640749 1 0.024996599 0.025633447 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1996,0,00 1 1 2017 1 5 7 25 25025 250250 1 106 NULL 0 0 2 1996 0
0 0.00621905 1 0.024996599 0.248795841 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1996,0,00 1 1 2017 1 5 7 25 25025 250250 1 100 NULL 0 0 2 1996 0 0 0.0130125 1 0.024996599 0.520570797 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1996,0,00 1 1 2017 1 5 7 25 25025 250250 1 98 NULL 0 0 2 1996 0 0 26.9810009 1 0.024996599 1079.386868 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1996,0,00 1 1 2017 1 5 7 25 25025 250250 1 91 NULL 0 0 2 1996 0 0 0.000347147 1 0.024996599 0.013887789 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1996,0,00 1 1 2017 1 5 7 25 25025 250250 1 90 NULL 0 0 2 1996 0 0 26.97909927 1 0.024996599 1079.310793 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1996,0,00 1 1 2017 1 5 7 25 25025 250250 1 87 NULL 0 0 2 1996 0 0 0.042013742 1 0.024996599 1.680778322 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1996,0,00 1 1 2017 1 5 7 25 25025 250250 1 79 NULL 0 0 2 1996 0 0 0.0360354 1 0.024996599 1.441612102 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1996,0,00 1 1 2017 1 5 7 25 25025 250250 1 66 NULL 0 0 2 1996 0 0 6.02418E-06 1 0.024996599 0.000241 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1996,0,00 1 1 2017 1 5 7 25 25025 250250 1 59 NULL 0 0 2 1996 0 0 3.62405E-05 1 0.024996599 0.001449817 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1996,0,00 1 1 2017 1 5 7 25 25025 250250 1 58 NULL 0 0 2 1996 0 0 1.66311E-05 1 0.024996599 0.000665335 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1996,0,00 1 1 2017 1 5 7 25 25025 250250 1 57 NULL 0 0 2 1996 0 0 6.20998E-05 1 0.024996599 0.00248433 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1996,0,00 1 1 2017 1 5 7 25 25025 250250 1 56 NULL 0 0 2 1996 0 0 2.4617E-06 1 0.024996599 9.84814E-05 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1996,0,00 1 1 2017 1 5 7 25 25025 250250 1 55 NULL 0 0 2 1996 0 0 9.85564E-05 1 0.024996599 0.003942792 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1996,0,00 1 1 2017 1 5 7 25 25025 250250 1 54 NULL 0 0 2 1996 0 0 3.248E-06 1 0.024996599 0.000129938 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1996,0,00 1 1 2017 1 5 7 25 25025 250250 1 53 NULL 0 0 2 1996 0 0 5.52905E-06 1 0.024996599 0.000221192 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1996,0,00 1 1 2017 1 5 7 25 25025 250250 1 52 NULL 0 0 2 1996 0 0 9.83184E-06 1 0.024996599 0.000393327 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1996,0,00 1 1 2017 1 5 7 25 25025 250250 1 51 NULL 0 0 2 1996 0 0 3.63093E-05 1 0.024996599 0.00145257 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1996,0,00 1 1 2017 1 5 7 25 25025 250250 1 36 NULL 0 0 2 1996 0 0 0.000101579 1 0.024996599 0.004063713 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1996,0,00 1 1 2017 1 5 7 25 25025 250250 1 35 NULL 0 0 2 1996 0 0 5.11528E-05 1 0.024996599 0.00204639 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1996,0,00 1 1 2017 1 5 7 25 25025 250250 1 31 NULL 0 0 2 1996 0 0 0.000242072 1 0.024996599 0.009684197 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1996,0,00 1 1 2017 1 5 7 25 25025 250250 1 5 NULL 0 0 2 1996 0 0 7.75208E-05 1 0.024996599 0.003101255 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1996,0,00 1 1 2017 1 5 7 25 25025 250250 1 3 NULL 0 0 2 1996 0 0 0.606635988 1 0.024996599 24.26874085 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1996,0,00 1 1 2017 1 5 7 25 25025 250250 1 2 NULL 0 0 2 1996 0 0 0.194000646 1 0.024996599 7.76108162 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1996,0,00 1 1 2017 1 5 7 25 25025 250250 1 1 NULL 0 0 2 1996 0 0 0.036110099 1 0.024996599 1.444600489 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1995,0,00 1 1 2017 1 5 7 25 25025 250250 1 122 NULL 0 0 2 1995 0 0 0.000604286 1 0.0130891 0.046167115 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1995,0,00 1 1 2017 1 5 7 25 25025 250250 1 121 NULL 0 0 2 1995 0 0 0.000226512 1 0.0130891 0.017305392 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1995,0,00	1	1	2017	1	5	7	25	25025	250250	1	119	NULL	0	0	2	1995	0	0	0	1	0.0130891	0	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1995,0,00	1	1	2017	1	5	7	25	25025	250250	1	118	NULL	0	0	2	1995	0	0	0.00423887	1	0.0130891	0.323847325	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1995,0,00	1	1	2017	1	5	7	25	25025	250250	1	117	NULL	0	0	2	1995	0	0	5.03277E-05	1	0.0130891	0.003845009	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1995,0,00	1	1	2017	1	5	7	25	25025	250250	1	116	NULL	0	0	2	1995	0	0	0.000407065	1	0.0130891	0.031099541	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1995,0,00	1	1	2017	1	5	7	25	25025	250250	1	115	NULL	0	0	2	1995	0	0	7.60704E-05	1	0.0130891	0.005811736	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1995,0,00	1	1	2017	1	5	7	25	25025	250250	1	112	NULL	0	0	2	1995	0	0	0.0045373	1	0.0130891	0.346647229	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1995,0,00	1	1	2017	1	5	7	25	25025	250250	1	111	NULL	0	0	2	1995	0	0	0.00302143	1	0.0130891	0.230835582	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1995,0,00	1	1	2017	1	5	7	25	25025	250250	1	110	NULL	0	0	2	1995	0	0	0.00877616	1	0.0130891	0.670493772	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1995,0,00	1	1	2017	1	5	7	25	25025	250250	1	107	NULL	0	0	2	1995	0	0	0.000335519	1	0.0130891	0.025633466	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1995,0,00	1	1	2017	1	5	7	25	25025	250250	1	106	NULL	0	0	2	1995	0	0	0.00325652	1	0.0130891	0.24879633	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1995,0,00	1	1	2017	1	5	7	25	25025	250250	1	100	NULL	0	0	2	1995	0	0	0.00953934	1	0.0130891	0.728800282	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1995,0,00	1	1	2017	1	5	7	25	25025	250250	1	98	NULL	0	0	2	1995	0	0	14.12849998	1	0.0130891	1079.409592	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1995,0,00	1	1	2017	1	5	7	25	25025	250250	1	91	NULL	0	0	2	1995	0	0	0.000181779	1	0.0130891	0.013887815	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1995,0,00	1	1	2017	1	5	7	25	25025	250250	1	90	NULL	0	0	2	1995	0	0	14.12720013	1	0.0130891	1079.310284	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1995,0,00	1	1	2017	1	5	7	25	25025	250250	1	87	NULL	0	0	2	1995	0	0	0.021985851	1	0.0130891	1.679706886	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1995,0,00	1	1	2017	1	5	7	25	25025	250250	1	79	NULL	0	0	2	1995	0	0	0.018857401	1	0.0130891	1.440695007	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1995,0,00	1	1	2017	1	5	7	25	25025	250250	1	66	NULL	0	0	2	1995	0	0	3.15448E-06	1	0.0130891	0.000241001	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1995,0,00	1	1	2017	1	5	7	25	25025	250250	1	59	NULL	0	0	2	1995	0	0	2.65677E-05	1	0.0130891	0.002029758	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1995,0,00	1	1	2017	1	5	7	25	25025	250250	1	58	NULL	0	0	2	1995	0	0	1.21922E-05	1	0.0130891	0.000931477	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1995,0,00	1	1	2017	1	5	7	25	25025	250250	1	57	NULL	0	0	2	1995	0	0	4.5525E-05	1	0.0130891	0.003478085	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1995,0,00	1	1	2017	1	5	7	25	25025	250250	1	56	NULL	0	0	2	1995	0	0	1.80466E-06	1	0.0130891	0.000137875	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1995,0,00	1	1	2017	1	5	7	25	25025	250250	1	55	NULL	0	0	2	1995	0	0	7.22511E-05	1	0.0130891	0.005519944	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1995,0,00	1	1	2017	1	5	7	25	25025	250250	1	54	NULL	0	0	2	1995	0	0	2.38109E-06	1	0.0130891	0.000181914	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1995,0,00	1	1	2017	1	5	7	25	25025	250250	1	53	NULL	0	0	2	1995	0	0	4.05332E-06	1	0.0130891	0.000309671	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1995,0,00	1	1	2017	1	5	7	25	25025	250250	1	52	NULL	0	0	2	1995	0	0	7.20767E-06	1	0.0130891	0.000550662	g	mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1995,0,00	1	1	2017	1	5	7	25	25025	250250	1	51	NULL	0	0	2	1995	0	0	2.66182E-05	1	0.0130891	0.002033616	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1995,0,00	1	1	2017	1	5	7	25	25025	250250	1	36	NULL	0	0	2	1995	0	0	7.44673E-05	1	0.0130891	0.005689261	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1995,0,00	1	1	2017	1	5	7	25	25025	250250	1	35	NULL	0	0	2	1995	0	0	3.74999E-05	1	0.0130891	0.002864972	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1995,0,00	1	1	2017	1	5	7	25	25025	250250	1	31	NULL	0	0	2	1995	0	0	0.000126758	1	0.0130891	0.009684241	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1995,0,00	1	1	2017	1	5	7	25	25025	250250	1	5	NULL	0	0	2	1995	0	0	5.29321E-05	1	0.0130891	0.004043984	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1995,0,00	1	1	2017	1	5	7	25	25025	250250	1	3	NULL	0	0	2	1995	0	0	0.317657322	1	0.0130891	24.26884386	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1995,0,00	1	1	2017	1	5	7	25	25025	250250	1	2	NULL	0	0	2	1995	0	0	0.101585671	1	0.0130891	7.761089157	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1995,0,00	1	1	2017	1	5	7	25	25025	250250	1	1	NULL	0	0	2	1995	0	0	0.018908501	1	0.0130891	1.444599004	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1994,0,00	1	1	2017	1	5	7	25	25025	250250	1	122	NULL	0	0	2	1994	0	0	0	1	0	NULL	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1994,0,00	1	1	2017	1	5	7	25	25025	250250	1	121	NULL	0	0	2	1994	0	0	0	1	0	NULL	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1994,0,00	1	1	2017	1	5	7	25	25025	250250	1	119	NULL	0	0	2	1994	0	0	0	1	0	NULL	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1994,0,00	1	1	2017	1	5	7	25	25025	250250	1	118	NULL	0	0	2	1994	0	0	0	1	0	NULL	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1994,0,00	1	1	2017	1	5	7	25	25025	250250	1	117	NULL	0	0	2	1994	0	0	0	1	0	NULL	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1994,0,00	1	1	2017	1	5	7	25	25025	250250	1	116	NULL	0	0	2	1994	0	0	0	1	0	NULL	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1994,0,00	1	1	2017	1	5	7	25	25025	250250	1	115	NULL	0	0	2	1994	0	0	0	1	0	NULL	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1994,0,00	1	1	2017	1	5	7	25	25025	250250	1	112	NULL	0	0	2	1994	0	0	0	1	0	NULL	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1994,0,00	1	1	2017	1	5	7	25	25025	250250	1	111	NULL	0	0	2	1994	0	0	0	1	0	NULL	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1994,0,00	1	1	2017	1	5	7	25	25025	250250	1	110	NULL	0	0	2	1994	0	0	0	1	0	NULL	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1994,0,00	1	1	2017	1	5	7	25	25025	250250	1	107	NULL	0	0	2	1994	0	0	0	1	0	NULL	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1994,0,00	1	1	2017	1	5	7	25	25025	250250	1	106	NULL	0	0	2	1994	0	0	0	1	0	NULL	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1994,0,00	1	1	2017	1	5	7	25	25025	250250	1	100	NULL	0	0	2	1994	0	0	0	1	0	NULL	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1994,0,00	1	1	2017	1	5	7	25	25025	250250	1	98	NULL	0	0	2	1994	0	0	0	1	0	NULL	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1994,0,00	1	1	2017	1	5	7	25	25025	250250	1	91	NULL	0	0	2	1994	0	0	0	1	0	NULL	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1994,0,00	1	1	2017	1	5	7	25	25025	250250	1	90	NULL	0	0	2	1994	0	0	0	1	0	NULL	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1994,0,00	1	1	2017	1	5	7	25	25025	250250	1	87	NULL	0	0	2	1994	0	0	0	1	0	NULL	g	mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1994,0,00 1 1 2017 1 5 7 25 25025 250250 1 79 NULL 0 0 2 1994 0 0 0 1 0 NULL g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1994,0,00 1 1 2017 1 5 7 25 25025 250250 1 66 NULL 0 0 2 1994 0 0 0 1 0 NULL g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1994,0,00 1 1 2017 1 5 7 25 25025 250250 1 59 NULL 0 0 2 1994 0 0 0 1 0 NULL g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1994,0,00 1 1 2017 1 5 7 25 25025 250250 1 58 NULL 0 0 2 1994 0 0 0 1 0 NULL g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1994,0,00 1 1 2017 1 5 7 25 25025 250250 1 57 NULL 0 0 2 1994 0 0 0 1 0 NULL g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1994,0,00 1 1 2017 1 5 7 25 25025 250250 1 56 NULL 0 0 2 1994 0 0 0 1 0 NULL g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1994,0,00 1 1 2017 1 5 7 25 25025 250250 1 55 NULL 0 0 2 1994 0 0 0 1 0 NULL g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1994,0,00 1 1 2017 1 5 7 25 25025 250250 1 54 NULL 0 0 2 1994 0 0 0 1 0 NULL g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1994,0,00 1 1 2017 1 5 7 25 25025 250250 1 53 NULL 0 0 2 1994 0 0 0 1 0 NULL g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1994,0,00 1 1 2017 1 5 7 25 25025 250250 1 52 NULL 0 0 2 1994 0 0 0 1 0 NULL g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1994,0,00 1 1 2017 1 5 7 25 25025 250250 1 51 NULL 0 0 2 1994 0 0 0 1 0 NULL g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1994,0,00 1 1 2017 1 5 7 25 25025 250250 1 36 NULL 0 0 2 1994 0 0 0 1 0 NULL g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1994,0,00 1 1 2017 1 5 7 25 25025 250250 1 35 NULL 0 0 2 1994 0 0 0 1 0 NULL g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1994,0,00 1 1 2017 1 5 7 25 25025 250250 1 31 NULL 0 0 2 1994 0 0 0 1 0 NULL g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1994,0,00 1 1 2017 1 5 7 25 25025 250250 1 5 NULL 0 0 2 1994 0 0 0 1 0 NULL g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1994,0,00 1 1 2017 1 5 7 25 25025 250250 1 3 NULL 0 0 2 1994 0 0 0 1 0 NULL g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1994,0,00 1 1 2017 1 5 7 25 25025 250250 1 2 NULL 0 0 2 1994 0 0 0 1 0 NULL g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1994,0,00 1 1 2017 1 5 7 25 25025 250250 1 1 NULL 0 0 2 1994 0 0 0 1 0 NULL g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1993,0,00 1 1 2017 1 5 7 25 25025 250250 1 122 NULL 0 0 2 1993 0 0 0 1 0 NULL g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1993,0,00 1 1 2017 1 5 7 25 25025 250250 1 121 NULL 0 0 2 1993 0 0 0 1 0 NULL g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1993,0,00 1 1 2017 1 5 7 25 25025 250250 1 119 NULL 0 0 2 1993 0 0 0 1 0 NULL g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1993,0,00 1 1 2017 1 5 7 25 25025 250250 1 118 NULL 0 0 2 1993 0 0 0 1 0 NULL g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1993,0,00 1 1 2017 1 5 7 25 25025 250250 1 117 NULL 0 0 2 1993 0 0 0 1 0 NULL g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1993,0,00 1 1 2017 1 5 7 25 25025 250250 1 116 NULL 0 0 2 1993 0 0 0 1 0 NULL g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1993,0,00 1 1 2017 1 5 7 25 25025 250250 1 115 NULL 0 0 2 1993 0 0 0 1 0 NULL g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1993,0,00 1 1 2017 1 5 7 25 25025 250250 1 112 NULL 0 0 2 1993 0 0 0 1 0 NULL g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1993,0,00 1 1 2017 1 5 7 25 25025 250250 1 111 NULL 0 0 2 1993 0 0 0 1 0 NULL g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1993,0,00 1 1 2017 1 5 7 25 25025 250250 1 110 NULL 0 0 2 1993 0 0 0 1 0 NULL g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1993,0,00 1 1 2017 1 5 7 25 25025 250250 1 107 NULL 0 0 2 1993 0 0 0 1 0 NULL g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1993,0,00 1 1 2017 1 5 7 25 25025 250250 1 106 NULL 0 0 2 1993 0 0 0 1 0 NULL g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1993,0,00 1 1 2017 1 5 7 25 25025 250250 1 100 NULL 0 0 2 1993 0 0 0 1 0 NULL g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1993,0,00 1 1 2017 1 5 7 25 25025 250250 1 98 NULL 0 0 2 1993 0 0 0 1 0 NULL g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1993,0,00 1 1 2017 1 5 7 25 25025 250250 1 91 NULL 0 0 2 1993 0 0 0 1 0 NULL g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1993,0,00 1 1 2017 1 5 7 25 25025 250250 1 90 NULL 0 0 2 1993 0 0 0 1 0 NULL g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1993,0,00 1 1 2017 1 5 7 25 25025 250250 1 87 NULL 0 0 2 1993 0 0 0 1 0 NULL g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1993,0,00 1 1 2017 1 5 7 25 25025 250250 1 79 NULL 0 0 2 1993 0 0 0 1 0 NULL g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1993,0,00 1 1 2017 1 5 7 25 25025 250250 1 66 NULL 0 0 2 1993 0 0 0 1 0 NULL g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1993,0,00 1 1 2017 1 5 7 25 25025 250250 1 59 NULL 0 0 2 1993 0 0 0 1 0 NULL g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1993,0,00 1 1 2017 1 5 7 25 25025 250250 1 58 NULL 0 0 2 1993 0 0 0 1 0 NULL g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1993,0,00 1 1 2017 1 5 7 25 25025 250250 1 57 NULL 0 0 2 1993 0 0 0 1 0 NULL g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1993,0,00 1 1 2017 1 5 7 25 25025 250250 1 56 NULL 0 0 2 1993 0 0 0 1 0 NULL g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1993,0,00 1 1 2017 1 5 7 25 25025 250250 1 55 NULL 0 0 2 1993 0 0 0 1 0 NULL g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1993,0,00 1 1 2017 1 5 7 25 25025 250250 1 54 NULL 0 0 2 1993 0 0 0 1 0 NULL g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1993,0,00 1 1 2017 1 5 7 25 25025 250250 1 53 NULL 0 0 2 1993 0 0 0 1 0 NULL g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1993,0,00 1 1 2017 1 5 7 25 25025 250250 1 52 NULL 0 0 2 1993 0 0 0 1 0 NULL g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1993,0,00 1 1 2017 1 5 7 25 25025 250250 1 51 NULL 0 0 2 1993 0 0 0 1 0 NULL g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1993,0,00 1 1 2017 1 5 7 25 25025 250250 1 36 NULL 0 0 2 1993 0 0 0 1 0 NULL g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1993,0,00 1 1 2017 1 5 7 25 25025 250250 1 35 NULL 0 0 2 1993 0 0 0 1 0 NULL g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1993,0,00 1 1 2017 1 5 7 25 25025 250250 1 31 NULL 0 0 2 1993 0 0 0 1 0 NULL g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1993,0,00 1 1 2017 1 5 7 25 25025 250250 1 5 NULL 0 0 2 1993 0 0 0 1 0 NULL g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1993,0,00	1	1	2017	1	5	7	25	25025	250250	1	3	NULL	0	0	2	1993	0	0	0	1	0	NULL	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1993,0,00	1	1	2017	1	5	7	25	25025	250250	1	2	NULL	0	0	2	1993	0	0	0	1	0	NULL	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1993,0,00	1	1	2017	1	5	7	25	25025	250250	1	1	NULL	0	0	2	1993	0	0	0	1	0	NULL	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1992,0,00	1	1	2017	1	5	7	25	25025	250250	1	122	NULL	0	0	2	1992	0	0	1.28233E-05	1	0.00060965	0.021033872	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1992,0,00	1	1	2017	1	5	7	25	25025	250250	1	121	NULL	0	0	2	1992	0	0	4.8067E-06	1	0.00060965	0.00788436	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1992,0,00	1	1	2017	1	5	7	25	25025	250250	1	119	NULL	0	0	2	1992	0	0	0	1	0.00060965	0	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1992,0,00	1	1	2017	1	5	7	25	25025	250250	1	118	NULL	0	0	2	1992	0	0	8.9951E-05	1	0.00060965	0.147545313	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1992,0,00	1	1	2017	1	5	7	25	25025	250250	1	117	NULL	0	0	2	1992	0	0	2.34411E-06	1	0.00060965	0.00384501	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1992,0,00	1	1	2017	1	5	7	25	25025	250250	1	116	NULL	0	0	2	1992	0	0	1.89599E-05	1	0.00060965	0.031099647	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1992,0,00	1	1	2017	1	5	7	25	25025	250250	1	115	NULL	0	0	2	1992	0	0	1.61426E-06	1	0.00060965	0.002647847	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1992,0,00	1	1	2017	1	5	7	25	25025	250250	1	112	NULL	0	0	2	1992	0	0	0.000108398	1	0.00060965	0.177803666	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1992,0,00	1	1	2017	1	5	7	25	25025	250250	1	111	NULL	0	0	2	1992	0	0	6.41164E-05	1	0.00060965	0.105169199	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1992,0,00	1	1	2017	1	5	7	25	25025	250250	1	110	NULL	0	0	2	1992	0	0	0.000198349	1	0.00060965	0.325348967	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1992,0,00	1	1	2017	1	5	7	25	25025	250250	1	107	NULL	0	0	2	1992	0	0	1.56275E-05	1	0.00060965	0.025633561	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1992,0,00	1	1	2017	1	5	7	25	25025	250250	1	106	NULL	0	0	2	1992	0	0	0.000151679	1	0.00060965	0.248796868	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1992,0,00	1	1	2017	1	5	7	25	25025	250250	1	100	NULL	0	0	2	1992	0	0	0.000215598	1	0.00060965	0.353642268	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1992,0,00	1	1	2017	1	5	7	25	25025	250250	1	98	NULL	0	0	2	1992	0	0	0.658064008	1	0.00060965	1079.412816	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1992,0,00	1	1	2017	1	5	7	25	25025	250250	1	91	NULL	0	0	2	1992	0	0	8.46673E-06	1	0.00060965	0.013887848	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1992,0,00	1	1	2017	1	5	7	25	25025	250250	1	90	NULL	0	0	2	1992	0	0	0.658004999	1	0.00060965	1079.316025	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1992,0,00	1	1	2017	1	5	7	25	25025	250250	1	87	NULL	0	0	2	1992	0	0	0.001024043	1	0.00060965	1.679722184	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1992,0,00	1	1	2017	1	5	7	25	25025	250250	1	79	NULL	0	0	2	1992	0	0	0.000878329	1	0.00060965	1.440710247	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1992,0,00	1	1	2017	1	5	7	25	25025	250250	1	66	NULL	0	0	2	1992	0	0	1.46926E-07	1	0.00060965	0.000241001	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1992,0,00	1	1	2017	1	5	7	25	25025	250250	1	59	NULL	0	0	2	1992	0	0	5.63782E-07	1	0.00060965	0.000924763	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1992,0,00	1	1	2017	1	5	7	25	25025	250250	1	58	NULL	0	0	2	1992	0	0	2.58724E-07	1	0.00060965	0.000424381	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1992,0,00	1	1	2017	1	5	7	25	25025	250250	1	57	NULL	0	0	2	1992	0	0	9.66065E-07	1	0.00060965	0.001584622	g	mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1992,0,00 1 1 2017 1 5 7 25 25025 250250 1 56 NULL 0 0 2 1992 0
0 3.82958E-08 1 0.00060965 6.2816E-05 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1992,0,00 1 1 2017 1 5 7 25 25025 250250 1 55 NULL 0 0 2 1992 0
0 1.53321E-06 1 0.00060965 0.002514902 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1992,0,00 1 1 2017 1 5 7 25 25025 250250 1 54 NULL 0 0 2 1992 0
0 5.0528E-08 1 0.00060965 8.28803E-05 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1992,0,00 1 1 2017 1 5 7 25 25025 250250 1 53 NULL 0 0 2 1992 0
0 8.60136E-08 1 0.00060965 0.000141087 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1992,0,00 1 1 2017 1 5 7 25 25025 250250 1 52 NULL 0 0 2 1992 0
0 1.52951E-07 1 0.00060965 0.000250883 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1992,0,00 1 1 2017 1 5 7 25 25025 250250 1 51 NULL 0 0 2 1992 0
0 5.64851E-07 1 0.00060965 0.000926517 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1992,0,00 1 1 2017 1 5 7 25 25025 250250 1 36 NULL 0 0 2 1992 0
0 1.58024E-06 1 0.00060965 0.002592045 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1992,0,00 1 1 2017 1 5 7 25 25025 250250 1 35 NULL 0 0 2 1992 0
0 7.95767E-07 1 0.00060965 0.001305285 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1992,0,00 1 1 2017 1 5 7 25 25025 250250 1 31 NULL 0 0 2 1992 0
0 5.90399E-06 1 0.00060965 0.009684229 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1992,0,00 1 1 2017 1 5 7 25 25025 250250 1 5 NULL 0 0 2 1992 0
0 2.46543E-06 1 0.00060965 0.004044003 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1992,0,00 1 1 2017 1 5 7 25 25025 250250 1 3 NULL 0 0 2 1992 0
0 0.014795481 1 0.00060965 24.26881256 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1992,0,00 1 1 2017 1 5 7 25 25025 250250 1 2 NULL 0 0 2 1992 0
0 0.004731561 1 0.00060965 7.761110751 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1992,0,00 1 1 2017 1 5 7 25 25025 250250 1 1 NULL 0 0 2 1992 0
0 0.000880705 1 0.00060965 1.444607626 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1991,0,00 1 1 2017 1 5 7 25 25025 250250 1 122 NULL 0 0 2 1991 0
0 2.62526E-05 1 0.00124811 0.021033883 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1991,0,00 1 1 2017 1 5 7 25 25025 250250 1 121 NULL 0 0 2 1991 0
0 9.84056E-06 1 0.00124811 0.007884369 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1991,0,00 1 1 2017 1 5 7 25 25025 250250 1 119 NULL 0 0 2 1991 0
0 0 1 0.00124811 0 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1991,0,00 1 1 2017 1 5 7 25 25025 250250 1 118 NULL 0 0 2 1991 0
0 0.000184153 1 0.00124811 0.147545495 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1991,0,00 1 1 2017 1 5 7 25 25025 250250 1 117 NULL 0 0 2 1991 0
0 4.79899E-06 1 0.00124811 0.003845006 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1991,0,00 1 1 2017 1 5 7 25 25025 250250 1 116 NULL 0 0 2 1991 0
0 3.88156E-05 1 0.00124811 0.031099504 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1991,0,00 1 1 2017 1 5 7 25 25025 250250 1 115 NULL 0 0 2 1991 0
0 3.3048E-06 1 0.00124811 0.002647844 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1991,0,00 1 1 2017 1 5 7 25 25025 250250 1 112 NULL 0 0 2 1991 0
0 0.000221918 1 0.00124811 0.177803245 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1991,0,00 1 1 2017 1 5 7 25 25025 250250 1 111 NULL 0 0 2 1991 0
0 0.000131263 1 0.00124811 0.105169423 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1991,0,00 1 1 2017 1 5 7 25 25025 250250 1 110 NULL 0 0 2 1991 0
0 0.000406071 1 0.00124811 0.325348728 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1991,0,00 1 1 2017 1 5 7 25 25025 250250 1 107 NULL 0 0 2 1991 0
0 3.19934E-05 1 0.00124811 0.025633479 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1991,0,00 1 1 2017 1 5 7 25 25025 250250 1 106 NULL 0 0 2 1991 0
0 0.000310525 1 0.00124811 0.248796192 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1991,0,00 1 1 2017 1 5 7 25 25025 250250 1 100 NULL 0 0 2 1991 0 0 0.000441383 1 0.00124811 0.353641105 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1991,0,00 1 1 2017 1 5 7 25 25025 250250 1 98 NULL 0 0 2 1991 0 0 1.347219944 1 0.00124811 1079.408047 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1991,0,00 1 1 2017 1 5 7 25 25025 250250 1 91 NULL 0 0 2 1991 0 0 1.73335E-05 1 0.00124811 0.013887789 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1991,0,00 1 1 2017 1 5 7 25 25025 250250 1 90 NULL 0 0 2 1991 0 0 1.347100019 1 0.00124811 1079.311962 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1991,0,00 1 1 2017 1 5 7 25 25025 250250 1 87 NULL 0 0 2 1991 0 0 0.002096462 1 0.00124811 1.67970904 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1991,0,00 1 1 2017 1 5 7 25 25025 250250 1 79 NULL 0 0 2 1991 0 0 0.00179815 1 0.00124811 1.440698382 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1991,0,00 1 1 2017 1 5 7 25 25025 250250 1 66 NULL 0 0 2 1991 0 0 3.00795E-07 1 0.00124811 0.000241 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1991,0,00 1 1 2017 1 5 7 25 25025 250250 1 59 NULL 0 0 2 1991 0 0 1.15421E-06 1 0.00124811 0.000924766 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1991,0,00 1 1 2017 1 5 7 25 25025 250250 1 58 NULL 0 0 2 1991 0 0 5.29676E-07 1 0.00124811 0.000424382 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1991,0,00 1 1 2017 1 5 7 25 25025 250250 1 57 NULL 0 0 2 1991 0 0 1.97779E-06 1 0.00124811 0.001584628 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1991,0,00 1 1 2017 1 5 7 25 25025 250250 1 56 NULL 0 0 2 1991 0 0 7.84014E-08 1 0.00124811 6.28161E-05 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1991,0,00 1 1 2017 1 5 7 25 25025 250250 1 55 NULL 0 0 2 1991 0 0 3.13888E-06 1 0.00124811 0.002514907 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1991,0,00 1 1 2017 1 5 7 25 25025 250250 1 54 NULL 0 0 2 1991 0 0 1.03444E-07 1 0.00124811 8.28805E-05 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1991,0,00 1 1 2017 1 5 7 25 25025 250250 1 53 NULL 0 0 2 1991 0 0 1.76092E-07 1 0.00124811 0.000141087 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1991,0,00 1 1 2017 1 5 7 25 25025 250250 1 52 NULL 0 0 2 1991 0 0 3.1313E-07 1 0.00124811 0.000250883 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1991,0,00 1 1 2017 1 5 7 25 25025 250250 1 51 NULL 0 0 2 1991 0 0 1.1564E-06 1 0.00124811 0.000926521 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1991,0,00 1 1 2017 1 5 7 25 25025 250250 1 36 NULL 0 0 2 1991 0 0 3.23515E-06 1 0.00124811 0.002592039 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1991,0,00 1 1 2017 1 5 7 25 25025 250250 1 35 NULL 0 0 2 1991 0 0 1.62914E-06 1 0.00124811 0.001305286 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1991,0,00 1 1 2017 1 5 7 25 25025 250250 1 31 NULL 0 0 2 1991 0 0 1.20869E-05 1 0.00124811 0.009684163 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1991,0,00 1 1 2017 1 5 7 25 25025 250250 1 5 NULL 0 0 2 1991 0 0 5.04734E-06 1 0.00124811 0.004043985 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1991,0,00 1 1 2017 1 5 7 25 25025 250250 1 3 NULL 0 0 2 1991 0 0 0.03029016 1 0.00124811 24.26882332 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1991,0,00 1 1 2017 1 5 7 25 25025 250250 1 2 NULL 0 0 2 1991 0 0 0.009686691 1 0.00124811 7.761087559 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1991,0,00 1 1 2017 1 5 7 25 25025 250250 1 1 NULL 0 0 2 1991 0 0 0.00180302 1 0.00124811 1.444600283 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1990,0,00 1 1 2017 1 5 7 25 25025 250250 1 122 NULL 0 0 2 1990 0 0 6.94593E-05 1 0.00125731 0.055244372 g mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1990,0,00 1 1 2017 1 5 7 25 25025 250250 1 121 NULL 0 0 2 1990 0 0 2.60363E-05 1 0.00125731 0.020707939 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1990,0,00 1 1 2017 1 5 7 25 25025 250250 1 119 NULL 0 0 2 1990 0 0 0 1 0.00125731 0 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1990,0,00 1 1 2017 1 5 7 25 25025 250250 1 118 NULL 0 0 2 1990 0 0 0.000487234 1 0.00125731 0.387520971 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1990,0,00 1 1 2017 1 5 7 25 25025 250250 1 117 NULL 0 0 2 1990 0 0 4.83434E-06 1 0.00125731 0.003844986 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1990,0,00 1 1 2017 1 5 7 25 25025 250250 1 116 NULL 0 0 2 1990 0 0 3.91016E-05 1 0.00125731 0.03109941 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1990,0,00 1 1 2017 1 5 7 25 25025 250250 1 115 NULL 0 0 2 1990 0 0 8.74388E-06 1 0.00125731 0.006954434 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1990,0,00 1 1 2017 1 5 7 25 25025 250250 1 112 NULL 0 0 2 1990 0 0 0.000567515 1 0.00125731 0.451372339 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1990,0,00 1 1 2017 1 5 7 25 25025 250250 1 111 NULL 0 0 2 1990 0 0 0.000347297 1 0.00125731 0.276222242 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1990,0,00 1 1 2017 1 5 7 25 25025 250250 1 110 NULL 0 0 2 1990 0 0 0.00105475 1 0.00125731 0.838894166 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1990,0,00 1 1 2017 1 5 7 25 25025 250250 1 107 NULL 0 0 2 1990 0 0 3.22291E-05 1 0.00125731 0.025633377 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1990,0,00 1 1 2017 1 5 7 25 25025 250250 1 106 NULL 0 0 2 1990 0 0 0.000312813 1 0.00125731 0.24879544 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1990,0,00 1 1 2017 1 5 7 25 25025 250250 1 100 NULL 0 0 2 1990 0 0 0.00114647 1 0.00125731 0.911843482 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1990,0,00 1 1 2017 1 5 7 25 25025 250250 1 98 NULL 0 0 2 1990 0 0 1.357149959 1 0.00125731 1079.407558 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1990,0,00 1 1 2017 1 5 7 25 25025 250250 1 91 NULL 0 0 2 1990 0 0 1.74612E-05 1 0.00125731 0.013887713 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1990,0,00 1 1 2017 1 5 7 25 25025 250250 1 90 NULL 0 0 2 1990 0 0 1.357030034 1 0.00125731 1079.312176 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1990,0,00 1 1 2017 1 5 7 25 25025 250250 1 87 NULL 0 0 2 1990 0 0 0.002111913 1 0.00125731 1.679707183 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1990,0,00 1 1 2017 1 5 7 25 25025 250250 1 79 NULL 0 0 2 1990 0 0 0.0018114 1 0.00125731 1.440694816 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1990,0,00 1 1 2017 1 5 7 25 25025 250250 1 66 NULL 0 0 2 1990 0 0 3.03011E-07 1 0.00125731 0.000240999 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1990,0,00 1 1 2017 1 5 7 25 25025 250250 1 59 NULL 0 0 2 1990 0 0 3.05382E-06 1 0.00125731 0.002428852 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1990,0,00 1 1 2017 1 5 7 25 25025 250250 1 58 NULL 0 0 2 1990 0 0 1.40142E-06 1 0.00125731 0.001114618 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1990,0,00 1 1 2017 1 5 7 25 25025 250250 1 57 NULL 0 0 2 1990 0 0 5.23285E-06 1 0.00125731 0.004161941 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1990,0,00 1 1 2017 1 5 7 25 25025 250250 1 56 NULL 0 0 2 1990 0 0 2.07435E-07 1 0.00125731 0.000164983 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1990,0,00 1 1 2017 1 5 7 25 25025 250250 1 55 NULL 0 0 2 1990 0 0 8.30487E-06 1 0.00125731 0.006605268 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1990,0,00 1 1 2017 1 5 7 25 25025 250250 1 54 NULL 0 0 2 1990 0 0 2.73693E-07 1 0.00125731 0.000217681 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1990,0,00 1 1 2017 1 5 7 25 25025 250250 1 53 NULL 0 0 2 1990 0 0 4.65907E-07 1 0.00125731 0.000370559 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1990,0,00 1 1 2017 1 5 7 25 25025 250250 1 52 NULL 0 0 2 1990 0 0 8.28482E-07 1 0.00125731 0.000658932 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1990,0,00 1 1 2017 1 5 7 25 25025 250250 1 51 NULL 0 0 2 1990 0 0 3.05961E-06 1 0.00125731 0.002433457 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1990,0,00 1 1 2017 1 5 7 25 25025 250250 1 36 NULL 0 0 2 1990 0 0 8.5596E-06 1 0.00125731 0.006807868 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1990,0,00 1 1 2017 1 5 7 25 25025 250250 1 35 NULL 0 0 2 1990 0 0 4.3104E-06 1 0.00125731 0.003428271 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1990,0,00 1 1 2017 1 5 7 25 25025 250250 1 31 NULL 0 0 2 1990 0 0 1.2176E-05 1 0.00125731 0.009684167 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1990,0,00 1 1 2017 1 5 7 25 25025 250250 1 5 NULL 0 0 2 1990 0 0 5.08453E-06 1 0.00125731 0.004043971 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1990,0,00 1 1 2017 1 5 7 25 25025 250250 1 3 NULL 0 0 2 1990 0 0 0.03245382 1 0.00125731 25.81210608 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1990,0,00 1 1 2017 1 5 7 25 25025 250250 1 2 NULL 0 0 2 1990 0 0 0.009758016 1 0.00125731 7.76102615 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1990,0,00 1 1 2017 1 5 7 25 25025 250250 1 1 NULL 0 0 2 1990 0 0 0.0018163 1 0.00125731 1.444591962 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1989,0,00 1 1 2017 1 5 7 25 25025 250250 1 122 NULL 0 0 2 1989 0 0 0 1 0 NULL g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1989,0,00 1 1 2017 1 5 7 25 25025 250250 1 121 NULL 0 0 2 1989 0 0 0 1 0 NULL g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1989,0,00 1 1 2017 1 5 7 25 25025 250250 1 119 NULL 0 0 2 1989 0 0 0 1 0 NULL g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1989,0,00 1 1 2017 1 5 7 25 25025 250250 1 118 NULL 0 0 2 1989 0 0 0 1 0 NULL g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1989,0,00 1 1 2017 1 5 7 25 25025 250250 1 117 NULL 0 0 2 1989 0 0 0 1 0 NULL g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1989,0,00 1 1 2017 1 5 7 25 25025 250250 1 116 NULL 0 0 2 1989 0 0 0 1 0 NULL g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1989,0,00 1 1 2017 1 5 7 25 25025 250250 1 115 NULL 0 0 2 1989 0 0 0 1 0 NULL g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1989,0,00 1 1 2017 1 5 7 25 25025 250250 1 112 NULL 0 0 2 1989 0 0 0 1 0 NULL g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1989,0,00 1 1 2017 1 5 7 25 25025 250250 1 111 NULL 0 0 2 1989 0 0 0 1 0 NULL g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1989,0,00 1 1 2017 1 5 7 25 25025 250250 1 110 NULL 0 0 2 1989 0 0 0 1 0 NULL g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1989,0,00 1 1 2017 1 5 7 25 25025 250250 1 107 NULL 0 0 2 1989 0 0 0 1 0 NULL g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1989,0,00 1 1 2017 1 5 7 25 25025 250250 1 106 NULL 0 0 2 1989 0 0 0 1 0 NULL g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1989,0,00 1 1 2017 1 5 7 25 25025 250250 1 100 NULL 0 0 2 1989 0 0 0 1 0 NULL g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1989,0,00 1 1 2017 1 5 7 25 25025 250250 1 98 NULL 0 0 2 1989 0 0 0 1 0 NULL g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1989,0,00 1 1 2017 1 5 7 25 25025 250250 1 91 NULL 0 0 2 1989 0 0 0 1 0 NULL g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1989,0,00 1 1 2017 1 5 7 25 25025 250250 1 90 NULL 0 0 2 1989 0 0 0 1 0 NULL g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1989,0,00 1 1 2017 1 5 7 25 25025 250250 1 87 NULL 0 0 2 1989 0 0 0 1 0 NULL g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1989,0,00	1	1	2017	1	5	7	25	25025	250250	1	79	NULL	0	0	2	1989	0	0	0	1	0	NULL	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1989,0,00	1	1	2017	1	5	7	25	25025	250250	1	66	NULL	0	0	2	1989	0	0	0	1	0	NULL	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1989,0,00	1	1	2017	1	5	7	25	25025	250250	1	59	NULL	0	0	2	1989	0	0	0	1	0	NULL	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1989,0,00	1	1	2017	1	5	7	25	25025	250250	1	58	NULL	0	0	2	1989	0	0	0	1	0	NULL	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1989,0,00	1	1	2017	1	5	7	25	25025	250250	1	57	NULL	0	0	2	1989	0	0	0	1	0	NULL	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1989,0,00	1	1	2017	1	5	7	25	25025	250250	1	56	NULL	0	0	2	1989	0	0	0	1	0	NULL	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1989,0,00	1	1	2017	1	5	7	25	25025	250250	1	55	NULL	0	0	2	1989	0	0	0	1	0	NULL	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1989,0,00	1	1	2017	1	5	7	25	25025	250250	1	54	NULL	0	0	2	1989	0	0	0	1	0	NULL	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1989,0,00	1	1	2017	1	5	7	25	25025	250250	1	53	NULL	0	0	2	1989	0	0	0	1	0	NULL	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1989,0,00	1	1	2017	1	5	7	25	25025	250250	1	52	NULL	0	0	2	1989	0	0	0	1	0	NULL	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1989,0,00	1	1	2017	1	5	7	25	25025	250250	1	51	NULL	0	0	2	1989	0	0	0	1	0	NULL	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1989,0,00	1	1	2017	1	5	7	25	25025	250250	1	36	NULL	0	0	2	1989	0	0	0	1	0	NULL	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1989,0,00	1	1	2017	1	5	7	25	25025	250250	1	35	NULL	0	0	2	1989	0	0	0	1	0	NULL	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1989,0,00	1	1	2017	1	5	7	25	25025	250250	1	31	NULL	0	0	2	1989	0	0	0	1	0	NULL	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1989,0,00	1	1	2017	1	5	7	25	25025	250250	1	5	NULL	0	0	2	1989	0	0	0	1	0	NULL	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1989,0,00	1	1	2017	1	5	7	25	25025	250250	1	3	NULL	0	0	2	1989	0	0	0	1	0	NULL	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1989,0,00	1	1	2017	1	5	7	25	25025	250250	1	2	NULL	0	0	2	1989	0	0	0	1	0	NULL	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1989,0,00	1	1	2017	1	5	7	25	25025	250250	1	1	NULL	0	0	2	1989	0	0	0	1	0	NULL	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1988,0,00	1	1	2017	1	5	7	25	25025	250250	1	122	NULL	0	0	2	1988	0	0	0	1	0	NULL	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1988,0,00	1	1	2017	1	5	7	25	25025	250250	1	121	NULL	0	0	2	1988	0	0	0	1	0	NULL	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1988,0,00	1	1	2017	1	5	7	25	25025	250250	1	119	NULL	0	0	2	1988	0	0	0	1	0	NULL	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1988,0,00	1	1	2017	1	5	7	25	25025	250250	1	118	NULL	0	0	2	1988	0	0	0	1	0	NULL	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1988,0,00	1	1	2017	1	5	7	25	25025	250250	1	117	NULL	0	0	2	1988	0	0	0	1	0	NULL	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1988,0,00	1	1	2017	1	5	7	25	25025	250250	1	116	NULL	0	0	2	1988	0	0	0	1	0	NULL	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1988,0,00	1	1	2017	1	5	7	25	25025	250250	1	115	NULL	0	0	2	1988	0	0	0	1	0	NULL	g	mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1988,0,00	1	1	2017	1	5	7	25	25025	250250	1	112	NULL	0	0	2	1988	0	0	0	1	0	NULL	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1988,0,00	1	1	2017	1	5	7	25	25025	250250	1	111	NULL	0	0	2	1988	0	0	0	1	0	NULL	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1988,0,00	1	1	2017	1	5	7	25	25025	250250	1	110	NULL	0	0	2	1988	0	0	0	1	0	NULL	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1988,0,00	1	1	2017	1	5	7	25	25025	250250	1	107	NULL	0	0	2	1988	0	0	0	1	0	NULL	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1988,0,00	1	1	2017	1	5	7	25	25025	250250	1	106	NULL	0	0	2	1988	0	0	0	1	0	NULL	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1988,0,00	1	1	2017	1	5	7	25	25025	250250	1	100	NULL	0	0	2	1988	0	0	0	1	0	NULL	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1988,0,00	1	1	2017	1	5	7	25	25025	250250	1	98	NULL	0	0	2	1988	0	0	0	1	0	NULL	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1988,0,00	1	1	2017	1	5	7	25	25025	250250	1	91	NULL	0	0	2	1988	0	0	0	1	0	NULL	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1988,0,00	1	1	2017	1	5	7	25	25025	250250	1	90	NULL	0	0	2	1988	0	0	0	1	0	NULL	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1988,0,00	1	1	2017	1	5	7	25	25025	250250	1	87	NULL	0	0	2	1988	0	0	0	1	0	NULL	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1988,0,00	1	1	2017	1	5	7	25	25025	250250	1	79	NULL	0	0	2	1988	0	0	0	1	0	NULL	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1988,0,00	1	1	2017	1	5	7	25	25025	250250	1	66	NULL	0	0	2	1988	0	0	0	1	0	NULL	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1988,0,00	1	1	2017	1	5	7	25	25025	250250	1	59	NULL	0	0	2	1988	0	0	0	1	0	NULL	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1988,0,00	1	1	2017	1	5	7	25	25025	250250	1	58	NULL	0	0	2	1988	0	0	0	1	0	NULL	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1988,0,00	1	1	2017	1	5	7	25	25025	250250	1	57	NULL	0	0	2	1988	0	0	0	1	0	NULL	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1988,0,00	1	1	2017	1	5	7	25	25025	250250	1	56	NULL	0	0	2	1988	0	0	0	1	0	NULL	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1988,0,00	1	1	2017	1	5	7	25	25025	250250	1	55	NULL	0	0	2	1988	0	0	0	1	0	NULL	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1988,0,00	1	1	2017	1	5	7	25	25025	250250	1	54	NULL	0	0	2	1988	0	0	0	1	0	NULL	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1988,0,00	1	1	2017	1	5	7	25	25025	250250	1	53	NULL	0	0	2	1988	0	0	0	1	0	NULL	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1988,0,00	1	1	2017	1	5	7	25	25025	250250	1	52	NULL	0	0	2	1988	0	0	0	1	0	NULL	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1988,0,00	1	1	2017	1	5	7	25	25025	250250	1	51	NULL	0	0	2	1988	0	0	0	1	0	NULL	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1988,0,00	1	1	2017	1	5	7	25	25025	250250	1	36	NULL	0	0	2	1988	0	0	0	1	0	NULL	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1988,0,00	1	1	2017	1	5	7	25	25025	250250	1	35	NULL	0	0	2	1988	0	0	0	1	0	NULL	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1988,0,00	1	1	2017	1	5	7	25	25025	250250	1	31	NULL	0	0	2	1988	0	0	0	1	0	NULL	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1988,0,00	1	1	2017	1	5	7	25	25025	250250	1	5	NULL	0	0	2	1988	0	0	0	1	0	NULL	g	mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1988,0,00 1 1 2017 1 5 7 25 25025 250250 1 3 NULL 0 0 2 1988 0 0 0 1 0 NULL g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1988,0,00 1 1 2017 1 5 7 25 25025 250250 1 2 NULL 0 0 2 1988 0 0 0 1 0 NULL g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1988,0,00 1 1 2017 1 5 7 25 25025 250250 1 1 NULL 0 0 2 1988 0 0 0 1 0 NULL g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1987,0,00 1 1 2017 1 5 7 25 25025 250250 1 122 NULL 0 0 2 1987 0 0 0.00068224 1 0.00680793 0.100212549 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1987,0,00 1 1 2017 1 5 7 25 25025 250250 1 121 NULL 0 0 2 1987 0 0 0.000255732 1 0.00680793 0.037563844 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1987,0,00 1 1 2017 1 5 7 25 25025 250250 1 119 NULL 0 0 2 1987 0 0 0 1 0.00680793 0 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1987,0,00 1 1 2017 1 5 7 25 25025 250250 1 118 NULL 0 0 2 1987 0 0 0.00478568 1 0.00680793 0.702956747 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1987,0,00 1 1 2017 1 5 7 25 25025 250250 1 117 NULL 0 0 2 1987 0 0 2.61765E-05 1 0.00680793 0.003845001 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1987,0,00 1 1 2017 1 5 7 25 25025 250250 1 116 NULL 0 0 2 1987 0 0 0.000211723 1 0.00680793 0.031099469 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1987,0,00 1 1 2017 1 5 7 25 25025 250250 1 115 NULL 0 0 2 1987 0 0 8.58836E-05 1 0.00680793 0.01261523 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1987,0,00 1 1 2017 1 5 7 25 25025 250250 1 112 NULL 0 0 2 1987 0 0 0.00674812 1 0.00680793 0.991214657 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1987,0,00 1 1 2017 1 5 7 25 25025 250250 1 111 NULL 0 0 2 1987 0 0 0.0034112 1 0.00680793 0.501062728 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1987,0,00 1 1 2017 1 5 7 25 25025 250250 1 110 NULL 0 0 2 1987 0 0 0.0115338 1 0.00680793 1.694171335 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1987,0,00 1 1 2017 1 5 7 25 25025 250250 1 107 NULL 0 0 2 1987 0 0 0.000174511 1 0.00680793 0.025633491 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1987,0,00 1 1 2017 1 5 7 25 25025 250250 1 106 NULL 0 0 2 1987 0 0 0.00169378 1 0.00680793 0.248795154 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1987,0,00 1 1 2017 1 5 7 25 25025 250250 1 100 NULL 0 0 2 1987 0 0 0.0125368 1 0.00680793 1.841499521 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1987,0,00 1 1 2017 1 5 7 25 25025 250250 1 98 NULL 0 0 2 1987 0 0 7.348519802 1 0.00680793 1079.405925 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1987,0,00 1 1 2017 1 5 7 25 25025 250250 1 91 NULL 0 0 2 1987 0 0 9.45468E-05 1 0.00680793 0.013887751 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1987,0,00 1 1 2017 1 5 7 25 25025 250250 1 90 NULL 0 0 2 1987 0 0 7.347859859 1 0.00680793 1079.308988 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1987,0,00 1 1 2017 1 5 7 25 25025 250250 1 87 NULL 0 0 2 1987 0 0 0.01143531 1 0.00680793 1.679704496 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1987,0,00 1 1 2017 1 5 7 25 25025 250250 1 79 NULL 0 0 2 1987 0 0 0.00980817 1 0.00680793 1.440697821 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1987,0,00 1 1 2017 1 5 7 25 25025 250250 1 66 NULL 0 0 2 1987 0 0 1.64071E-06 1 0.00680793 0.000241 g mi

1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1987,0,00 1 1 2017 1 5 7 25 25025 250250 1 59 NULL 0 0 2 1987 0 0 2.9995E-05 1 0.00680793 0.004405892 g mi

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1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1987,0,00	1	1	2017	1	5	7	25	25025	250250	1	56	NULL	0	0	2	1987	0	0	2.03746E-06	1	0.00680793	0.000299277	g	mi
1,1,2017,1,5,7,25,25025,250250,1,0,0,2,1987,0,00	1	1	2017	1	5	7	25	25025	250250	1	55	NULL	0	0	2	1987	0	0	8.15716E-05	1	0.00680793	0.011981851	g	mi
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Source: KBE and Massport, 2019.

Table I-10 MOVES2014b Sample Input File for the Future Planning Horizon


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Source: KBE and Massport, 2019.

Table I-11 MOVES2014b Sample Output File for the Future Planning Horizon

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1,1,2035,7,5,16,25,25025,250250,21,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	21	53	NULL	21	0	0	0	0	0	2.20884E-05	1	0	NULL	g	mi
1,1,2035,7,5,16,25,25025,250250,21,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	21	52	NULL	21	0	0	0	0	0	1.21947E-05	1	0	NULL	g	mi
1,1,2035,7,5,16,25,25025,250250,21,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	21	51	NULL	21	0	0	0	0	0	2.70625E-05	1	0	NULL	g	mi
1,1,2035,7,5,16,25,25025,250250,21,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	21	36	NULL	21	0	0	0	0	0	0.000717679	1	0	NULL	g	mi
1,1,2035,7,5,16,25,25025,250250,21,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	21	35	NULL	21	0	0	0	0	0	7.45783E-05	1	0	NULL	g	mi
1,1,2035,7,5,16,25,25025,250250,21,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	21	31	NULL	21	0	0	0	0	0	0.014551	1	0	NULL	g	mi
1,1,2035,7,5,16,25,25025,250250,21,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	21	5	NULL	21	0	0	0	0	0	0.003961123	1	0	NULL	g	mi
1,1,2035,7,5,16,25,25025,250250,21,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	21	3	NULL	21	0	0	0	0	0	0.058679447	1	0	NULL	g	mi
1,1,2035,7,5,16,25,25025,250250,21,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	21	2	NULL	21	0	0	0	0	0	0.360723495	1	0	NULL	g	mi
1,1,2035,7,5,16,25,25025,250250,21,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	21	1	NULL	21	0	0	0	0	0	0.435614794	1	0	NULL	g	mi
1,1,2035,7,5,16,25,25025,250250,20,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	20	122	NULL	31	0	0	0	0	0	0.000241829	1	1	0.000241829	g	mi
1,1,2035,7,5,16,25,25025,250250,20,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	20	121	NULL	31	0	0	0	0	0	9.85119E-05	1	1	9.85119E-05	g	mi
1,1,2035,7,5,16,25,25025,250250,20,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	20	119	NULL	31	0	0	0	0	0	0	1	1	0	g	mi
1,1,2035,7,5,16,25,25025,250250,20,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	20	118	NULL	31	0	0	0	0	0	0.00184712	1	1	0.00184712	g	mi
1,1,2035,7,5,16,25,25025,250250,20,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	20	117	NULL	31	0	0	0	0	0	0.00124394	1	1	0.00124394	g	mi
1,1,2035,7,5,16,25,25025,250250,20,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	20	116	NULL	31	0	0	0	0	0	0.00139998	1	1	0.00139998	g	mi
1,1,2035,7,5,16,25,25025,250250,20,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	20	115	NULL	31	0	0	0	0	0	0.000137519	1	1	0.000137519	g	mi
1,1,2035,7,5,16,25,25025,250250,20,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	20	112	NULL	31	0	0	0	0	0	0.000312754	1	1	0.000312754	g	mi
1,1,2035,7,5,16,25,25025,250250,20,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	20	111	NULL	31	0	0	0	0	0	0.00120914	1	1	0.00120914	g	mi

1,1,2035,7,5,16,25,25025,250250,20,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	20	110	NULL	31	0	0	0	0	0	0.00215987	1	1	0.00215987	g	mi
1,1,2035,7,5,16,25,25025,250250,20,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	20	107	NULL	31	0	0	0	0	0	0.00829296	1	1	0.00829296	g	mi
1,1,2035,7,5,16,25,25025,250250,20,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	20	106	NULL	31	0	0	0	0	0	0.0111998	1	1	0.0111998	g	mi
1,1,2035,7,5,16,25,25025,250250,20,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	20	100	NULL	31	0	0	0	0	0	0.00243596	1	1	0.00243596	g	mi
1,1,2035,7,5,16,25,25025,250250,20,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	20	98	NULL	31	0	0	0	0	0	249.3829956	1	1	249.3829956	g	mi
1,1,2035,7,5,16,25,25025,250250,20,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	20	91	NULL	31	0	0	0	0	0	0.003287058	1	1	0.003287058	g	mi
1,1,2035,7,5,16,25,25025,250250,20,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	20	90	NULL	31	0	0	0	0	0	249.3439941	1	1	249.3439941	g	mi
1,1,2035,7,5,16,25,25025,250250,20,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	20	87	NULL	31	0	0	0	0	0	0.04174022	1	1	0.04174022	g	mi
1,1,2035,7,5,16,25,25025,250250,20,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	20	79	NULL	31	0	0	0	0	0	0.037842542	1	1	0.037842542	g	mi
1,1,2035,7,5,16,25,25025,250250,20,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	20	66	NULL	31	0	0	0	0	0	1.58408E-05	1	1	1.58408E-05	g	mi
1,1,2035,7,5,16,25,25025,250250,20,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	20	59	NULL	31	0	0	0	0	0	3.95885E-05	1	1	3.95885E-05	g	mi
1,1,2035,7,5,16,25,25025,250250,20,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	20	58	NULL	31	0	0	0	0	0	7.01034E-06	1	1	7.01034E-06	g	mi
1,1,2035,7,5,16,25,25025,250250,20,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	20	57	NULL	31	0	0	0	0	0	7.00048E-06	1	1	7.00048E-06	g	mi
1,1,2035,7,5,16,25,25025,250250,20,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	20	56	NULL	31	0	0	0	0	0	7.41663E-07	1	1	7.41663E-07	g	mi
1,1,2035,7,5,16,25,25025,250250,20,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	20	55	NULL	31	0	0	0	0	0	3.12306E-05	1	1	3.12306E-05	g	mi
1,1,2035,7,5,16,25,25025,250250,20,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	20	54	NULL	31	0	0	0	0	0	3.20625E-06	1	1	3.20625E-06	g	mi
1,1,2035,7,5,16,25,25025,250250,20,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	20	53	NULL	31	0	0	0	0	0	1.85947E-06	1	1	1.85947E-06	g	mi
1,1,2035,7,5,16,25,25025,250250,20,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	20	52	NULL	31	0	0	0	0	0	1.69457E-06	1	1	1.69457E-06	g	mi
1,1,2035,7,5,16,25,25025,250250,20,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	20	51	NULL	31	0	0	0	0	0	2.26781E-06	1	1	2.26781E-06	g	mi
1,1,2035,7,5,16,25,25025,250250,20,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	20	36	NULL	31	0	0	0	0	0	5.93447E-05	1	1	5.93447E-05	g	mi
1,1,2035,7,5,16,25,25025,250250,20,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	20	35	NULL	31	0	0	0	0	0	6.17012E-06	1	1	6.17012E-06	g	mi
1,1,2035,7,5,16,25,25025,250250,20,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	20	31	NULL	31	0	0	0	0	0	0.00169248	1	1	0.00169248	g	mi
1,1,2035,7,5,16,25,25025,250250,20,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	20	5	NULL	31	0	0	0	0	0	0.001594883	1	1	0.001594883	g	mi
1,1,2035,7,5,16,25,25025,250250,20,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	20	3	NULL	31	0	0	0	0	0	0.03442128	1	1	0.03442128	g	mi
1,1,2035,7,5,16,25,25025,250250,20,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	20	2	NULL	31	0	0	0	0	0	0.920191288	1	1	0.920191288	g	mi
1,1,2035,7,5,16,25,25025,250250,20,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	20	1	NULL	31	0	0	0	0	0	0.039421961	1	1	0.039421961	g	mi
1,1,2035,7,5,16,25,25025,250250,19,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	19	122	NULL	31	0	0	0	0	0	0.00024179	1	1	0.00024179	g	mi

1,1,2035,7,5,16,25,25025,250250,19,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	19	121	NULL	31	0	0	0	0	0	9.84852E-05	1	1	9.84852E-05	g	mi
1,1,2035,7,5,16,25,25025,250250,19,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	19	119	NULL	31	0	0	0	0	0	0	1	1	0	g	mi
1,1,2035,7,5,16,25,25025,250250,19,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	19	118	NULL	31	0	0	0	0	0	0.00184774	1	1	0.00184774	g	mi
1,1,2035,7,5,16,25,25025,250250,19,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	19	117	NULL	31	0	0	0	0	0	0.00134012	1	1	0.00134012	g	mi
1,1,2035,7,5,16,25,25025,250250,19,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	19	116	NULL	31	0	0	0	0	0	0.00219601	1	1	0.00219601	g	mi
1,1,2035,7,5,16,25,25025,250250,19,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	19	115	NULL	31	0	0	0	0	0	0.000138436	1	1	0.000138436	g	mi
1,1,2035,7,5,16,25,25025,250250,19,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	19	112	NULL	31	0	0	0	0	0	0.000312629	1	1	0.000312629	g	mi
1,1,2035,7,5,16,25,25025,250250,19,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	19	111	NULL	31	0	0	0	0	0	0.00120895	1	1	0.00120895	g	mi
1,1,2035,7,5,16,25,25025,250250,19,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	19	110	NULL	31	0	0	0	0	0	0.00216037	1	1	0.00216037	g	mi
1,1,2035,7,5,16,25,25025,250250,19,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	19	107	NULL	31	0	0	0	0	0	0.00893417	1	1	0.00893417	g	mi
1,1,2035,7,5,16,25,25025,250250,19,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	19	106	NULL	31	0	0	0	0	0	0.017568	1	1	0.017568	g	mi
1,1,2035,7,5,16,25,25025,250250,19,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	19	100	NULL	31	0	0	0	0	0	0.00243646	1	1	0.00243646	g	mi
1,1,2035,7,5,16,25,25025,250250,19,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	19	98	NULL	31	0	0	0	0	0	254.654007	1	1	254.654007	g	mi
1,1,2035,7,5,16,25,25025,250250,19,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	19	91	NULL	31	0	0	0	0	0	0.003356543	1	1	0.003356543	g	mi
1,1,2035,7,5,16,25,25025,250250,19,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	19	90	NULL	31	0	0	0	0	0	254.6139984	1	1	254.6139984	g	mi
1,1,2035,7,5,16,25,25025,250250,19,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	19	87	NULL	31	0	0	0	0	0	0.042410254	1	1	0.042410254	g	mi
1,1,2035,7,5,16,25,25025,250250,19,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	19	79	NULL	31	0	0	0	0	0	0.038430549	1	1	0.038430549	g	mi
1,1,2035,7,5,16,25,25025,250250,19,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	19	66	NULL	31	0	0	0	0	0	1.76009E-05	1	1	1.76009E-05	g	mi
1,1,2035,7,5,16,25,25025,250250,19,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	19	59	NULL	31	0	0	0	0	0	3.95786E-05	1	1	3.95786E-05	g	mi
1,1,2035,7,5,16,25,25025,250250,19,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	19	58	NULL	31	0	0	0	0	0	7.00878E-06	1	1	7.00878E-06	g	mi
1,1,2035,7,5,16,25,25025,250250,19,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	19	57	NULL	31	0	0	0	0	0	6.99994E-06	1	1	6.99994E-06	g	mi
1,1,2035,7,5,16,25,25025,250250,19,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	19	56	NULL	31	0	0	0	0	0	7.41567E-07	1	1	7.41567E-07	g	mi
1,1,2035,7,5,16,25,25025,250250,19,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	19	55	NULL	31	0	0	0	0	0	3.12243E-05	1	1	3.12243E-05	g	mi
1,1,2035,7,5,16,25,25025,250250,19,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	19	54	NULL	31	0	0	0	0	0	3.20629E-06	1	1	3.20629E-06	g	mi
1,1,2035,7,5,16,25,25025,250250,19,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	19	53	NULL	31	0	0	0	0	0	1.85928E-06	1	1	1.85928E-06	g	mi
1,1,2035,7,5,16,25,25025,250250,19,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	19	52	NULL	31	0	0	0	0	0	1.70364E-06	1	1	1.70364E-06	g	mi
1,1,2035,7,5,16,25,25025,250250,19,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	19	51	NULL	31	0	0	0	0	0	2.26817E-06	1	1	2.26817E-06	g	mi

1,1,2035,7,5,16,25,25025,250250,19,31,0,0,0,0,00 1 1 2035 7 5 16 25 25025 250250 19 36 NULL 31 0 0 0 0 0 5.93218E-05 1 1 5.93218E-05 g mi

1,1,2035,7,5,16,25,25025,250250,19,31,0,0,0,0,00 1 1 2035 7 5 16 25 25025 250250 19 35 NULL 31 0 0 0 0 0 6.16881E-06 1 1 6.16881E-06 g mi

1,1,2035,7,5,16,25,25025,250250,19,31,0,0,0,0,00 1 1 2035 7 5 16 25 25025 250250 19 31 NULL 31 0 0 0 0 0 0.00172827 1 1 0.00172827 g mi

1,1,2035,7,5,16,25,25025,250250,19,31,0,0,0,0,00 1 1 2035 7 5 16 25 25025 250250 19 5 NULL 31 0 0 0 0 0 0.001618448 1 1 0.001618448 g mi

1,1,2035,7,5,16,25,25025,250250,19,31,0,0,0,0,00 1 1 2035 7 5 16 25 25025 250250 19 3 NULL 31 0 0 0 0 0 0.033051021 1 1 0.033051021 g mi

1,1,2035,7,5,16,25,25025,250250,19,31,0,0,0,0,00 1 1 2035 7 5 16 25 25025 250250 19 2 NULL 31 0 0 0 0 0 0.9141801 1 1 0.9141801 g mi

1,1,2035,7,5,16,25,25025,250250,19,31,0,0,0,0,00 1 1 2035 7 5 16 25 25025 250250 19 1 NULL 31 0 0 0 0 0 0.040033549 1 1 0.040033549 g mi

1,1,2035,7,5,16,25,25025,250250,18,31,0,0,0,0,00 1 1 2035 7 5 16 25 25025 250250 18 122 NULL 31 0 0 0 0 0 0.000249531 1 1 0.000249531 g mi

1,1,2035,7,5,16,25,25025,250250,18,31,0,0,0,0,00 1 1 2035 7 5 16 25 25025 250250 18 121 NULL 31 0 0 0 0 0 0.000101632 1 1 0.000101632 g mi

1,1,2035,7,5,16,25,25025,250250,18,31,0,0,0,0,00 1 1 2035 7 5 16 25 25025 250250 18 119 NULL 31 0 0 0 0 0 0 1 1 0 g mi

1,1,2035,7,5,16,25,25025,250250,18,31,0,0,0,0,00 1 1 2035 7 5 16 25 25025 250250 18 118 NULL 31 0 0 0 0 0 0.00190739 1 1 0.00190739 g mi

1,1,2035,7,5,16,25,25025,250250,18,31,0,0,0,0,00 1 1 2035 7 5 16 25 25025 250250 18 117 NULL 31 0 0 0 0 0 0.00144433 1 1 0.00144433 g mi

1,1,2035,7,5,16,25,25025,250250,18,31,0,0,0,0,00 1 1 2035 7 5 16 25 25025 250250 18 116 NULL 31 0 0 0 0 0 0.00307419 1 1 0.00307419 g mi

1,1,2035,7,5,16,25,25025,250250,18,31,0,0,0,0,00 1 1 2035 7 5 16 25 25025 250250 18 115 NULL 31 0 0 0 0 0 0.000143372 1 1 0.000143372 g mi

1,1,2035,7,5,16,25,25025,250250,18,31,0,0,0,0,00 1 1 2035 7 5 16 25 25025 250250 18 112 NULL 31 0 0 0 0 0 0.00032246 1 1 0.00032246 g mi

1,1,2035,7,5,16,25,25025,250250,18,31,0,0,0,0,00 1 1 2035 7 5 16 25 25025 250250 18 111 NULL 31 0 0 0 0 0 0.00124765 1 1 0.00124765 g mi

1,1,2035,7,5,16,25,25025,250250,18,31,0,0,0,0,00 1 1 2035 7 5 16 25 25025 250250 18 110 NULL 31 0 0 0 0 0 0.00222985 1 1 0.00222985 g mi

1,1,2035,7,5,16,25,25025,250250,18,31,0,0,0,0,00 1 1 2035 7 5 16 25 25025 250250 18 107 NULL 31 0 0 0 0 0 0.00962893 1 1 0.00962893 g mi

1,1,2035,7,5,16,25,25025,250250,18,31,0,0,0,0,00 1 1 2035 7 5 16 25 25025 250250 18 106 NULL 31 0 0 0 0 0 0.0245935 1 1 0.0245935 g mi

1,1,2035,7,5,16,25,25025,250250,18,31,0,0,0,0,00 1 1 2035 7 5 16 25 25025 250250 18 100 NULL 31 0 0 0 0 0 0.00251479 1 1 0.00251479 g mi

1,1,2035,7,5,16,25,25025,250250,18,31,0,0,0,0,00 1 1 2035 7 5 16 25 25025 250250 18 98 NULL 31 0 0 0 0 0 261.4689941 1 1 261.4689941 g mi

1,1,2035,7,5,16,25,25025,250250,18,31,0,0,0,0,00 1 1 2035 7 5 16 25 25025 250250 18 91 NULL 31 0 0 0 0 0 0.003446329 1 1 0.003446329 g mi

1,1,2035,7,5,16,25,25025,250250,18,31,0,0,0,0,00 1 1 2035 7 5 16 25 25025 250250 18 90 NULL 31 0 0 0 0 0 261.427002 1 1 261.427002 g mi

1,1,2035,7,5,16,25,25025,250250,18,31,0,0,0,0,00 1 1 2035 7 5 16 25 25025 250250 18 87 NULL 31 0 0 0 0 0 0.04339271 1 1 0.04339271 g mi

1,1,2035,7,5,16,25,25025,250250,18,31,0,0,0,0,00 1 1 2035 7 5 16 25 25025 250250 18 79 NULL 31 0 0 0 0 0 0.03932384 1 1 0.03932384 g mi

1,1,2035,7,5,16,25,25025,250250,18,31,0,0,0,0,00 1 1 2035 7 5 16 25 25025 250250 18 66 NULL 31 0 0 0 0 0 1.9801E-05 1 1 1.9801E-05 g mi

1,1,2035,7,5,16,25,25025,250250,18,31,0,0,0,0,00 1 1 2035 7 5 16 25 25025 250250 18 59 NULL 31 0 0 0 0 0 4.08428E-05 1 1 4.08428E-05 g mi

1,1,2035,7,5,16,25,25025,250250,18,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	18	58	NULL	31	0	0	0	0	0	7.23285E-06	1	1	7.23285E-06	g	mi
1,1,2035,7,5,16,25,25025,250250,18,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	18	57	NULL	31	0	0	0	0	0	7.22481E-06	1	1	7.22481E-06	g	mi
1,1,2035,7,5,16,25,25025,250250,18,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	18	56	NULL	31	0	0	0	0	0	7.65321E-07	1	1	7.65321E-07	g	mi
1,1,2035,7,5,16,25,25025,250250,18,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	18	55	NULL	31	0	0	0	0	0	3.22232E-05	1	1	3.22232E-05	g	mi
1,1,2035,7,5,16,25,25025,250250,18,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	18	54	NULL	31	0	0	0	0	0	3.30915E-06	1	1	3.30915E-06	g	mi
1,1,2035,7,5,16,25,25025,250250,18,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	18	53	NULL	31	0	0	0	0	0	1.91885E-06	1	1	1.91885E-06	g	mi
1,1,2035,7,5,16,25,25025,250250,18,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	18	52	NULL	31	0	0	0	0	0	1.76328E-06	1	1	1.76328E-06	g	mi
1,1,2035,7,5,16,25,25025,250250,18,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	18	51	NULL	31	0	0	0	0	0	2.34151E-06	1	1	2.34151E-06	g	mi
1,1,2035,7,5,16,25,25025,250250,18,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	18	36	NULL	31	0	0	0	0	0	6.12127E-05	1	1	6.12127E-05	g	mi
1,1,2035,7,5,16,25,25025,250250,18,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	18	35	NULL	31	0	0	0	0	0	6.36648E-06	1	1	6.36648E-06	g	mi
1,1,2035,7,5,16,25,25025,250250,18,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	18	31	NULL	31	0	0	0	0	0	0.00177461	1	1	0.00177461	g	mi
1,1,2035,7,5,16,25,25025,250250,18,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	18	5	NULL	31	0	0	0	0	0	0.001669297	1	1	0.001669297	g	mi
1,1,2035,7,5,16,25,25025,250250,18,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	18	3	NULL	31	0	0	0	0	0	0.031508658	1	1	0.031508658	g	mi
1,1,2035,7,5,16,25,25025,250250,18,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	18	2	NULL	31	0	0	0	0	0	0.937955499	1	1	0.937955499	g	mi
1,1,2035,7,5,16,25,25025,250250,18,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	18	1	NULL	31	0	0	0	0	0	0.04097737	1	1	0.04097737	g	mi
1,1,2035,7,5,16,25,25025,250250,17,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	17	122	NULL	31	0	0	0	0	0	0.000264209	1	1	0.000264209	g	mi
1,1,2035,7,5,16,25,25025,250250,17,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	17	121	NULL	31	0	0	0	0	0	0.000107607	1	1	0.000107607	g	mi
1,1,2035,7,5,16,25,25025,250250,17,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	17	119	NULL	31	0	0	0	0	0	0	1	1	0	g	mi
1,1,2035,7,5,16,25,25025,250250,17,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	17	118	NULL	31	0	0	0	0	0	0.00201979	1	1	0.00201979	g	mi
1,1,2035,7,5,16,25,25025,250250,17,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	17	117	NULL	31	0	0	0	0	0	0.00155567	1	1	0.00155567	g	mi
1,1,2035,7,5,16,25,25025,250250,17,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	17	116	NULL	31	0	0	0	0	0	0.00413238	1	1	0.00413238	g	mi
1,1,2035,7,5,16,25,25025,250250,17,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	17	115	NULL	31	0	0	0	0	0	0.000152017	1	1	0.000152017	g	mi
1,1,2035,7,5,16,25,25025,250250,17,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	17	112	NULL	31	0	0	0	0	0	0.000341157	1	1	0.000341157	g	mi
1,1,2035,7,5,16,25,25025,250250,17,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	17	111	NULL	31	0	0	0	0	0	0.00132104	1	1	0.00132104	g	mi
1,1,2035,7,5,16,25,25025,250250,17,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	17	110	NULL	31	0	0	0	0	0	0.00236095	1	1	0.00236095	g	mi
1,1,2035,7,5,16,25,25025,250250,17,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	17	107	NULL	31	0	0	0	0	0	0.0103712	1	1	0.0103712	g	mi
1,1,2035,7,5,16,25,25025,250250,17,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	17	106	NULL	31	0	0	0	0	0	0.033059102	1	1	0.033059102	g	mi

1,1,2035,7,5,16,25,25025,250250,17,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	17	100	NULL	31	0	0	0	0	0	0.00266263	1	1	0.00266263	g	mi
1,1,2035,7,5,16,25,25025,250250,17,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	17	98	NULL	31	0	0	0	0	0	270.3659973	1	1	270.3659973	g	mi
1,1,2035,7,5,16,25,25025,250250,17,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	17	91	NULL	31	0	0	0	0	0	0.003563574	1	1	0.003563574	g	mi
1,1,2035,7,5,16,25,25025,250250,17,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	17	90	NULL	31	0	0	0	0	0	270.322998	1	1	270.322998	g	mi
1,1,2035,7,5,16,25,25025,250250,17,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	17	87	NULL	31	0	0	0	0	0	0.044744097	1	1	0.044744097	g	mi
1,1,2035,7,5,16,25,25025,250250,17,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	17	79	NULL	31	0	0	0	0	0	0.04056811	1	1	0.04056811	g	mi
1,1,2035,7,5,16,25,25025,250250,17,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	17	66	NULL	31	0	0	0	0	0	2.26297E-05	1	1	2.26297E-05	g	mi
1,1,2035,7,5,16,25,25025,250250,17,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	17	59	NULL	31	0	0	0	0	0	4.32424E-05	1	1	4.32424E-05	g	mi
1,1,2035,7,5,16,25,25025,250250,17,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	17	58	NULL	31	0	0	0	0	0	7.65806E-06	1	1	7.65806E-06	g	mi
1,1,2035,7,5,16,25,25025,250250,17,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	17	57	NULL	31	0	0	0	0	0	7.65074E-06	1	1	7.65074E-06	g	mi
1,1,2035,7,5,16,25,25025,250250,17,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	17	56	NULL	31	0	0	0	0	0	8.10344E-07	1	1	8.10344E-07	g	mi
1,1,2035,7,5,16,25,25025,250250,17,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	17	55	NULL	31	0	0	0	0	0	3.41182E-05	1	1	3.41182E-05	g	mi
1,1,2035,7,5,16,25,25025,250250,17,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	17	54	NULL	31	0	0	0	0	0	3.50377E-06	1	1	3.50377E-06	g	mi
1,1,2035,7,5,16,25,25025,250250,17,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	17	53	NULL	31	0	0	0	0	0	2.03173E-06	1	1	2.03173E-06	g	mi
1,1,2035,7,5,16,25,25025,250250,17,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	17	52	NULL	31	0	0	0	0	0	1.86927E-06	1	1	1.86927E-06	g	mi
1,1,2035,7,5,16,25,25025,250250,17,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	17	51	NULL	31	0	0	0	0	0	2.48001E-06	1	1	2.48001E-06	g	mi
1,1,2035,7,5,16,25,25025,250250,17,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	17	36	NULL	31	0	0	0	0	0	6.48082E-05	1	1	6.48082E-05	g	mi
1,1,2035,7,5,16,25,25025,250250,17,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	17	35	NULL	31	0	0	0	0	0	6.74154E-06	1	1	6.74154E-06	g	mi
1,1,2035,7,5,16,25,25025,250250,17,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	17	31	NULL	31	0	0	0	0	0	0.00183515	1	1	0.00183515	g	mi
1,1,2035,7,5,16,25,25025,250250,17,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	17	5	NULL	31	0	0	0	0	0	0.001747662	1	1	0.001747662	g	mi
1,1,2035,7,5,16,25,25025,250250,17,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	17	3	NULL	31	0	0	0	0	0	0.029629184	1	1	0.029629184	g	mi
1,1,2035,7,5,16,25,25025,250250,17,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	17	2	NULL	31	0	0	0	0	0	0.98750627	1	1	0.98750627	g	mi
1,1,2035,7,5,16,25,25025,250250,17,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	17	1	NULL	31	0	0	0	0	0	0.042299379	1	1	0.042299379	g	mi
1,1,2035,7,5,16,25,25025,250250,16,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	16	122	NULL	31	0	0	0	0	0	0.000283937	1	1	0.000283937	g	mi
1,1,2035,7,5,16,25,25025,250250,16,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	16	121	NULL	31	0	0	0	0	0	0.000115616	1	1	0.000115616	g	mi
1,1,2035,7,5,16,25,25025,250250,16,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	16	119	NULL	31	0	0	0	0	0	0	1	1	0	g	mi
1,1,2035,7,5,16,25,25025,250250,16,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	16	118	NULL	31	0	0	0	0	0	0.00217298	1	1	0.00217298	g	mi

1,1,2035,7,5,16,25,25025,250250,16,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	16	117	NULL	31	0	0	0	0	0	0.00167614	1	1	0.00167614	g	mi
1,1,2035,7,5,16,25,25025,250250,16,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	16	116	NULL	31	0	0	0	0	0	0.00553225	1	1	0.00553225	g	mi
1,1,2035,7,5,16,25,25025,250250,16,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	16	115	NULL	31	0	0	0	0	0	0.000165785	1	1	0.000165785	g	mi
1,1,2035,7,5,16,25,25025,250250,16,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	16	112	NULL	31	0	0	0	0	0	0.000366562	1	1	0.000366562	g	mi
1,1,2035,7,5,16,25,25025,250250,16,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	16	111	NULL	31	0	0	0	0	0	0.00141969	1	1	0.00141969	g	mi
1,1,2035,7,5,16,25,25025,250250,16,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	16	110	NULL	31	0	0	0	0	0	0.00253955	1	1	0.00253955	g	mi
1,1,2035,7,5,16,25,25025,250250,16,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	16	107	NULL	31	0	0	0	0	0	0.0111743	1	1	0.0111743	g	mi
1,1,2035,7,5,16,25,25025,250250,16,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	16	106	NULL	31	0	0	0	0	0	0.044257998	1	1	0.044257998	g	mi
1,1,2035,7,5,16,25,25025,250250,16,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	16	100	NULL	31	0	0	0	0	0	0.00286391	1	1	0.00286391	g	mi
1,1,2035,7,5,16,25,25025,250250,16,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	16	98	NULL	31	0	0	0	0	0	285.394989	1	1	285.394989	g	mi
1,1,2035,7,5,16,25,25025,250250,16,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	16	91	NULL	31	0	0	0	0	0	0.00376163	1	1	0.00376163	g	mi
1,1,2035,7,5,16,25,25025,250250,16,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	16	90	NULL	31	0	0	0	0	0	285.3500061	1	1	285.3500061	g	mi
1,1,2035,7,5,16,25,25025,250250,16,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	16	87	NULL	31	0	0	0	0	0	0.046487361	1	1	0.046487361	g	mi
1,1,2035,7,5,16,25,25025,250250,16,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	16	79	NULL	31	0	0	0	0	0	0.042163581	1	1	0.042163581	g	mi
1,1,2035,7,5,16,25,25025,250250,16,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	16	66	NULL	31	0	0	0	0	0	2.64014E-05	1	1	2.64014E-05	g	mi
1,1,2035,7,5,16,25,25025,250250,16,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	16	59	NULL	31	0	0	0	0	0	4.64658E-05	1	1	4.64658E-05	g	mi
1,1,2035,7,5,16,25,25025,250250,16,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	16	58	NULL	31	0	0	0	0	0	8.22905E-06	1	1	8.22905E-06	g	mi
1,1,2035,7,5,16,25,25025,250250,16,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	16	57	NULL	31	0	0	0	0	0	8.22225E-06	1	1	8.22225E-06	g	mi
1,1,2035,7,5,16,25,25025,250250,16,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	16	56	NULL	31	0	0	0	0	0	8.70917E-07	1	1	8.70917E-07	g	mi
1,1,2035,7,5,16,25,25025,250250,16,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	16	55	NULL	31	0	0	0	0	0	3.66629E-05	1	1	3.66629E-05	g	mi
1,1,2035,7,5,16,25,25025,250250,16,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	16	54	NULL	31	0	0	0	0	0	3.76707E-06	1	1	3.76707E-06	g	mi
1,1,2035,7,5,16,25,25025,250250,16,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	16	53	NULL	31	0	0	0	0	0	2.18373E-06	1	1	2.18373E-06	g	mi
1,1,2035,7,5,16,25,25025,250250,16,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	16	52	NULL	31	0	0	0	0	0	2.03262E-06	1	1	2.03262E-06	g	mi
1,1,2035,7,5,16,25,25025,250250,16,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	16	51	NULL	31	0	0	0	0	0	2.66607E-06	1	1	2.66607E-06	g	mi
1,1,2035,7,5,16,25,25025,250250,16,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	16	36	NULL	31	0	0	0	0	0	6.96171E-05	1	1	6.96171E-05	g	mi
1,1,2035,7,5,16,25,25025,250250,16,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	16	35	NULL	31	0	0	0	0	0	7.2431E-06	1	1	7.2431E-06	g	mi
1,1,2035,7,5,16,25,25025,250250,16,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	16	31	NULL	31	0	0	0	0	0	0.00193732	1	1	0.00193732	g	mi

1,1,2035,7,5,16,25,25025,250250,16,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	16	5	NULL	31	0	0	0	0	0	0.001845748	1	1	0.001845748	g	mi
1,1,2035,7,5,16,25,25025,250250,16,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	16	3	NULL	31	0	0	0	0	0	0.027752411	1	1	0.027752411	g	mi
1,1,2035,7,5,16,25,25025,250250,16,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	16	2	NULL	31	0	0	0	0	0	1.036638856	1	1	1.036638856	g	mi
1,1,2035,7,5,16,25,25025,250250,16,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	16	1	NULL	31	0	0	0	0	0	0.043992229	1	1	0.043992229	g	mi
1,1,2035,7,5,16,25,25025,250250,15,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	15	122	NULL	31	0	0	0	0	0	0.000313002	1	1	0.000313002	g	mi
1,1,2035,7,5,16,25,25025,250250,15,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	15	121	NULL	31	0	0	0	0	0	0.000127316	1	1	0.000127316	g	mi
1,1,2035,7,5,16,25,25025,250250,15,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	15	119	NULL	31	0	0	0	0	0	0	1	1	0	g	mi
1,1,2035,7,5,16,25,25025,250250,15,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	15	118	NULL	31	0	0	0	0	0	0.00240787	1	1	0.00240787	g	mi
1,1,2035,7,5,16,25,25025,250250,15,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	15	117	NULL	31	0	0	0	0	0	0.00180567	1	1	0.00180567	g	mi
1,1,2035,7,5,16,25,25025,250250,15,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	15	116	NULL	31	0	0	0	0	0	0.00732565	1	1	0.00732565	g	mi
1,1,2035,7,5,16,25,25025,250250,15,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	15	115	NULL	31	0	0	0	0	0	0.000195401	1	1	0.000195401	g	mi
1,1,2035,7,5,16,25,25025,250250,15,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	15	112	NULL	31	0	0	0	0	0	0.000405199	1	1	0.000405199	g	mi
1,1,2035,7,5,16,25,25025,250250,15,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	15	111	NULL	31	0	0	0	0	0	0.00156501	1	1	0.00156501	g	mi
1,1,2035,7,5,16,25,25025,250250,15,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	15	110	NULL	31	0	0	0	0	0	0.00281307	1	1	0.00281307	g	mi
1,1,2035,7,5,16,25,25025,250250,15,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	15	107	NULL	31	0	0	0	0	0	0.0120379	1	1	0.0120379	g	mi
1,1,2035,7,5,16,25,25025,250250,15,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	15	106	NULL	31	0	0	0	0	0	0.058605202	1	1	0.058605202	g	mi
1,1,2035,7,5,16,25,25025,250250,15,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	15	100	NULL	31	0	0	0	0	0	0.00317159	1	1	0.00317159	g	mi
1,1,2035,7,5,16,25,25025,250250,15,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	15	98	NULL	31	0	0	0	0	0	320.2579956	1	1	320.2579956	g	mi
1,1,2035,7,5,16,25,25025,250250,15,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	15	91	NULL	31	0	0	0	0	0	0.00422116	1	1	0.00422116	g	mi
1,1,2035,7,5,16,25,25025,250250,15,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	15	90	NULL	31	0	0	0	0	0	320.2090149	1	1	320.2090149	g	mi
1,1,2035,7,5,16,25,25025,250250,15,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	15	87	NULL	31	0	0	0	0	0	0.048671626	1	1	0.048671626	g	mi
1,1,2035,7,5,16,25,25025,250250,15,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	15	79	NULL	31	0	0	0	0	0	0.044116881	1	1	0.044116881	g	mi
1,1,2035,7,5,16,25,25025,250250,15,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	15	66	NULL	31	0	0	0	0	0	3.16816E-05	1	1	3.16816E-05	g	mi
1,1,2035,7,5,16,25,25025,250250,15,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	15	59	NULL	31	0	0	0	0	0	5.1207E-05	1	1	5.1207E-05	g	mi
1,1,2035,7,5,16,25,25025,250250,15,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	15	58	NULL	31	0	0	0	0	0	9.06803E-06	1	1	9.06803E-06	g	mi
1,1,2035,7,5,16,25,25025,250250,15,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	15	57	NULL	31	0	0	0	0	0	9.0599E-06	1	1	9.0599E-06	g	mi
1,1,2035,7,5,16,25,25025,250250,15,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	15	56	NULL	31	0	0	0	0	0	9.60412E-07	1	1	9.60412E-07	g	mi

1,1,2035,7,5,16,25,25025,250250,15,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	15	55	NULL	31	0	0	0	0	0	4.04017E-05	1	1	4.04017E-05	g	mi
1,1,2035,7,5,16,25,25025,250250,15,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	15	54	NULL	31	0	0	0	0	0	4.16247E-06	1	1	4.16247E-06	g	mi
1,1,2035,7,5,16,25,25025,250250,15,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	15	53	NULL	31	0	0	0	0	0	2.40889E-06	1	1	2.40889E-06	g	mi
1,1,2035,7,5,16,25,25025,250250,15,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	15	52	NULL	31	0	0	0	0	0	2.36406E-06	1	1	2.36406E-06	g	mi
1,1,2035,7,5,16,25,25025,250250,15,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	15	51	NULL	31	0	0	0	0	0	2.9397E-06	1	1	2.9397E-06	g	mi
1,1,2035,7,5,16,25,25025,250250,15,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	15	36	NULL	31	0	0	0	0	0	7.65982E-05	1	1	7.65982E-05	g	mi
1,1,2035,7,5,16,25,25025,250250,15,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	15	35	NULL	31	0	0	0	0	0	7.97091E-06	1	1	7.97091E-06	g	mi
1,1,2035,7,5,16,25,25025,250250,15,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	15	31	NULL	31	0	0	0	0	0	0.00217402	1	1	0.00217402	g	mi
1,1,2035,7,5,16,25,25025,250250,15,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	15	5	NULL	31	0	0	0	0	0	0.001956782	1	1	0.001956782	g	mi
1,1,2035,7,5,16,25,25025,250250,15,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	15	3	NULL	31	0	0	0	0	0	0.028099224	1	1	0.028099224	g	mi
1,1,2035,7,5,16,25,25025,250250,15,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	15	2	NULL	31	0	0	0	0	0	1.041411161	1	1	1.041411161	g	mi
1,1,2035,7,5,16,25,25025,250250,15,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	15	1	NULL	31	0	0	0	0	0	0.046056021	1	1	0.046056021	g	mi
1,1,2035,7,5,16,25,25025,250250,14,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	14	122	NULL	31	0	0	0	0	0	0.000367451	1	1	0.000367451	g	mi
1,1,2035,7,5,16,25,25025,250250,14,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	14	121	NULL	31	0	0	0	0	0	0.000149369	1	1	0.000149369	g	mi
1,1,2035,7,5,16,25,25025,250250,14,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	14	119	NULL	31	0	0	0	0	0	0	1	1	0	g	mi
1,1,2035,7,5,16,25,25025,250250,14,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	14	118	NULL	31	0	0	0	0	0	0.00283531	1	1	0.00283531	g	mi
1,1,2035,7,5,16,25,25025,250250,14,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	14	117	NULL	31	0	0	0	0	0	0.00194537	1	1	0.00194537	g	mi
1,1,2035,7,5,16,25,25025,250250,14,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	14	116	NULL	31	0	0	0	0	0	0.00826571	1	1	0.00826571	g	mi
1,1,2035,7,5,16,25,25025,250250,14,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	14	115	NULL	31	0	0	0	0	0	0.000238114	1	1	0.000238114	g	mi
1,1,2035,7,5,16,25,25025,250250,14,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	14	112	NULL	31	0	0	0	0	0	0.000476195	1	1	0.000476195	g	mi
1,1,2035,7,5,16,25,25025,250250,14,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	14	111	NULL	31	0	0	0	0	0	0.00183725	1	1	0.00183725	g	mi
1,1,2035,7,5,16,25,25025,250250,14,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	14	110	NULL	31	0	0	0	0	0	0.00331151	1	1	0.00331151	g	mi
1,1,2035,7,5,16,25,25025,250250,14,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	14	107	NULL	31	0	0	0	0	0	0.0129692	1	1	0.0129692	g	mi
1,1,2035,7,5,16,25,25025,250250,14,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	14	106	NULL	31	0	0	0	0	0	0.066125698	1	1	0.066125698	g	mi
1,1,2035,7,5,16,25,25025,250250,14,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	14	100	NULL	31	0	0	0	0	0	0.00373303	1	1	0.00373303	g	mi
1,1,2035,7,5,16,25,25025,250250,14,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	14	98	NULL	31	0	0	0	0	0	358.2470093	1	1	358.2470093	g	mi
1,1,2035,7,5,16,25,25025,250250,14,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	14	91	NULL	31	0	0	0	0	0	0.00472192	1	1	0.00472192	g	mi

1,1,2035,7,5,16,25,25025,250250,14,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	14	90	NULL	31	0	0	0	0	0	358.1929932	1	1	358.1929932	g	mi
1,1,2035,7,5,16,25,25025,250250,14,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	14	87	NULL	31	0	0	0	0	0	0.052193224	1	1	0.052193224	g	mi
1,1,2035,7,5,16,25,25025,250250,14,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	14	79	NULL	31	0	0	0	0	0	0.047306679	1	1	0.047306679	g	mi
1,1,2035,7,5,16,25,25025,250250,14,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	14	66	NULL	31	0	0	0	0	0	3.9602E-05	1	1	3.9602E-05	g	mi
1,1,2035,7,5,16,25,25025,250250,14,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	14	59	NULL	31	0	0	0	0	0	6.01009E-05	1	1	6.01009E-05	g	mi
1,1,2035,7,5,16,25,25025,250250,14,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	14	58	NULL	31	0	0	0	0	0	1.06429E-05	1	1	1.06429E-05	g	mi
1,1,2035,7,5,16,25,25025,250250,14,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	14	57	NULL	31	0	0	0	0	0	1.06345E-05	1	1	1.06345E-05	g	mi
1,1,2035,7,5,16,25,25025,250250,14,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	14	56	NULL	31	0	0	0	0	0	1.12772E-06	1	1	1.12772E-06	g	mi
1,1,2035,7,5,16,25,25025,250250,14,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	14	55	NULL	31	0	0	0	0	0	4.74198E-05	1	1	4.74198E-05	g	mi
1,1,2035,7,5,16,25,25025,250250,14,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	14	54	NULL	31	0	0	0	0	0	4.89305E-06	1	1	4.89305E-06	g	mi
1,1,2035,7,5,16,25,25025,250250,14,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	14	53	NULL	31	0	0	0	0	0	2.82903E-06	1	1	2.82903E-06	g	mi
1,1,2035,7,5,16,25,25025,250250,14,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	14	52	NULL	31	0	0	0	0	0	2.86065E-06	1	1	2.86065E-06	g	mi
1,1,2035,7,5,16,25,25025,250250,14,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	14	51	NULL	31	0	0	0	0	0	3.45255E-06	1	1	3.45255E-06	g	mi
1,1,2035,7,5,16,25,25025,250250,14,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	14	36	NULL	31	0	0	0	0	0	8.98193E-05	1	1	8.98193E-05	g	mi
1,1,2035,7,5,16,25,25025,250250,14,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	14	35	NULL	31	0	0	0	0	0	9.34913E-06	1	1	9.34913E-06	g	mi
1,1,2035,7,5,16,25,25025,250250,14,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	14	31	NULL	31	0	0	0	0	0	0.00243169	1	1	0.00243169	g	mi
1,1,2035,7,5,16,25,25025,250250,14,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	14	5	NULL	31	0	0	0	0	0	0.002176681	1	1	0.002176681	g	mi
1,1,2035,7,5,16,25,25025,250250,14,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	14	3	NULL	31	0	0	0	0	0	0.029225569	1	1	0.029225569	g	mi
1,1,2035,7,5,16,25,25025,250250,14,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	14	2	NULL	31	0	0	0	0	0	1.276393414	1	1	1.276393414	g	mi
1,1,2035,7,5,16,25,25025,250250,14,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	14	1	NULL	31	0	0	0	0	0	0.049464379	1	1	0.049464379	g	mi
1,1,2035,7,5,16,25,25025,250250,13,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	13	122	NULL	31	0	0	0	0	0	0.000403137	1	1	0.000403137	g	mi
1,1,2035,7,5,16,25,25025,250250,13,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	13	121	NULL	31	0	0	0	0	0	0.000163564	1	1	0.000163564	g	mi
1,1,2035,7,5,16,25,25025,250250,13,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	13	119	NULL	31	0	0	0	0	0	0	1	1	0	g	mi
1,1,2035,7,5,16,25,25025,250250,13,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	13	118	NULL	31	0	0	0	0	0	0.00313914	1	1	0.00313914	g	mi
1,1,2035,7,5,16,25,25025,250250,13,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	13	117	NULL	31	0	0	0	0	0	0.00209615	1	1	0.00209615	g	mi
1,1,2035,7,5,16,25,25025,250250,13,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	13	116	NULL	31	0	0	0	0	0	0.00985679	1	1	0.00985679	g	mi
1,1,2035,7,5,16,25,25025,250250,13,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	13	115	NULL	31	0	0	0	0	0	0.000290165	1	1	0.000290165	g	mi

1,1,2035,7,5,16,25,25025,250250,13,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	13	112	NULL	31	0	0	0	0	0	0.000524631	1	1	0.000524631	g	mi
1,1,2035,7,5,16,25,25025,250250,13,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	13	111	NULL	31	0	0	0	0	0	0.00201568	1	1	0.00201568	g	mi
1,1,2035,7,5,16,25,25025,250250,13,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	13	110	NULL	31	0	0	0	0	0	0.00366378	1	1	0.00366378	g	mi
1,1,2035,7,5,16,25,25025,250250,13,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	13	107	NULL	31	0	0	0	0	0	0.0139744	1	1	0.0139744	g	mi
1,1,2035,7,5,16,25,25025,250250,13,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	13	106	NULL	31	0	0	0	0	0	0.0788543	1	1	0.0788543	g	mi
1,1,2035,7,5,16,25,25025,250250,13,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	13	100	NULL	31	0	0	0	0	0	0.00412837	1	1	0.00412837	g	mi
1,1,2035,7,5,16,25,25025,250250,13,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	13	98	NULL	31	0	0	0	0	0	416.8559875	1	1	416.8559875	g	mi
1,1,2035,7,5,16,25,25025,250250,13,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	13	91	NULL	31	0	0	0	0	0	0.005494543	1	1	0.005494543	g	mi
1,1,2035,7,5,16,25,25025,250250,13,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	13	90	NULL	31	0	0	0	0	0	416.7950134	1	1	416.7950134	g	mi
1,1,2035,7,5,16,25,25025,250250,13,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	13	87	NULL	31	0	0	0	0	0	0.057612464	1	1	0.057612464	g	mi
1,1,2035,7,5,16,25,25025,250250,13,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	13	79	NULL	31	0	0	0	0	0	0.05214306	1	1	0.05214306	g	mi
1,1,2035,7,5,16,25,25025,250250,13,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	13	66	NULL	31	0	0	0	0	0	5.28027E-05	1	1	5.28027E-05	g	mi
1,1,2035,7,5,16,25,25025,250250,13,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	13	59	NULL	31	0	0	0	0	0	6.58971E-05	1	1	6.58971E-05	g	mi
1,1,2035,7,5,16,25,25025,250250,13,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	13	58	NULL	31	0	0	0	0	0	1.16684E-05	1	1	1.16684E-05	g	mi
1,1,2035,7,5,16,25,25025,250250,13,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	13	57	NULL	31	0	0	0	0	0	1.16604E-05	1	1	1.16604E-05	g	mi
1,1,2035,7,5,16,25,25025,250250,13,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	13	56	NULL	31	0	0	0	0	0	1.23803E-06	1	1	1.23803E-06	g	mi
1,1,2035,7,5,16,25,25025,250250,13,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	13	55	NULL	31	0	0	0	0	0	5.19924E-05	1	1	5.19924E-05	g	mi
1,1,2035,7,5,16,25,25025,250250,13,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	13	54	NULL	31	0	0	0	0	0	5.3902E-06	1	1	5.3902E-06	g	mi
1,1,2035,7,5,16,25,25025,250250,13,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	13	53	NULL	31	0	0	0	0	0	3.10745E-06	1	1	3.10745E-06	g	mi
1,1,2035,7,5,16,25,25025,250250,13,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	13	52	NULL	31	0	0	0	0	0	3.42114E-06	1	1	3.42114E-06	g	mi
1,1,2035,7,5,16,25,25025,250250,13,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	13	51	NULL	31	0	0	0	0	0	3.79117E-06	1	1	3.79117E-06	g	mi
1,1,2035,7,5,16,25,25025,250250,13,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	13	36	NULL	31	0	0	0	0	0	9.82044E-05	1	1	9.82044E-05	g	mi
1,1,2035,7,5,16,25,25025,250250,13,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	13	35	NULL	31	0	0	0	0	0	1.02277E-05	1	1	1.02277E-05	g	mi
1,1,2035,7,5,16,25,25025,250250,13,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	13	31	NULL	31	0	0	0	0	0	0.00282915	1	1	0.00282915	g	mi
1,1,2035,7,5,16,25,25025,250250,13,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	13	5	NULL	31	0	0	0	0	0	0.002433197	1	1	0.002433197	g	mi
1,1,2035,7,5,16,25,25025,250250,13,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	13	3	NULL	31	0	0	0	0	0	0.030868035	1	1	0.030868035	g	mi
1,1,2035,7,5,16,25,25025,250250,13,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	13	2	NULL	31	0	0	0	0	0	1.405640483	1	1	1.405640483	g	mi

1,1,2035,7,5,16,25,25025,250250,13,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	13	1	NULL	31	0	0	0	0	0	0.054556232	1	1	0.054556232	g	mi
1,1,2035,7,5,16,25,25025,250250,12,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	12	122	NULL	31	0	0	0	0	0	0.000441687	1	1	0.000441687	g	mi
1,1,2035,7,5,16,25,25025,250250,12,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	12	121	NULL	31	0	0	0	0	0	0.000178508	1	1	0.000178508	g	mi
1,1,2035,7,5,16,25,25025,250250,12,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	12	119	NULL	31	0	0	0	0	0	0	1	1	0	g	mi
1,1,2035,7,5,16,25,25025,250250,12,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	12	118	NULL	31	0	0	0	0	0	0.00350326	1	1	0.00350326	g	mi
1,1,2035,7,5,16,25,25025,250250,12,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	12	117	NULL	31	0	0	0	0	0	0.0022581	1	1	0.0022581	g	mi
1,1,2035,7,5,16,25,25025,250250,12,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	12	116	NULL	31	0	0	0	0	0	0.0130535	1	1	0.0130535	g	mi
1,1,2035,7,5,16,25,25025,250250,12,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	12	115	NULL	31	0	0	0	0	0	0.00038286	1	1	0.00038286	g	mi
1,1,2035,7,5,16,25,25025,250250,12,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	12	112	NULL	31	0	0	0	0	0	0.000579841	1	1	0.000579841	g	mi
1,1,2035,7,5,16,25,25025,250250,12,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	12	111	NULL	31	0	0	0	0	0	0.00220843	1	1	0.00220843	g	mi
1,1,2035,7,5,16,25,25025,250250,12,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	12	110	NULL	31	0	0	0	0	0	0.0040831	1	1	0.0040831	g	mi
1,1,2035,7,5,16,25,25025,250250,12,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	12	107	NULL	31	0	0	0	0	0	0.0150541	1	1	0.0150541	g	mi
1,1,2035,7,5,16,25,25025,250250,12,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	12	106	NULL	31	0	0	0	0	0	0.104428001	1	1	0.104428001	g	mi
1,1,2035,7,5,16,25,25025,250250,12,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	12	100	NULL	31	0	0	0	0	0	0.00459695	1	1	0.00459695	g	mi
1,1,2035,7,5,16,25,25025,250250,12,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	12	98	NULL	31	0	0	0	0	0	531.2680054	1	1	531.2680054	g	mi
1,1,2035,7,5,16,25,25025,250250,12,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	12	91	NULL	31	0	0	0	0	0	0.007002824	1	1	0.007002824	g	mi
1,1,2035,7,5,16,25,25025,250250,12,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	12	90	NULL	31	0	0	0	0	0	531.1970215	1	1	531.1970215	g	mi
1,1,2035,7,5,16,25,25025,250250,12,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	12	87	NULL	31	0	0	0	0	0	0.068182535	1	1	0.068182535	g	mi
1,1,2035,7,5,16,25,25025,250250,12,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	12	79	NULL	31	0	0	0	0	0	0.061529711	1	1	0.061529711	g	mi
1,1,2035,7,5,16,25,25025,250250,12,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	12	66	NULL	31	0	0	0	0	0	7.9204E-05	1	1	7.9204E-05	g	mi
1,1,2035,7,5,16,25,25025,250250,12,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	12	59	NULL	31	0	0	0	0	0	7.21088E-05	1	1	7.21088E-05	g	mi
1,1,2035,7,5,16,25,25025,250250,12,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	12	58	NULL	31	0	0	0	0	0	1.2766E-05	1	1	1.2766E-05	g	mi
1,1,2035,7,5,16,25,25025,250250,12,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	12	57	NULL	31	0	0	0	0	0	1.27594E-05	1	1	1.27594E-05	g	mi
1,1,2035,7,5,16,25,25025,250250,12,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	12	56	NULL	31	0	0	0	0	0	1.35818E-06	1	1	1.35818E-06	g	mi
1,1,2035,7,5,16,25,25025,250250,12,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	12	55	NULL	31	0	0	0	0	0	5.68907E-05	1	1	5.68907E-05	g	mi
1,1,2035,7,5,16,25,25025,250250,12,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	12	54	NULL	31	0	0	0	0	0	5.95504E-06	1	1	5.95504E-06	g	mi
1,1,2035,7,5,16,25,25025,250250,12,31,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	12	53	NULL	31	0	0	0	0	0	3.41288E-06	1	1	3.41288E-06	g	mi

1,1,2035,7,5,16,25,25025,250250,12,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	12	52	NULL	31	0	0	0	0	0	4.38284E-06	1	1	4.38284E-06	g	mi
1,1,2035,7,5,16,25,25025,250250,12,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	12	51	NULL	31	0	0	0	0	0	4.16076E-06	1	1	4.16076E-06	g	mi
1,1,2035,7,5,16,25,25025,250250,12,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	12	36	NULL	31	0	0	0	0	0	0.000106838	1	1	0.000106838	g	mi
1,1,2035,7,5,16,25,25025,250250,12,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	12	35	NULL	31	0	0	0	0	0	1.11393E-05	1	1	1.11393E-05	g	mi
1,1,2035,7,5,16,25,25025,250250,12,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	12	31	NULL	31	0	0	0	0	0	0.00360497	1	1	0.00360497	g	mi
1,1,2035,7,5,16,25,25025,250250,12,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	12	5	NULL	31	0	0	0	0	0	0.002880662	1	1	0.002880662	g	mi
1,1,2035,7,5,16,25,25025,250250,12,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	12	3	NULL	31	0	0	0	0	0	0.034012958	1	1	0.034012958	g	mi
1,1,2035,7,5,16,25,25025,250250,12,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	12	2	NULL	31	0	0	0	0	0	1.507733583	1	1	1.507733583	g	mi
1,1,2035,7,5,16,25,25025,250250,12,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	12	1	NULL	31	0	0	0	0	0	0.064389169	1	1	0.064389169	g	mi
1,1,2035,7,5,16,25,25025,250250,11,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	11	122	NULL	31	0	0	0	0	0	0.000557337	1	1	0.000557337	g	mi
1,1,2035,7,5,16,25,25025,250250,11,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	11	121	NULL	31	0	0	0	0	0	0.00022334	1	1	0.00022334	g	mi
1,1,2035,7,5,16,25,25025,250250,11,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	11	119	NULL	31	0	0	0	0	0	0	1	1	0	g	mi
1,1,2035,7,5,16,25,25025,250250,11,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	11	118	NULL	31	0	0	0	0	0	0.0045956	1	1	0.0045956	g	mi
1,1,2035,7,5,16,25,25025,250250,11,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	11	117	NULL	31	0	0	0	0	0	0.0024332	1	1	0.0024332	g	mi
1,1,2035,7,5,16,25,25025,250250,11,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	11	116	NULL	31	0	0	0	0	0	0.022643499	1	1	0.022643499	g	mi
1,1,2035,7,5,16,25,25025,250250,11,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	11	115	NULL	31	0	0	0	0	0	0.000660946	1	1	0.000660946	g	mi
1,1,2035,7,5,16,25,25025,250250,11,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	11	112	NULL	31	0	0	0	0	0	0.000745472	1	1	0.000745472	g	mi
1,1,2035,7,5,16,25,25025,250250,11,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	11	111	NULL	31	0	0	0	0	0	0.00278668	1	1	0.00278668	g	mi
1,1,2035,7,5,16,25,25025,250250,11,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	11	110	NULL	31	0	0	0	0	0	0.00534107	1	1	0.00534107	g	mi
1,1,2035,7,5,16,25,25025,250250,11,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	11	107	NULL	31	0	0	0	0	0	0.0162214	1	1	0.0162214	g	mi
1,1,2035,7,5,16,25,25025,250250,11,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	11	106	NULL	31	0	0	0	0	0	0.181147993	1	1	0.181147993	g	mi
1,1,2035,7,5,16,25,25025,250250,11,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	11	100	NULL	31	0	0	0	0	0	0.00600268	1	1	0.00600268	g	mi
1,1,2035,7,5,16,25,25025,250250,11,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	11	98	NULL	31	0	0	0	0	0	874.5059814	1	1	874.5059814	g	mi
1,1,2035,7,5,16,25,25025,250250,11,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	11	91	NULL	31	0	0	0	0	0	0.011527635	1	1	0.011527635	g	mi
1,1,2035,7,5,16,25,25025,250250,11,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	11	90	NULL	31	0	0	0	0	0	874.401001	1	1	874.401001	g	mi
1,1,2035,7,5,16,25,25025,250250,11,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	11	87	NULL	31	0	0	0	0	0	0.099892974	1	1	0.099892974	g	mi
1,1,2035,7,5,16,25,25025,250250,11,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	11	79	NULL	31	0	0	0	0	0	0.089689761	1	1	0.089689761	g	mi

1,1,2035,7,5,16,25,25025,250250,11,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	11	66	NULL	31	0	0	0	0	0	0.000158408	1	1	0.000158408	g	mi
1,1,2035,7,5,16,25,25025,250250,11,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	11	59	NULL	31	0	0	0	0	0	9.07437E-05	1	1	9.07437E-05	g	mi
1,1,2035,7,5,16,25,25025,250250,11,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	11	58	NULL	31	0	0	0	0	0	1.60588E-05	1	1	1.60588E-05	g	mi
1,1,2035,7,5,16,25,25025,250250,11,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	11	57	NULL	31	0	0	0	0	0	1.60563E-05	1	1	1.60563E-05	g	mi
1,1,2035,7,5,16,25,25025,250250,11,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	11	56	NULL	31	0	0	0	0	0	1.71865E-06	1	1	1.71865E-06	g	mi
1,1,2035,7,5,16,25,25025,250250,11,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	11	55	NULL	31	0	0	0	0	0	7.15858E-05	1	1	7.15858E-05	g	mi
1,1,2035,7,5,16,25,25025,250250,11,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	11	54	NULL	31	0	0	0	0	0	7.64953E-06	1	1	7.64953E-06	g	mi
1,1,2035,7,5,16,25,25025,250250,11,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	11	53	NULL	31	0	0	0	0	0	4.32914E-06	1	1	4.32914E-06	g	mi
1,1,2035,7,5,16,25,25025,250250,11,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	11	52	NULL	31	0	0	0	0	0	7.26795E-06	1	1	7.26795E-06	g	mi
1,1,2035,7,5,16,25,25025,250250,11,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	11	51	NULL	31	0	0	0	0	0	5.26952E-06	1	1	5.26952E-06	g	mi
1,1,2035,7,5,16,25,25025,250250,11,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	11	36	NULL	31	0	0	0	0	0	0.000132738	1	1	0.000132738	g	mi
1,1,2035,7,5,16,25,25025,250250,11,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	11	35	NULL	31	0	0	0	0	0	1.38741E-05	1	1	1.38741E-05	g	mi
1,1,2035,7,5,16,25,25025,250250,11,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	11	31	NULL	31	0	0	0	0	0	0.00593245	1	1	0.00593245	g	mi
1,1,2035,7,5,16,25,25025,250250,11,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	11	5	NULL	31	0	0	0	0	0	0.004223058	1	1	0.004223058	g	mi
1,1,2035,7,5,16,25,25025,250250,11,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	11	3	NULL	31	0	0	0	0	0	0.043447737	1	1	0.043447737	g	mi
1,1,2035,7,5,16,25,25025,250250,11,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	11	2	NULL	31	0	0	0	0	0	1.813992858	1	1	1.813992858	g	mi
1,1,2035,7,5,16,25,25025,250250,11,31,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	11	1	NULL	31	0	0	0	0	0	0.093887791	1	1	0.093887791	g	mi
1,1,2035,7,5,16,25,25025,250250,10,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	10	122	NULL	21	0	0	0	0	0	0.0002061	1	1	0.0002061	g	mi
1,1,2035,7,5,16,25,25025,250250,10,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	10	121	NULL	21	0	0	0	0	0	8.45829E-05	1	1	8.45829E-05	g	mi
1,1,2035,7,5,16,25,25025,250250,10,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	10	119	NULL	21	0	0	0	0	0	0	1	1	0	g	mi
1,1,2035,7,5,16,25,25025,250250,10,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	10	118	NULL	21	0	0	0	0	0	0.00151627	1	1	0.00151627	g	mi
1,1,2035,7,5,16,25,25025,250250,10,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	10	117	NULL	21	0	0	0	0	0	0.001229	1	1	0.001229	g	mi
1,1,2035,7,5,16,25,25025,250250,10,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	10	116	NULL	21	0	0	0	0	0	0.00128294	1	1	0.00128294	g	mi
1,1,2035,7,5,16,25,25025,250250,10,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	10	115	NULL	21	0	0	0	0	0	5.83666E-05	1	1	5.83666E-05	g	mi
1,1,2035,7,5,16,25,25025,250250,10,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	10	112	NULL	21	0	0	0	0	0	0.00026002	1	1	0.00026002	g	mi
1,1,2035,7,5,16,25,25025,250250,10,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	10	111	NULL	21	0	0	0	0	0	0.0010305	1	1	0.0010305	g	mi
1,1,2035,7,5,16,25,25025,250250,10,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	10	110	NULL	21	0	0	0	0	0	0.00177629	1	1	0.00177629	g	mi

1,1,2035,7,5,16,25,25025,250250,10,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	10	107	NULL	21	0	0	0	0	0	0.00819337	1	1	0.00819337	g	mi
1,1,2035,7,5,16,25,25025,250250,10,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	10	106	NULL	21	0	0	0	0	0	0.0102635	1	1	0.0102635	g	mi
1,1,2035,7,5,16,25,25025,250250,10,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	10	100	NULL	21	0	0	0	0	0	0.00200698	1	1	0.00200698	g	mi
1,1,2035,7,5,16,25,25025,250250,10,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	10	98	NULL	21	0	0	0	0	0	186.2189941	1	1	186.2189941	g	mi
1,1,2035,7,5,16,25,25025,250250,10,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	10	91	NULL	21	0	0	0	0	0	0.002455225	1	1	0.002455225	g	mi
1,1,2035,7,5,16,25,25025,250250,10,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	10	90	NULL	21	0	0	0	0	0	186.1889954	1	1	186.1889954	g	mi
1,1,2035,7,5,16,25,25025,250250,10,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	10	87	NULL	21	0	0	0	0	0	0.053973529	1	1	0.053973529	g	mi
1,1,2035,7,5,16,25,25025,250250,10,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	10	79	NULL	21	0	0	0	0	0	0.049413402	1	1	0.049413402	g	mi
1,1,2035,7,5,16,25,25025,250250,10,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	10	66	NULL	21	0	0	0	0	0	1.59196E-05	1	1	1.59196E-05	g	mi
1,1,2035,7,5,16,25,25025,250250,10,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	10	59	NULL	21	0	0	0	0	0	3.38006E-05	1	1	3.38006E-05	g	mi
1,1,2035,7,5,16,25,25025,250250,10,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	10	58	NULL	21	0	0	0	0	0	5.98958E-06	1	1	5.98958E-06	g	mi
1,1,2035,7,5,16,25,25025,250250,10,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	10	57	NULL	21	0	0	0	0	0	5.98857E-06	1	1	5.98857E-06	g	mi
1,1,2035,7,5,16,25,25025,250250,10,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	10	56	NULL	21	0	0	0	0	0	6.30474E-07	1	1	6.30474E-07	g	mi
1,1,2035,7,5,16,25,25025,250250,10,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	10	55	NULL	21	0	0	0	0	0	2.66813E-05	1	1	2.66813E-05	g	mi
1,1,2035,7,5,16,25,25025,250250,10,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	10	54	NULL	21	0	0	0	0	0	2.68627E-06	1	1	2.68627E-06	g	mi
1,1,2035,7,5,16,25,25025,250250,10,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	10	53	NULL	21	0	0	0	0	0	1.5771E-06	1	1	1.5771E-06	g	mi
1,1,2035,7,5,16,25,25025,250250,10,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	10	52	NULL	21	0	0	0	0	0	8.70691E-07	1	1	8.70691E-07	g	mi
1,1,2035,7,5,16,25,25025,250250,10,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	10	51	NULL	21	0	0	0	0	0	1.93224E-06	1	1	1.93224E-06	g	mi
1,1,2035,7,5,16,25,25025,250250,10,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	10	36	NULL	21	0	0	0	0	0	5.12417E-05	1	1	5.12417E-05	g	mi
1,1,2035,7,5,16,25,25025,250250,10,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	10	35	NULL	21	0	0	0	0	0	5.32484E-06	1	1	5.32484E-06	g	mi
1,1,2035,7,5,16,25,25025,250250,10,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	10	31	NULL	21	0	0	0	0	0	0.00124863	1	1	0.00124863	g	mi
1,1,2035,7,5,16,25,25025,250250,10,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	10	5	NULL	21	0	0	0	0	0	0.001182528	1	1	0.001182528	g	mi
1,1,2035,7,5,16,25,25025,250250,10,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	10	3	NULL	21	0	0	0	0	0	0.027828714	1	1	0.027828714	g	mi
1,1,2035,7,5,16,25,25025,250250,10,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	10	2	NULL	21	0	0	0	0	0	0.870431423	1	1	0.870431423	g	mi
1,1,2035,7,5,16,25,25025,250250,10,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	10	1	NULL	21	0	0	0	0	0	0.05058109	1	1	0.05058109	g	mi
1,1,2035,7,5,16,25,25025,250250,9,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	9	122	NULL	21	0	0	0	0	0	0.000205903	1	1	0.000205903	g	mi
1,1,2035,7,5,16,25,25025,250250,9,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	9	121	NULL	21	0	0	0	0	0	8.45019E-05	1	1	8.45019E-05	g	mi

1,1,2035,7,5,16,25,25025,250250,9,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	9	119	NULL	21	0	0	0	0	0	0	1	1	0	g	mi
1,1,2035,7,5,16,25,25025,250250,9,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	9	118	NULL	21	0	0	0	0	0	0.00151482	1	1	0.00151482	g	mi
1,1,2035,7,5,16,25,25025,250250,9,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	9	117	NULL	21	0	0	0	0	0	0.001324	1	1	0.001324	g	mi
1,1,2035,7,5,16,25,25025,250250,9,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	9	116	NULL	21	0	0	0	0	0	0.00198081	1	1	0.00198081	g	mi
1,1,2035,7,5,16,25,25025,250250,9,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	9	115	NULL	21	0	0	0	0	0	5.83107E-05	1	1	5.83107E-05	g	mi
1,1,2035,7,5,16,25,25025,250250,9,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	9	112	NULL	21	0	0	0	0	0	0.000259771	1	1	0.000259771	g	mi
1,1,2035,7,5,16,25,25025,250250,9,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	9	111	NULL	21	0	0	0	0	0	0.00102951	1	1	0.00102951	g	mi
1,1,2035,7,5,16,25,25025,250250,9,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	9	110	NULL	21	0	0	0	0	0	0.00177459	1	1	0.00177459	g	mi
1,1,2035,7,5,16,25,25025,250250,9,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	9	107	NULL	21	0	0	0	0	0	0.00882671	1	1	0.00882671	g	mi
1,1,2035,7,5,16,25,25025,250250,9,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	9	106	NULL	21	0	0	0	0	0	0.0158465	1	1	0.0158465	g	mi
1,1,2035,7,5,16,25,25025,250250,9,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	9	100	NULL	21	0	0	0	0	0	0.00200506	1	1	0.00200506	g	mi
1,1,2035,7,5,16,25,25025,250250,9,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	9	98	NULL	21	0	0	0	0	0	190.7220001	1	1	190.7220001	g	mi
1,1,2035,7,5,16,25,25025,250250,9,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	9	91	NULL	21	0	0	0	0	0	0.002514616	1	1	0.002514616	g	mi
1,1,2035,7,5,16,25,25025,250250,9,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	9	90	NULL	21	0	0	0	0	0	190.6940002	1	1	190.6940002	g	mi
1,1,2035,7,5,16,25,25025,250250,9,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	9	87	NULL	21	0	0	0	0	0	0.054735187	1	1	0.054735187	g	mi
1,1,2035,7,5,16,25,25025,250250,9,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	9	79	NULL	21	0	0	0	0	0	0.050072011	1	1	0.050072011	g	mi
1,1,2035,7,5,16,25,25025,250250,9,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	9	66	NULL	21	0	0	0	0	0	1.76884E-05	1	1	1.76884E-05	g	mi
1,1,2035,7,5,16,25,25025,250250,9,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	9	59	NULL	21	0	0	0	0	0	3.37682E-05	1	1	3.37682E-05	g	mi
1,1,2035,7,5,16,25,25025,250250,9,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	9	58	NULL	21	0	0	0	0	0	5.98384E-06	1	1	5.98384E-06	g	mi
1,1,2035,7,5,16,25,25025,250250,9,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	9	57	NULL	21	0	0	0	0	0	5.98283E-06	1	1	5.98283E-06	g	mi
1,1,2035,7,5,16,25,25025,250250,9,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	9	56	NULL	21	0	0	0	0	0	6.2987E-07	1	1	6.2987E-07	g	mi
1,1,2035,7,5,16,25,25025,250250,9,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	9	55	NULL	21	0	0	0	0	0	2.66558E-05	1	1	2.66558E-05	g	mi
1,1,2035,7,5,16,25,25025,250250,9,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	9	54	NULL	21	0	0	0	0	0	2.6837E-06	1	1	2.6837E-06	g	mi
1,1,2035,7,5,16,25,25025,250250,9,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	9	53	NULL	21	0	0	0	0	0	1.57559E-06	1	1	1.57559E-06	g	mi
1,1,2035,7,5,16,25,25025,250250,9,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	9	52	NULL	21	0	0	0	0	0	8.69857E-07	1	1	8.69857E-07	g	mi
1,1,2035,7,5,16,25,25025,250250,9,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	9	51	NULL	21	0	0	0	0	0	1.93039E-06	1	1	1.93039E-06	g	mi
1,1,2035,7,5,16,25,25025,250250,9,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	9	36	NULL	21	0	0	0	0	0	5.11926E-05	1	1	5.11926E-05	g	mi

1,1,2035,7,5,16,25,25025,250250,9,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	9	35	NULL	21	0	0	0	0	0	5.31974E-06	1	1	5.31974E-06	g	mi
1,1,2035,7,5,16,25,25025,250250,9,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	9	31	NULL	21	0	0	0	0	0	0.00127884	1	1	0.00127884	g	mi
1,1,2035,7,5,16,25,25025,250250,9,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	9	5	NULL	21	0	0	0	0	0	0.001152559	1	1	0.001152559	g	mi
1,1,2035,7,5,16,25,25025,250250,9,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	9	3	NULL	21	0	0	0	0	0	0.026067443	1	1	0.026067443	g	mi
1,1,2035,7,5,16,25,25025,250250,9,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	9	2	NULL	21	0	0	0	0	0	0.863840938	1	1	0.863840938	g	mi
1,1,2035,7,5,16,25,25025,250250,9,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	9	1	NULL	21	0	0	0	0	0	0.051210113	1	1	0.051210113	g	mi
1,1,2035,7,5,16,25,25025,250250,8,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	8	122	NULL	21	0	0	0	0	0	0.000211539	1	1	0.000211539	g	mi
1,1,2035,7,5,16,25,25025,250250,8,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	8	121	NULL	21	0	0	0	0	0	8.68148E-05	1	1	8.68148E-05	g	mi
1,1,2035,7,5,16,25,25025,250250,8,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	8	119	NULL	21	0	0	0	0	0	0	1	1	0	g	mi
1,1,2035,7,5,16,25,25025,250250,8,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	8	118	NULL	21	0	0	0	0	0	0.00155628	1	1	0.00155628	g	mi
1,1,2035,7,5,16,25,25025,250250,8,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	8	117	NULL	21	0	0	0	0	0	0.001427	1	1	0.001427	g	mi
1,1,2035,7,5,16,25,25025,250250,8,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	8	116	NULL	21	0	0	0	0	0	0.00275537	1	1	0.00275537	g	mi
1,1,2035,7,5,16,25,25025,250250,8,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	8	115	NULL	21	0	0	0	0	0	5.99067E-05	1	1	5.99067E-05	g	mi
1,1,2035,7,5,16,25,25025,250250,8,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	8	112	NULL	21	0	0	0	0	0	0.000266881	1	1	0.000266881	g	mi
1,1,2035,7,5,16,25,25025,250250,8,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	8	111	NULL	21	0	0	0	0	0	0.00105769	1	1	0.00105769	g	mi
1,1,2035,7,5,16,25,25025,250250,8,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	8	110	NULL	21	0	0	0	0	0	0.00182317	1	1	0.00182317	g	mi
1,1,2035,7,5,16,25,25025,250250,8,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	8	107	NULL	21	0	0	0	0	0	0.00951338	1	1	0.00951338	g	mi
1,1,2035,7,5,16,25,25025,250250,8,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	8	106	NULL	21	0	0	0	0	0	0.022043001	1	1	0.022043001	g	mi
1,1,2035,7,5,16,25,25025,250250,8,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	8	100	NULL	21	0	0	0	0	0	0.00205994	1	1	0.00205994	g	mi
1,1,2035,7,5,16,25,25025,250250,8,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	8	98	NULL	21	0	0	0	0	0	196.9570007	1	1	196.9570007	g	mi
1,1,2035,7,5,16,25,25025,250250,8,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	8	91	NULL	21	0	0	0	0	0	0.002596829	1	1	0.002596829	g	mi
1,1,2035,7,5,16,25,25025,250250,8,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	8	90	NULL	21	0	0	0	0	0	196.9279938	1	1	196.9279938	g	mi
1,1,2035,7,5,16,25,25025,250250,8,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	8	87	NULL	21	0	0	0	0	0	0.056036592	1	1	0.056036592	g	mi
1,1,2035,7,5,16,25,25025,250250,8,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	8	79	NULL	21	0	0	0	0	0	0.051272951	1	1	0.051272951	g	mi
1,1,2035,7,5,16,25,25025,250250,8,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	8	66	NULL	21	0	0	0	0	0	1.98995E-05	1	1	1.98995E-05	g	mi
1,1,2035,7,5,16,25,25025,250250,8,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	8	59	NULL	21	0	0	0	0	0	3.46925E-05	1	1	3.46925E-05	g	mi
1,1,2035,7,5,16,25,25025,250250,8,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	8	58	NULL	21	0	0	0	0	0	6.14763E-06	1	1	6.14763E-06	g	mi

1,1,2035,7,5,16,25,25025,250250,8,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	8	57	NULL	21	0	0	0	0	0	6.1466E-06	1	1	6.1466E-06	g	mi
1,1,2035,7,5,16,25,25025,250250,8,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	8	56	NULL	21	0	0	0	0	0	6.4711E-07	1	1	6.4711E-07	g	mi
1,1,2035,7,5,16,25,25025,250250,8,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	8	55	NULL	21	0	0	0	0	0	2.73854E-05	1	1	2.73854E-05	g	mi
1,1,2035,7,5,16,25,25025,250250,8,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	8	54	NULL	21	0	0	0	0	0	2.75715E-06	1	1	2.75715E-06	g	mi
1,1,2035,7,5,16,25,25025,250250,8,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	8	53	NULL	21	0	0	0	0	0	1.61871E-06	1	1	1.61871E-06	g	mi
1,1,2035,7,5,16,25,25025,250250,8,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	8	52	NULL	21	0	0	0	0	0	8.93667E-07	1	1	8.93667E-07	g	mi
1,1,2035,7,5,16,25,25025,250250,8,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	8	51	NULL	21	0	0	0	0	0	1.98323E-06	1	1	1.98323E-06	g	mi
1,1,2035,7,5,16,25,25025,250250,8,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	8	36	NULL	21	0	0	0	0	0	5.25939E-05	1	1	5.25939E-05	g	mi
1,1,2035,7,5,16,25,25025,250250,8,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	8	35	NULL	21	0	0	0	0	0	5.46535E-06	1	1	5.46535E-06	g	mi
1,1,2035,7,5,16,25,25025,250250,8,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	8	31	NULL	21	0	0	0	0	0	0.00132065	1	1	0.00132065	g	mi
1,1,2035,7,5,16,25,25025,250250,8,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	8	5	NULL	21	0	0	0	0	0	0.001185084	1	1	0.001185084	g	mi
1,1,2035,7,5,16,25,25025,250250,8,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	8	3	NULL	21	0	0	0	0	0	0.025141606	1	1	0.025141606	g	mi
1,1,2035,7,5,16,25,25025,250250,8,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	8	2	NULL	21	0	0	0	0	0	0.909018397	1	1	0.909018397	g	mi
1,1,2035,7,5,16,25,25025,250250,8,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	8	1	NULL	21	0	0	0	0	0	0.052443169	1	1	0.052443169	g	mi
1,1,2035,7,5,16,25,25025,250250,7,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	7	122	NULL	21	0	0	0	0	0	0.000222354	1	1	0.000222354	g	mi
1,1,2035,7,5,16,25,25025,250250,7,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	7	121	NULL	21	0	0	0	0	0	9.12532E-05	1	1	9.12532E-05	g	mi
1,1,2035,7,5,16,25,25025,250250,7,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	7	119	NULL	21	0	0	0	0	0	0	1	1	0	g	mi
1,1,2035,7,5,16,25,25025,250250,7,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	7	118	NULL	21	0	0	0	0	0	0.00163585	1	1	0.00163585	g	mi
1,1,2035,7,5,16,25,25025,250250,7,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	7	117	NULL	21	0	0	0	0	0	0.001537	1	1	0.001537	g	mi
1,1,2035,7,5,16,25,25025,250250,7,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	7	116	NULL	21	0	0	0	0	0	0.00369192	1	1	0.00369192	g	mi
1,1,2035,7,5,16,25,25025,250250,7,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	7	115	NULL	21	0	0	0	0	0	6.29695E-05	1	1	6.29695E-05	g	mi
1,1,2035,7,5,16,25,25025,250250,7,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	7	112	NULL	21	0	0	0	0	0	0.000280526	1	1	0.000280526	g	mi
1,1,2035,7,5,16,25,25025,250250,7,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	7	111	NULL	21	0	0	0	0	0	0.00111177	1	1	0.00111177	g	mi
1,1,2035,7,5,16,25,25025,250250,7,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	7	110	NULL	21	0	0	0	0	0	0.00191638	1	1	0.00191638	g	mi
1,1,2035,7,5,16,25,25025,250250,7,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	7	107	NULL	21	0	0	0	0	0	0.0102467	1	1	0.0102467	g	mi
1,1,2035,7,5,16,25,25025,250250,7,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	7	106	NULL	21	0	0	0	0	0	0.029535299	1	1	0.029535299	g	mi
1,1,2035,7,5,16,25,25025,250250,7,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	7	100	NULL	21	0	0	0	0	0	0.00216526	1	1	0.00216526	g	mi

1,1,2035,7,5,16,25,25025,250250,7,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	7	98	NULL	21	0	0	0	0	0	205.3419952	1	1	205.3419952	g	mi
1,1,2035,7,5,16,25,25025,250250,7,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	7	91	NULL	21	0	0	0	0	0	0.002707364	1	1	0.002707364	g	mi
1,1,2035,7,5,16,25,25025,250250,7,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	7	90	NULL	21	0	0	0	0	0	205.3099976	1	1	205.3099976	g	mi
1,1,2035,7,5,16,25,25025,250250,7,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	7	87	NULL	21	0	0	0	0	0	0.05792151	1	1	0.05792151	g	mi
1,1,2035,7,5,16,25,25025,250250,7,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	7	79	NULL	21	0	0	0	0	0	0.053046279	1	1	0.053046279	g	mi
1,1,2035,7,5,16,25,25025,250250,7,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	7	66	NULL	21	0	0	0	0	0	2.27422E-05	1	1	2.27422E-05	g	mi
1,1,2035,7,5,16,25,25025,250250,7,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	7	59	NULL	21	0	0	0	0	0	3.64662E-05	1	1	3.64662E-05	g	mi
1,1,2035,7,5,16,25,25025,250250,7,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	7	58	NULL	21	0	0	0	0	0	6.46192E-06	1	1	6.46192E-06	g	mi
1,1,2035,7,5,16,25,25025,250250,7,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	7	57	NULL	21	0	0	0	0	0	6.46084E-06	1	1	6.46084E-06	g	mi
1,1,2035,7,5,16,25,25025,250250,7,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	7	56	NULL	21	0	0	0	0	0	6.80194E-07	1	1	6.80194E-07	g	mi
1,1,2035,7,5,16,25,25025,250250,7,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	7	55	NULL	21	0	0	0	0	0	2.87855E-05	1	1	2.87855E-05	g	mi
1,1,2035,7,5,16,25,25025,250250,7,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	7	54	NULL	21	0	0	0	0	0	2.89811E-06	1	1	2.89811E-06	g	mi
1,1,2035,7,5,16,25,25025,250250,7,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	7	53	NULL	21	0	0	0	0	0	1.70147E-06	1	1	1.70147E-06	g	mi
1,1,2035,7,5,16,25,25025,250250,7,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	7	52	NULL	21	0	0	0	0	0	9.39356E-07	1	1	9.39356E-07	g	mi
1,1,2035,7,5,16,25,25025,250250,7,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	7	51	NULL	21	0	0	0	0	0	2.08462E-06	1	1	2.08462E-06	g	mi
1,1,2035,7,5,16,25,25025,250250,7,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	7	36	NULL	21	0	0	0	0	0	5.52827E-05	1	1	5.52827E-05	g	mi
1,1,2035,7,5,16,25,25025,250250,7,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	7	35	NULL	21	0	0	0	0	0	5.74476E-06	1	1	5.74476E-06	g	mi
1,1,2035,7,5,16,25,25025,250250,7,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	7	31	NULL	21	0	0	0	0	0	0.00137686	1	1	0.00137686	g	mi
1,1,2035,7,5,16,25,25025,250250,7,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	7	5	NULL	21	0	0	0	0	0	0.001269359	1	1	0.001269359	g	mi
1,1,2035,7,5,16,25,25025,250250,7,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	7	3	NULL	21	0	0	0	0	0	0.024724988	1	1	0.024724988	g	mi
1,1,2035,7,5,16,25,25025,250250,7,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	7	2	NULL	21	0	0	0	0	0	0.999509454	1	1	0.999509454	g	mi
1,1,2035,7,5,16,25,25025,250250,7,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	7	1	NULL	21	0	0	0	0	0	0.054299731	1	1	0.054299731	g	mi
1,1,2035,7,5,16,25,25025,250250,6,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	6	122	NULL	21	0	0	0	0	0	0.000237083	1	1	0.000237083	g	mi
1,1,2035,7,5,16,25,25025,250250,6,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	6	121	NULL	21	0	0	0	0	0	9.72981E-05	1	1	9.72981E-05	g	mi
1,1,2035,7,5,16,25,25025,250250,6,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	6	119	NULL	21	0	0	0	0	0	0	1	1	0	g	mi
1,1,2035,7,5,16,25,25025,250250,6,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	6	118	NULL	21	0	0	0	0	0	0.00174421	1	1	0.00174421	g	mi
1,1,2035,7,5,16,25,25025,250250,6,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	6	117	NULL	21	0	0	0	0	0	0.001656	1	1	0.001656	g	mi

1,1,2035,7,5,16,25,25025,250250,6,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	6	116	NULL	21	0	0	0	0	0	0.00493551	1	1	0.00493551	g	mi
1,1,2035,7,5,16,25,25025,250250,6,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	6	115	NULL	21	0	0	0	0	0	6.71408E-05	1	1	6.71408E-05	g	mi
1,1,2035,7,5,16,25,25025,250250,6,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	6	112	NULL	21	0	0	0	0	0	0.000299108	1	1	0.000299108	g	mi
1,1,2035,7,5,16,25,25025,250250,6,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	6	111	NULL	21	0	0	0	0	0	0.00118541	1	1	0.00118541	g	mi
1,1,2035,7,5,16,25,25025,250250,6,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	6	110	NULL	21	0	0	0	0	0	0.00204332	1	1	0.00204332	g	mi
1,1,2035,7,5,16,25,25025,250250,6,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	6	107	NULL	21	0	0	0	0	0	0.0110401	1	1	0.0110401	g	mi
1,1,2035,7,5,16,25,25025,250250,6,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	6	106	NULL	21	0	0	0	0	0	0.039484099	1	1	0.039484099	g	mi
1,1,2035,7,5,16,25,25025,250250,6,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	6	100	NULL	21	0	0	0	0	0	0.00230869	1	1	0.00230869	g	mi
1,1,2035,7,5,16,25,25025,250250,6,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	6	98	NULL	21	0	0	0	0	0	218.348999	1	1	218.348999	g	mi
1,1,2035,7,5,16,25,25025,250250,6,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	6	91	NULL	21	0	0	0	0	0	0.002878862	1	1	0.002878862	g	mi
1,1,2035,7,5,16,25,25025,250250,6,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	6	90	NULL	21	0	0	0	0	0	218.3150024	1	1	218.3150024	g	mi
1,1,2035,7,5,16,25,25025,250250,6,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	6	87	NULL	21	0	0	0	0	0	0.060318481	1	1	0.060318481	g	mi
1,1,2035,7,5,16,25,25025,250250,6,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	6	79	NULL	21	0	0	0	0	0	0.055284761	1	1	0.055284761	g	mi
1,1,2035,7,5,16,25,25025,250250,6,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	6	66	NULL	21	0	0	0	0	0	2.65326E-05	1	1	2.65326E-05	g	mi
1,1,2035,7,5,16,25,25025,250250,6,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	6	59	NULL	21	0	0	0	0	0	3.88818E-05	1	1	3.88818E-05	g	mi
1,1,2035,7,5,16,25,25025,250250,6,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	6	58	NULL	21	0	0	0	0	0	6.88998E-06	1	1	6.88998E-06	g	mi
1,1,2035,7,5,16,25,25025,250250,6,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	6	57	NULL	21	0	0	0	0	0	6.88883E-06	1	1	6.88883E-06	g	mi
1,1,2035,7,5,16,25,25025,250250,6,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	6	56	NULL	21	0	0	0	0	0	7.25252E-07	1	1	7.25252E-07	g	mi
1,1,2035,7,5,16,25,25025,250250,6,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	6	55	NULL	21	0	0	0	0	0	3.06923E-05	1	1	3.06923E-05	g	mi
1,1,2035,7,5,16,25,25025,250250,6,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	6	54	NULL	21	0	0	0	0	0	3.09009E-06	1	1	3.09009E-06	g	mi
1,1,2035,7,5,16,25,25025,250250,6,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	6	53	NULL	21	0	0	0	0	0	1.81418E-06	1	1	1.81418E-06	g	mi
1,1,2035,7,5,16,25,25025,250250,6,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	6	52	NULL	21	0	0	0	0	0	1.00158E-06	1	1	1.00158E-06	g	mi
1,1,2035,7,5,16,25,25025,250250,6,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	6	51	NULL	21	0	0	0	0	0	2.22272E-06	1	1	2.22272E-06	g	mi
1,1,2035,7,5,16,25,25025,250250,6,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	6	36	NULL	21	0	0	0	0	0	5.89448E-05	1	1	5.89448E-05	g	mi
1,1,2035,7,5,16,25,25025,250250,6,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	6	35	NULL	21	0	0	0	0	0	6.12531E-06	1	1	6.12531E-06	g	mi
1,1,2035,7,5,16,25,25025,250250,6,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	6	31	NULL	21	0	0	0	0	0	0.00146407	1	1	0.00146407	g	mi
1,1,2035,7,5,16,25,25025,250250,6,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	6	5	NULL	21	0	0	0	0	0	0.001358291	1	1	0.001358291	g	mi

1,1,2035,7,5,16,25,25025,250250,6,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	6	3	NULL	21	0	0	0	0	0	0.02424317	1	1	0.02424317	g	mi
1,1,2035,7,5,16,25,25025,250250,6,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	6	2	NULL	21	0	0	0	0	0	1.087555289	1	1	1.087555289	g	mi
1,1,2035,7,5,16,25,25025,250250,6,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	6	1	NULL	21	0	0	0	0	0	0.056626018	1	1	0.056626018	g	mi
1,1,2035,7,5,16,25,25025,250250,5,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	5	122	NULL	21	0	0	0	0	0	0.000260023	1	1	0.000260023	g	mi
1,1,2035,7,5,16,25,25025,250250,5,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	5	121	NULL	21	0	0	0	0	0	0.000106712	1	1	0.000106712	g	mi
1,1,2035,7,5,16,25,25025,250250,5,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	5	119	NULL	21	0	0	0	0	0	0	1	1	0	g	mi
1,1,2035,7,5,16,25,25025,250250,5,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	5	118	NULL	21	0	0	0	0	0	0.00191298	1	1	0.00191298	g	mi
1,1,2035,7,5,16,25,25025,250250,5,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	5	117	NULL	21	0	0	0	0	0	0.001784	1	1	0.001784	g	mi
1,1,2035,7,5,16,25,25025,250250,5,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	5	116	NULL	21	0	0	0	0	0	0.00655265	1	1	0.00655265	g	mi
1,1,2035,7,5,16,25,25025,250250,5,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	5	115	NULL	21	0	0	0	0	0	7.36371E-05	1	1	7.36371E-05	g	mi
1,1,2035,7,5,16,25,25025,250250,5,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	5	112	NULL	21	0	0	0	0	0	0.000328049	1	1	0.000328049	g	mi
1,1,2035,7,5,16,25,25025,250250,5,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	5	111	NULL	21	0	0	0	0	0	0.00130011	1	1	0.00130011	g	mi
1,1,2035,7,5,16,25,25025,250250,5,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	5	110	NULL	21	0	0	0	0	0	0.00224103	1	1	0.00224103	g	mi
1,1,2035,7,5,16,25,25025,250250,5,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	5	107	NULL	21	0	0	0	0	0	0.0118934	1	1	0.0118934	g	mi
1,1,2035,7,5,16,25,25025,250250,5,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	5	106	NULL	21	0	0	0	0	0	0.052421201	1	1	0.052421201	g	mi
1,1,2035,7,5,16,25,25025,250250,5,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	5	100	NULL	21	0	0	0	0	0	0.00253207	1	1	0.00253207	g	mi
1,1,2035,7,5,16,25,25025,250250,5,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	5	98	NULL	21	0	0	0	0	0	244.5820007	1	1	244.5820007	g	mi
1,1,2035,7,5,16,25,25025,250250,5,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	5	91	NULL	21	0	0	0	0	0	0.003224768	1	1	0.003224768	g	mi
1,1,2035,7,5,16,25,25025,250250,5,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	5	90	NULL	21	0	0	0	0	0	244.5469971	1	1	244.5469971	g	mi
1,1,2035,7,5,16,25,25025,250250,5,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	5	87	NULL	21	0	0	0	0	0	0.063184656	1	1	0.063184656	g	mi
1,1,2035,7,5,16,25,25025,250250,5,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	5	79	NULL	21	0	0	0	0	0	0.057889339	1	1	0.057889339	g	mi
1,1,2035,7,5,16,25,25025,250250,5,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	5	66	NULL	21	0	0	0	0	0	3.18391E-05	1	1	3.18391E-05	g	mi
1,1,2035,7,5,16,25,25025,250250,5,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	5	59	NULL	21	0	0	0	0	0	4.26439E-05	1	1	4.26439E-05	g	mi
1,1,2035,7,5,16,25,25025,250250,5,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	5	58	NULL	21	0	0	0	0	0	7.55663E-06	1	1	7.55663E-06	g	mi
1,1,2035,7,5,16,25,25025,250250,5,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	5	57	NULL	21	0	0	0	0	0	7.55536E-06	1	1	7.55536E-06	g	mi
1,1,2035,7,5,16,25,25025,250250,5,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	5	56	NULL	21	0	0	0	0	0	7.95425E-07	1	1	7.95425E-07	g	mi
1,1,2035,7,5,16,25,25025,250250,5,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	5	55	NULL	21	0	0	0	0	0	3.3662E-05	1	1	3.3662E-05	g	mi

1,1,2035,7,5,16,25,25025,250250,5,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	5	54	NULL	21	0	0	0	0	0	3.38908E-06	1	1	3.38908E-06	g	mi
1,1,2035,7,5,16,25,25025,250250,5,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	5	53	NULL	21	0	0	0	0	0	1.98971E-06	1	1	1.98971E-06	g	mi
1,1,2035,7,5,16,25,25025,250250,5,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	5	52	NULL	21	0	0	0	0	0	1.09849E-06	1	1	1.09849E-06	g	mi
1,1,2035,7,5,16,25,25025,250250,5,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	5	51	NULL	21	0	0	0	0	0	2.43778E-06	1	1	2.43778E-06	g	mi
1,1,2035,7,5,16,25,25025,250250,5,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	5	36	NULL	21	0	0	0	0	0	6.46481E-05	1	1	6.46481E-05	g	mi
1,1,2035,7,5,16,25,25025,250250,5,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	5	35	NULL	21	0	0	0	0	0	6.71798E-06	1	1	6.71798E-06	g	mi
1,1,2035,7,5,16,25,25025,250250,5,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	5	31	NULL	21	0	0	0	0	0	0.00163999	1	1	0.00163999	g	mi
1,1,2035,7,5,16,25,25025,250250,5,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	5	5	NULL	21	0	0	0	0	0	0.001383796	1	1	0.001383796	g	mi
1,1,2035,7,5,16,25,25025,250250,5,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	5	3	NULL	21	0	0	0	0	0	0.024045762	1	1	0.024045762	g	mi
1,1,2035,7,5,16,25,25025,250250,5,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	5	2	NULL	21	0	0	0	0	0	1.080061316	1	1	1.080061316	g	mi
1,1,2035,7,5,16,25,25025,250250,5,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	5	1	NULL	21	0	0	0	0	0	0.05925579	1	1	0.05925579	g	mi
1,1,2035,7,5,16,25,25025,250250,4,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	4	122	NULL	21	0	0	0	0	0	0.000307774	1	1	0.000307774	g	mi
1,1,2035,7,5,16,25,25025,250250,4,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	4	121	NULL	21	0	0	0	0	0	0.000126309	1	1	0.000126309	g	mi
1,1,2035,7,5,16,25,25025,250250,4,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	4	119	NULL	21	0	0	0	0	0	0	1	1	0	g	mi
1,1,2035,7,5,16,25,25025,250250,4,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	4	118	NULL	21	0	0	0	0	0	0.00226428	1	1	0.00226428	g	mi
1,1,2035,7,5,16,25,25025,250250,4,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	4	117	NULL	21	0	0	0	0	0	0.001922	1	1	0.001922	g	mi
1,1,2035,7,5,16,25,25025,250250,4,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	4	116	NULL	21	0	0	0	0	0	0.00745542	1	1	0.00745542	g	mi
1,1,2035,7,5,16,25,25025,250250,4,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	4	115	NULL	21	0	0	0	0	0	8.716E-05	1	1	8.716E-05	g	mi
1,1,2035,7,5,16,25,25025,250250,4,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	4	112	NULL	21	0	0	0	0	0	0.000388293	1	1	0.000388293	g	mi
1,1,2035,7,5,16,25,25025,250250,4,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	4	111	NULL	21	0	0	0	0	0	0.00153887	1	1	0.00153887	g	mi
1,1,2035,7,5,16,25,25025,250250,4,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	4	110	NULL	21	0	0	0	0	0	0.00265258	1	1	0.00265258	g	mi
1,1,2035,7,5,16,25,25025,250250,4,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	4	107	NULL	21	0	0	0	0	0	0.0128134	1	1	0.0128134	g	mi
1,1,2035,7,5,16,25,25025,250250,4,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	4	106	NULL	21	0	0	0	0	0	0.059643298	1	1	0.059643298	g	mi
1,1,2035,7,5,16,25,25025,250250,4,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	4	100	NULL	21	0	0	0	0	0	0.00299707	1	1	0.00299707	g	mi
1,1,2035,7,5,16,25,25025,250250,4,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	4	98	NULL	21	0	0	0	0	0	276.2539978	1	1	276.2539978	g	mi
1,1,2035,7,5,16,25,25025,250250,4,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	4	91	NULL	21	0	0	0	0	0	0.003642366	1	1	0.003642366	g	mi
1,1,2035,7,5,16,25,25025,250250,4,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	4	90	NULL	21	0	0	0	0	0	276.2149963	1	1	276.2149963	g	mi

1,1,2035,7,5,16,25,25025,250250,4,21,0,0,0,0,00 0.068305112 1 1 0.068305112 g mi	1	1	2035	7	5	16	25	25025	250250	4	87	NULL	21	0	0	0	0	0
1,1,2035,7,5,16,25,25025,250250,4,21,0,0,0,0,00 0.06268438 1 1 0.06268438 g mi	1	1	2035	7	5	16	25	25025	250250	4	79	NULL	21	0	0	0	0	0
1,1,2035,7,5,16,25,25025,250250,4,21,0,0,0,0,00 3.97989E-05 1 1 3.97989E-05 g mi	1	1	2035	7	5	16	25	25025	250250	4	66	NULL	21	0	0	0	0	0
1,1,2035,7,5,16,25,25025,250250,4,21,0,0,0,0,00 5.04751E-05 1 1 5.04751E-05 g mi	1	1	2035	7	5	16	25	25025	250250	4	59	NULL	21	0	0	0	0	0
1,1,2035,7,5,16,25,25025,250250,4,21,0,0,0,0,00 8.94436E-06 1 1 8.94436E-06 g mi	1	1	2035	7	5	16	25	25025	250250	4	58	NULL	21	0	0	0	0	0
1,1,2035,7,5,16,25,25025,250250,4,21,0,0,0,0,00 8.94286E-06 1 1 8.94286E-06 g mi	1	1	2035	7	5	16	25	25025	250250	4	57	NULL	21	0	0	0	0	0
1,1,2035,7,5,16,25,25025,250250,4,21,0,0,0,0,00 9.415E-07 1 1 9.415E-07 g mi	1	1	2035	7	5	16	25	25025	250250	4	56	NULL	21	0	0	0	0	0
1,1,2035,7,5,16,25,25025,250250,4,21,0,0,0,0,00 3.98438E-05 1 1 3.98438E-05 g mi	1	1	2035	7	5	16	25	25025	250250	4	55	NULL	21	0	0	0	0	0
1,1,2035,7,5,16,25,25025,250250,4,21,0,0,0,0,00 4.01146E-06 1 1 4.01146E-06 g mi	1	1	2035	7	5	16	25	25025	250250	4	54	NULL	21	0	0	0	0	0
1,1,2035,7,5,16,25,25025,250250,4,21,0,0,0,0,00 2.35511E-06 1 1 2.35511E-06 g mi	1	1	2035	7	5	16	25	25025	250250	4	53	NULL	21	0	0	0	0	0
1,1,2035,7,5,16,25,25025,250250,4,21,0,0,0,0,00 1.30022E-06 1 1 1.30022E-06 g mi	1	1	2035	7	5	16	25	25025	250250	4	52	NULL	21	0	0	0	0	0
1,1,2035,7,5,16,25,25025,250250,4,21,0,0,0,0,00 2.88546E-06 1 1 2.88546E-06 g mi	1	1	2035	7	5	16	25	25025	250250	4	51	NULL	21	0	0	0	0	0
1,1,2035,7,5,16,25,25025,250250,4,21,0,0,0,0,00 7.65204E-05 1 1 7.65204E-05 g mi	1	1	2035	7	5	16	25	25025	250250	4	36	NULL	21	0	0	0	0	0
1,1,2035,7,5,16,25,25025,250250,4,21,0,0,0,0,00 7.95169E-06 1 1 7.95169E-06 g mi	1	1	2035	7	5	16	25	25025	250250	4	35	NULL	21	0	0	0	0	0
1,1,2035,7,5,16,25,25025,250250,4,21,0,0,0,0,00 0.00185236 1 1 0.00185236 g mi	1	1	2035	7	5	16	25	25025	250250	4	31	NULL	21	0	0	0	0	0
1,1,2035,7,5,16,25,25025,250250,4,21,0,0,0,0,00 0.001579481 1 1 0.001579481 g mi	1	1	2035	7	5	16	25	25025	250250	4	5	NULL	21	0	0	0	0	0
1,1,2035,7,5,16,25,25025,250250,4,21,0,0,0,0,00 0.025783231 1 1 0.025783231 g mi	1	1	2035	7	5	16	25	25025	250250	4	3	NULL	21	0	0	0	0	0
1,1,2035,7,5,16,25,25025,250250,4,21,0,0,0,0,00 1.393504143 1 1 1.393504143 g mi	1	1	2035	7	5	16	25	25025	250250	4	2	NULL	21	0	0	0	0	0
1,1,2035,7,5,16,25,25025,250250,4,21,0,0,0,0,00 0.064244151 1 1 0.064244151 g mi	1	1	2035	7	5	16	25	25025	250250	4	1	NULL	21	0	0	0	0	0
1,1,2035,7,5,16,25,25025,250250,3,21,0,0,0,0,00 0.000357514 1 1 0.000357514 g mi	1	1	2035	7	5	16	25	25025	250250	3	122	NULL	21	0	0	0	0	0
1,1,2035,7,5,16,25,25025,250250,3,21,0,0,0,0,00 0.000146723 1 1 0.000146723 g mi	1	1	2035	7	5	16	25	25025	250250	3	121	NULL	21	0	0	0	0	0
1,1,2035,7,5,16,25,25025,250250,3,21,0,0,0,0,00 0 1 1 0 g mi	1	1	2035	7	5	16	25	25025	250250	3	119	NULL	21	0	0	0	0	0
1,1,2035,7,5,16,25,25025,250250,3,21,0,0,0,0,00 0.00263022 1 1 0.00263022 g mi	1	1	2035	7	5	16	25	25025	250250	3	118	NULL	21	0	0	0	0	0
1,1,2035,7,5,16,25,25025,250250,3,21,0,0,0,0,00 0.002071 1 1 0.002071 g mi	1	1	2035	7	5	16	25	25025	250250	3	117	NULL	21	0	0	0	0	0
1,1,2035,7,5,16,25,25025,250250,3,21,0,0,0,0,00 0.00888721 1 1 0.00888721 g mi	1	1	2035	7	5	16	25	25025	250250	3	116	NULL	21	0	0	0	0	0
1,1,2035,7,5,16,25,25025,250250,3,21,0,0,0,0,00 0.000101246 1 1 0.000101246 g mi	1	1	2035	7	5	16	25	25025	250250	3	115	NULL	21	0	0	0	0	0
1,1,2035,7,5,16,25,25025,250250,3,21,0,0,0,0,00 0.000451046 1 1 0.000451046 g mi	1	1	2035	7	5	16	25	25025	250250	3	112	NULL	21	0	0	0	0	0

1,1,2035,7,5,16,25,25025,250250,3,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	3	111	NULL	21	0	0	0	0	0	0.00178757	1	1	0.00178757	g mi
1,1,2035,7,5,16,25,25025,250250,3,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	3	110	NULL	21	0	0	0	0	0	0.00308127	1	1	0.00308127	g mi
1,1,2035,7,5,16,25,25025,250250,3,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	3	107	NULL	21	0	0	0	0	0	0.0138067	1	1	0.0138067	g mi
1,1,2035,7,5,16,25,25025,250250,3,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	3	106	NULL	21	0	0	0	0	0	0.071097702	1	1	0.071097702	g mi
1,1,2035,7,5,16,25,25025,250250,3,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	3	100	NULL	21	0	0	0	0	0	0.00348144	1	1	0.00348144	g mi
1,1,2035,7,5,16,25,25025,250250,3,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	3	98	NULL	21	0	0	0	0	0	323.8619995	1	1	323.8619995	g mi
1,1,2035,7,5,16,25,25025,250250,3,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	3	91	NULL	21	0	0	0	0	0	0.004270115	1	1	0.004270115	g mi
1,1,2035,7,5,16,25,25025,250250,3,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	3	90	NULL	21	0	0	0	0	0	323.8200073	1	1	323.8200073	g mi
1,1,2035,7,5,16,25,25025,250250,3,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	3	87	NULL	21	0	0	0	0	0	0.07581076	1	1	0.07581076	g mi
1,1,2035,7,5,16,25,25025,250250,3,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	3	79	NULL	21	0	0	0	0	0	0.069564022	1	1	0.069564022	g mi
1,1,2035,7,5,16,25,25025,250250,3,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	3	66	NULL	21	0	0	0	0	0	5.30652E-05	1	1	5.30652E-05	g mi
1,1,2035,7,5,16,25,25025,250250,3,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	3	59	NULL	21	0	0	0	0	0	5.86326E-05	1	1	5.86326E-05	g mi
1,1,2035,7,5,16,25,25025,250250,3,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	3	58	NULL	21	0	0	0	0	0	1.03899E-05	1	1	1.03899E-05	g mi
1,1,2035,7,5,16,25,25025,250250,3,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	3	57	NULL	21	0	0	0	0	0	1.03881E-05	1	1	1.03881E-05	g mi
1,1,2035,7,5,16,25,25025,250250,3,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	3	56	NULL	21	0	0	0	0	0	1.09366E-06	1	1	1.09366E-06	g mi
1,1,2035,7,5,16,25,25025,250250,3,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	3	55	NULL	21	0	0	0	0	0	4.62831E-05	1	1	4.62831E-05	g mi
1,1,2035,7,5,16,25,25025,250250,3,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	3	54	NULL	21	0	0	0	0	0	4.65977E-06	1	1	4.65977E-06	g mi
1,1,2035,7,5,16,25,25025,250250,3,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	3	53	NULL	21	0	0	0	0	0	2.73573E-06	1	1	2.73573E-06	g mi
1,1,2035,7,5,16,25,25025,250250,3,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	3	52	NULL	21	0	0	0	0	0	1.51035E-06	1	1	1.51035E-06	g mi
1,1,2035,7,5,16,25,25025,250250,3,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	3	51	NULL	21	0	0	0	0	0	3.35179E-06	1	1	3.35179E-06	g mi
1,1,2035,7,5,16,25,25025,250250,3,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	3	36	NULL	21	0	0	0	0	0	8.88871E-05	1	1	8.88871E-05	g mi
1,1,2035,7,5,16,25,25025,250250,3,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	3	35	NULL	21	0	0	0	0	0	9.23679E-06	1	1	9.23679E-06	g mi
1,1,2035,7,5,16,25,25025,250250,3,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	3	31	NULL	21	0	0	0	0	0	0.00217161	1	1	0.00217161	g mi
1,1,2035,7,5,16,25,25025,250250,3,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	3	5	NULL	21	0	0	0	0	0	0.001698654	1	1	0.001698654	g mi
1,1,2035,7,5,16,25,25025,250250,3,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	3	3	NULL	21	0	0	0	0	0	0.026550163	1	1	0.026550163	g mi
1,1,2035,7,5,16,25,25025,250250,3,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	3	2	NULL	21	0	0	0	0	0	1.570075989	1	1	1.570075989	g mi
1,1,2035,7,5,16,25,25025,250250,3,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	3	1	NULL	21	0	0	0	0	0	0.071241401	1	1	0.071241401	g mi

1,1,2035,7,5,16,25,25025,250250,2,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	2	122	NULL	21	0	0	0	0	0	0.000439205	1	1	0.000439205	g	mi
1,1,2035,7,5,16,25,25025,250250,2,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	2	121	NULL	21	0	0	0	0	0	0.000180248	1	1	0.000180248	g	mi
1,1,2035,7,5,16,25,25025,250250,2,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	2	119	NULL	21	0	0	0	0	0	0	1	1	0	g	mi
1,1,2035,7,5,16,25,25025,250250,2,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	2	118	NULL	21	0	0	0	0	0	0.00323121	1	1	0.00323121	g	mi
1,1,2035,7,5,16,25,25025,250250,2,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	2	117	NULL	21	0	0	0	0	0	0.002231	1	1	0.002231	g	mi
1,1,2035,7,5,16,25,25025,250250,2,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	2	116	NULL	21	0	0	0	0	0	0.0117074	1	1	0.0117074	g	mi
1,1,2035,7,5,16,25,25025,250250,2,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	2	115	NULL	21	0	0	0	0	0	0.000124381	1	1	0.000124381	g	mi
1,1,2035,7,5,16,25,25025,250250,2,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	2	112	NULL	21	0	0	0	0	0	0.000554109	1	1	0.000554109	g	mi
1,1,2035,7,5,16,25,25025,250250,2,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	2	111	NULL	21	0	0	0	0	0	0.00219602	1	1	0.00219602	g	mi
1,1,2035,7,5,16,25,25025,250250,2,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	2	110	NULL	21	0	0	0	0	0	0.00378532	1	1	0.00378532	g	mi
1,1,2035,7,5,16,25,25025,250250,2,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	2	107	NULL	21	0	0	0	0	0	0.0148734	1	1	0.0148734	g	mi
1,1,2035,7,5,16,25,25025,250250,2,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	2	106	NULL	21	0	0	0	0	0	0.093659602	1	1	0.093659602	g	mi
1,1,2035,7,5,16,25,25025,250250,2,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	2	100	NULL	21	0	0	0	0	0	0.00427693	1	1	0.00427693	g	mi
1,1,2035,7,5,16,25,25025,250250,2,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	2	98	NULL	21	0	0	0	0	0	415.9899902	1	1	415.9899902	g	mi
1,1,2035,7,5,16,25,25025,250250,2,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	2	91	NULL	21	0	0	0	0	0	0.005484951	1	1	0.005484951	g	mi
1,1,2035,7,5,16,25,25025,250250,2,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	2	90	NULL	21	0	0	0	0	0	415.9460144	1	1	415.9460144	g	mi
1,1,2035,7,5,16,25,25025,250250,2,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	2	87	NULL	21	0	0	0	0	0	0.090209045	1	1	0.090209045	g	mi
1,1,2035,7,5,16,25,25025,250250,2,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	2	79	NULL	21	0	0	0	0	0	0.082659893	1	1	0.082659893	g	mi
1,1,2035,7,5,16,25,25025,250250,2,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	2	66	NULL	21	0	0	0	0	0	7.95978E-05	1	1	7.95978E-05	g	mi
1,1,2035,7,5,16,25,25025,250250,2,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	2	59	NULL	21	0	0	0	0	0	7.20299E-05	1	1	7.20299E-05	g	mi
1,1,2035,7,5,16,25,25025,250250,2,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	2	58	NULL	21	0	0	0	0	0	1.27639E-05	1	1	1.27639E-05	g	mi
1,1,2035,7,5,16,25,25025,250250,2,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	2	57	NULL	21	0	0	0	0	0	1.27618E-05	1	1	1.27618E-05	g	mi
1,1,2035,7,5,16,25,25025,250250,2,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	2	56	NULL	21	0	0	0	0	0	1.34355E-06	1	1	1.34355E-06	g	mi
1,1,2035,7,5,16,25,25025,250250,2,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	2	55	NULL	21	0	0	0	0	0	5.68586E-05	1	1	5.68586E-05	g	mi
1,1,2035,7,5,16,25,25025,250250,2,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	2	54	NULL	21	0	0	0	0	0	5.7245E-06	1	1	5.7245E-06	g	mi
1,1,2035,7,5,16,25,25025,250250,2,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	2	53	NULL	21	0	0	0	0	0	3.36083E-06	1	1	3.36083E-06	g	mi
1,1,2035,7,5,16,25,25025,250250,2,21,0,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	2	52	NULL	21	0	0	0	0	0	1.85546E-06	1	1	1.85546E-06	g	mi

1,1,2035,7,5,16,25,25025,250250,2,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	2	51	NULL	21	0	0	0	0	0	4.11766E-06	1	1	4.11766E-06	g	mi
1,1,2035,7,5,16,25,25025,250250,2,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	2	36	NULL	21	0	0	0	0	0	0.000109197	1	1	0.000109197	g	mi
1,1,2035,7,5,16,25,25025,250250,2,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	2	35	NULL	21	0	0	0	0	0	1.13474E-05	1	1	1.13474E-05	g	mi
1,1,2035,7,5,16,25,25025,250250,2,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	2	31	NULL	21	0	0	0	0	0	0.00278942	1	1	0.00278942	g	mi
1,1,2035,7,5,16,25,25025,250250,2,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	2	5	NULL	21	0	0	0	0	0	0.00181363	1	1	0.00181363	g	mi
1,1,2035,7,5,16,25,25025,250250,2,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	2	3	NULL	21	0	0	0	0	0	0.026814973	1	1	0.026814973	g	mi
1,1,2035,7,5,16,25,25025,250250,2,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	2	2	NULL	21	0	0	0	0	0	1.717092395	1	1	1.717092395	g	mi
1,1,2035,7,5,16,25,25025,250250,2,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	2	1	NULL	21	0	0	0	0	0	0.084450796	1	1	0.084450796	g	mi
1,1,2035,7,5,16,25,25025,250250,1,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	1	122	NULL	21	0	0	0	0	0	0.000684276	1	1	0.000684276	g	mi
1,1,2035,7,5,16,25,25025,250250,1,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	1	121	NULL	21	0	0	0	0	0	0.000280825	1	1	0.000280825	g	mi
1,1,2035,7,5,16,25,25025,250250,1,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	1	119	NULL	21	0	0	0	0	0	0	1	1	0	g	mi
1,1,2035,7,5,16,25,25025,250250,1,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	1	118	NULL	21	0	0	0	0	0	0.0050342	1	1	0.0050342	g	mi
1,1,2035,7,5,16,25,25025,250250,1,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	1	117	NULL	21	0	0	0	0	0	0.002404	1	1	0.002404	g	mi
1,1,2035,7,5,16,25,25025,250250,1,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	1	116	NULL	21	0	0	0	0	0	0.0201681	1	1	0.0201681	g	mi
1,1,2035,7,5,16,25,25025,250250,1,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	1	115	NULL	21	0	0	0	0	0	0.000193784	1	1	0.000193784	g	mi
1,1,2035,7,5,16,25,25025,250250,1,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	1	112	NULL	21	0	0	0	0	0	0.000863295	1	1	0.000863295	g	mi
1,1,2035,7,5,16,25,25025,250250,1,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	1	111	NULL	21	0	0	0	0	0	0.00342137	1	1	0.00342137	g	mi
1,1,2035,7,5,16,25,25025,250250,1,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	1	110	NULL	21	0	0	0	0	0	0.00589749	1	1	0.00589749	g	mi
1,1,2035,7,5,16,25,25025,250250,1,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	1	107	NULL	21	0	0	0	0	0	0.0160267	1	1	0.0160267	g	mi
1,1,2035,7,5,16,25,25025,250250,1,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	1	106	NULL	21	0	0	0	0	0	0.161345005	1	1	0.161345005	g	mi
1,1,2035,7,5,16,25,25025,250250,1,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	1	100	NULL	21	0	0	0	0	0	0.0066634	1	1	0.0066634	g	mi
1,1,2035,7,5,16,25,25025,250250,1,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	1	98	NULL	21	0	0	0	0	0	692.3759766	1	1	692.3759766	g	mi
1,1,2035,7,5,16,25,25025,250250,1,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	1	91	NULL	21	0	0	0	0	0	0.00912944	1	1	0.00912944	g	mi
1,1,2035,7,5,16,25,25025,250250,1,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	1	90	NULL	21	0	0	0	0	0	692.3220215	1	1	692.3220215	g	mi
1,1,2035,7,5,16,25,25025,250250,1,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	1	87	NULL	21	0	0	0	0	0	0.133404016	1	1	0.133404016	g	mi
1,1,2035,7,5,16,25,25025,250250,1,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	1	79	NULL	21	0	0	0	0	0	0.121947795	1	1	0.121947795	g	mi
1,1,2035,7,5,16,25,25025,250250,1,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	1	66	NULL	21	0	0	0	0	0	0.000159196	1	1	0.000159196	g	mi

1,1,2035,7,5,16,25,25025,250250,1,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	1	59	NULL	21	0	0	0	0	0	0.000112222	1	1	0.000112222	g	mi
1,1,2035,7,5,16,25,25025,250250,1,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	1	58	NULL	21	0	0	0	0	0	1.98861E-05	1	1	1.98861E-05	g	mi
1,1,2035,7,5,16,25,25025,250250,1,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	1	57	NULL	21	0	0	0	0	0	1.98827E-05	1	1	1.98827E-05	g	mi
1,1,2035,7,5,16,25,25025,250250,1,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	1	56	NULL	21	0	0	0	0	0	2.09324E-06	1	1	2.09324E-06	g	mi
1,1,2035,7,5,16,25,25025,250250,1,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	1	55	NULL	21	0	0	0	0	0	8.8585E-05	1	1	8.8585E-05	g	mi
1,1,2035,7,5,16,25,25025,250250,1,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	1	54	NULL	21	0	0	0	0	0	8.91871E-06	1	1	8.91871E-06	g	mi
1,1,2035,7,5,16,25,25025,250250,1,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	1	53	NULL	21	0	0	0	0	0	5.23614E-06	1	1	5.23614E-06	g	mi
1,1,2035,7,5,16,25,25025,250250,1,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	1	52	NULL	21	0	0	0	0	0	2.89079E-06	1	1	2.89079E-06	g	mi
1,1,2035,7,5,16,25,25025,250250,1,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	1	51	NULL	21	0	0	0	0	0	6.41526E-06	1	1	6.41526E-06	g	mi
1,1,2035,7,5,16,25,25025,250250,1,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	1	36	NULL	21	0	0	0	0	0	0.000170128	1	1	0.000170128	g	mi
1,1,2035,7,5,16,25,25025,250250,1,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	1	35	NULL	21	0	0	0	0	0	1.76791E-05	1	1	1.76791E-05	g	mi
1,1,2035,7,5,16,25,25025,250250,1,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	1	31	NULL	21	0	0	0	0	0	0.00464287	1	1	0.00464287	g	mi
1,1,2035,7,5,16,25,25025,250250,1,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	1	5	NULL	21	0	0	0	0	0	0.002158558	1	1	0.002158558	g	mi
1,1,2035,7,5,16,25,25025,250250,1,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	1	3	NULL	21	0	0	0	0	0	0.027609205	1	1	0.027609205	g	mi
1,1,2035,7,5,16,25,25025,250250,1,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	1	2	NULL	21	0	0	0	0	0	2.158131838	1	1	2.158131838	g	mi
1,1,2035,7,5,16,25,25025,250250,1,21,0,0,0,0,00	1	1	2035	7	5	16	25	25025	250250	1	1	NULL	21	0	0	0	0	0	0.124079295	1	1	0.124079295	g	mi

Source: KBE and Massport, 2019.

Fuel Storage and Handling

As in previous years, VOC emissions from fuel storage and handling were calculated using methods based on EPA's AP-421 document. Calculations account for evaporative emissions from breathing losses, working losses, and spillage from aboveground storage tanks, underground storage tanks, and aircraft refueling. In 2003, additional information became available on the fire training fuel, Tek-Flame®. Emissions of VOCs from this fuel were estimated by AEDT. **Table I-12** presents Logan Airport's fuel throughput by category.

Stationary Sources

Stationary sources include the Central Heating and Cooling Plant, emergency generators, snow melters, space heaters, and boilers. Emission factors from EPA's AP-42 or NO_x Reasonably Available Control Technology (RACT) compliance testing were combined with the actual 2017 fuel throughput of the stationary sources to obtain emissions of VOCs, NO_X, CO, and $PM_{10}/PM_{2.5}$.

Title V of the 1990 Clean Air Act (CAA) Amendments requires facilities with air emissions to document their emissions and obtain a single permit combining all sources. The permitting program ensures that all emission sources are accounted for, the proper permits have been received, and permit conditions are being followed. A Title V Air Operating Permit covers all of the stationary sources at Logan Airport including boilers, emergency generators, snow melters, fire training, cooling towers, paint booths, deicing facilities, and storage tanks. **Table I-13** presents Logan Airport's stationary source fuel throughput by fuel category.

1 Compilation of Air Pollutant Emission Factors, AP-42, Office of Air Quality Planning and Standards, EPA, Fifth Edition, 1995.

Table I-12 Fuel Throughput by Fuel Category (gallons)

Fuel Category	1999	2000	2001	2002	2003	2004	2005	2006	2007
Jet Fuel	354,095,516	441,901,932	416,748,819	358,190,362	319,439,910	373,996,141	368,645,392	364,450,864	367,585,187
Fire Training Fuel[1]	N/A	N/A	N/A	N/A	13,719	12,227	8,105	5,000	8,631
Aviation Gas	99,726	90,922	60,691	35,111	32,515	34,717	52,487	35,098	29,067
Auto Gas	7,200,000	7,569,206	6,181,472	5,754,740	5,436,322	5,803,442	5,903,424	6,028,931	6,022,237
Diesel	768,106	839,751	1,239,904	1,067,847	1,030,185	1,078,665	1,567,688	1,164,493	1,141,335
Heating Oil No.2	480,733	494,500	582,283	340,492	370,903	381,852	367,899	259,768	423,181
Heating Oil No.62	1,600,893	1,555,527	1,641,693	1,079,283	1,122,975	2,940,752	3,098,126	1,396,529	1,073,260

Fuel Category	2008	2009	2010	2011	2012	2013	2014	2015	2016
Jet Fuel	345,631,788	327,358,619	335,693,997	340,421,373	343,731,127	349,397,940	370,222,342	374,985,216	456,003,328
Fire Training Fuel[1]	5,971	3,510	800	3,810	2,587	5,400	3,753	7,619	6,153
Aviation Gas	25,037	18,238	15,268	14,064	12,306	14,422	12,514	10,225	10,654
Auto Gas	5,693,178	5,736,724	5,696,505	5,487,952	6,694,626	6,800,936	7,007,591	7,432,165	7,794,957
Diesel	1,071,707	1,121,241	1,168,761	1,099,720	878,499	1,094,714	1,178,805	1,473,720	1,233,200
Heating Oil No.2	303,143	409,049	319,727	384,906	210,794	289,665	289,956	294,704	520,977
Heating Oil No.6[2]	16,385	368,690	9,010	11,285	6,786	17,721	77,146	0	0

Table I-12 Fuel Throughput by Fuel Category (gallons) (Continued)

Fuel Category	2017
Jet Fuel	484,310,931
Fire Training Fuel[1]	5,211
Aviation Gas	11,075
Auto Gas	7,737,865
Diesel	1,272,828
Heating Oil No.2	213,279
Heating Oil No.6[2]	0

Source: Massport, 2019.
N/A Not available.
1 Fire Training Fuel used in 1999-2002 was Jet A Fuel while in 2003 through 2014 it was Tek-Flame®. 2012 includes 100 gallons of AvGas, 2013 includes 400 gallons of AvGas, 2014 includes 338 gallons of AvGas, 2015 includes 742 gallons of AvGas, 2016 includes 494 gallons of AvGas, and 2017 includes 1,241 gallons of AvGas.
2 Effective November 2014, Massport no longer uses No. 6 heating oil at the Central Heating and Cooling Plant and was replaced with No. 2 heating oil.

Table I-13 Stationary Source Fuel Throughput by Fuel Category (gallons)

Fuel Category	1999	2000	2001	2002	2003	2004	2005	2006	2007
Natural Gas (ft^3)	183,943,000	283,720,049	199,500,000	268,359,282	201,714,114	62,610,000	92,460,000	112,390,000	338,430,000
Heating Oil No. 2	480,733	494,500	582,283	340,492	370,903	381,852	367,899	259,768	423,181
Heating Oil No. 6[1]	1,600,893	1,555,527	1,641,693	1,079,283	1,122,975	2,940,752	3,098,126	1,396,529	1,073,260
Diesel Fuel[2]	57,441	N/A	N/A	N/A	N/A	67,198	77,848	77,848	258,606
Fire Training Fuel[3]	23,000	N/A	N/A	N/A	13,719	12,227	8,105	5,000	8,631

Fuel Category	2008	2009	2010	2011	2012	2013	2014	2015	2016
Natural Gas (ft^3)	458,680,000	430,810,000	449,640,000	479,830,000	360,523,000	402,496,000	418,805,000	463,170,000	429,502,000
Heating Oil No. 2	303,143	409,050	319,727	384,906	210,794	289,665	289,956	294,704	520,977
Heating Oil No. 6[1]	16,385	368,690	9,010	11,285	6,786	17,721	77,146	0	0
Diesel Fuel[2]	146,718	145,778	116,511	218,081	42,109	231,130	124,480	381,581	90,850
Fire Training Fuel[3]	5,971	3,510	800	3,810	2,587	5,400	3,753	7,619	6,153

Fuel Category	2017
Natural Gas (ft^3)	491,356,303
Heating Oil No. 2	115,878
Heating Oil No. 6[1]	0
Diesel Fuel[2]	157,243
Fire Training Fuel[3]	5,211

Source: Massport, 2019.
N/A Not available.
1 Effective November 2014, Massport no longer uses No. 6 heating oil at the Central Heating and Cooling Plant and was replaced with No. 2 heating oil.
2 Diesel fuel was from the stationary snow melter usage. Starting in 2007, portable snow melter usage was also included.
3 Fire Training Fuel used in 1999-2002 was Jet A Fuel while in 2003 through 2015 it was Tek-Flame®. 2012 includes 100 gallons of AvGas, 2013 includes 400 gallons of AvGas, 2014 includes 338 gallons of AvGas, 2015 includes 742 gallons of AvGas, 2016 includes 494 gallons of AvGas, and 2017 includes 1,241 gallons of AvGas.

Tables I-14 through **I-20** contain the 1993 through 2009 Emissions Inventory summary tables for Logan Airport.

Table I-14 Estimated VOC Emissions (in kg/day) at Logan Airport 1993-2001[1]

Aircraft/GSE Model:	**Logan Dispersion Modeling System (LDMS)**					**EDMS v3.22**	**EDMS v4.21**	**EDMS v4.03**	
Motor Vehicle Model:	**MOBILE5a**					**MOBILE 5a_h**	**MOBILE 6.2.03**	**MOBILE 6.0**	
Year:	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999[2]**	**2000**	**2001**
Aircraft Sources									
Air carriers	1,958	1,554	1,407	1,390	1,227	736	653	514	374
Commuter aircraft	943	543	531	622	498	154	196	140	113
Cargo aircraft	89	244	236	214	207	43	318	207	149
General aviation	51	48	36	24	27	13	141	42	43
Total aircraft sources	3,041	2,389	2,210	2,250	1,959	946	1,308	903	679
GSE[3]	636	533	521	497	530	145	243	153	143
Motor Vehicles									
Ted Williams Tunnel through-traffic	N/A	N/A	N/A	N/A	N/A	N/A	15	12	10
Parking/curbside	173	148	127	102	102	118	101	89	77
On-airport vehicles[4]	238	215	179	223	205	258	256	206	170
Total motor vehicle sources	411	363	306	325	307	376	372	307	257
Other Sources									
Fuel storage/handling	408	434	318	356	381	372	352	412	372
Miscellaneous sources[5]	5	5	5	6	6	2	16	2	2
Total other sources	413	439	323	362	387	374	368	414	374
Total Airport Sources	4,501	3,724	3,360	3,434	3,183	1,841	2,291	1,777	1,453

Source: KBE and Massport. 2019.
Notes: GSE – ground service equipment; N/A - not available; VOC – volatile organic compound.
kg/day Kilograms per day. One kg/day is approximately equivalent to 0.40234 tons per year (tpy).
1 The emissions inventory for 1990 is shown in Chapter 7, *Air Quality/Emissions Reduction*. Emission inventories for 1991 and 1992 were not prepared.
2 Year 1999 emissions were last re-calculated using EDMS v4.21 in the *2004 ESPR* Air Quality Analysis.
3 Beginning in 1996 and later, emissions include vehicles and equipment converted to alternative fuels. Auxiliary power unit (APU) emissions are also included.
4 1999 emissions inventory include reductions attributable to compressed natural gas (CNG) shuttle buses.
5 Includes the Central Heating and Cooling Plant, emergency electricity generation, and other stationary sources. Fire Training emissions were included in 1999. Diesel snow melter usage was added in 1999.

Table I-15 Estimated VOC Emissions (in kg/day) at Logan Airport 2002-2009

Aircraft/GSE Model:	EDMS v4.11		EDMS v4.21	EDMS v4.5		EDMS v5.0.1		EDMS v5.0.2		EDMS v5.1		EDMS v5.1.2
Motor Vehicle Model:	**MOBILE 6.0**	**MOBILE 6.2.01**	**MOBILE 6.2.03**									
Year:	**2002**	**2003**	**2004**	**2005**	**2006**		**2007**		**2008**		**2009**	
Aircraft Sources												
Air carriers	248	208	292	271	227	511	435	381	324	286	237	235
Commuter aircraft	75	95	127	140	125	371	479	409	253	176	131	133
Cargo aircraft	127	94	110	41	19	46	129	112	107	70	71	71
General aviation	52	61	127	147	147	236	226	206	201	171	78	78
Total aircraft sources	502	458	656	599	518	1,164[1]	1,269	1,108	885	703	517	517
GSE[2]	247	227	187	178	167	77	78	78	66	66	56	56
Motor Vehicles												
Ted Williams Tunnel through-traffic	9	0[3]	0[3]	0[3]	0[3]	0[3]	0[3]	0[3]	0[3]	0[3]	0[3]	0[3]
Parking/curbside[4]	51	45	38	37	33	33	31	31	25	25	22	22
On-airport vehicles	152	135	129	118	106	106	104	104	82	82	71	71
Total motor vehicle sources	212	180	167	155	139	139	135	135	107	107	93	93
Other Sources												
Fuel storage/handling	329	297	341	340	336	336	338	338	320	320	307	307
Miscellaneous sources[5]	2	3	9	13	8	8	14	14	13	12	7	7
Total other sources	331	300	350	353	344	344	352	352	333	332	314	314
Total Airport Sources	1,292	1,165	1,360	1,285	1,168	1,724	1,834	1,673	1,391	1,208	980	980

Source: KBE and Massport, 2019.
Notes: GSE – ground service equipment; VOC – volatile organic compound.
Years 2006 to 2009 were computed with previous years EDMS version to provide for a common basis of comparison.
Kg/day Kilograms per day. One kg/day is equivalent to approximately 0.40234 tons per year (tpy).
1 The 2006 increase in aircraft VOC emissions is largely attributable to the addition of aircraft main engine startup emissions.
2 GSE emissions include aircraft auxiliary power units (APUs) as well as vehicles and equipment converted to alternative fuels.
3 Due to the new roadway configuration and opening of the Ted Williams Tunnel there was no Ted Williams Tunnel through-traffic at Logan Airport beginning in 2003.
4 Parking/curbside is based on vehicle miles traveled (VMT) analysis.
5 Includes the Central Heating and Cooling Plant, emergency electricity generation, snow melter usage, and other stationary sources.

Table I-16 Estimated NO_X Emissions (in kg/day) at Logan Airport 1993-2001[1]

Aircraft/GSE Model:	Logan Dispersion Modeling System (LDMS)					EDMS v3.22	EDMS v4.21	EDMS v4.03	
Motor Vehicle Model:	**MOBILE5a**					**MOBILE 5a_h**	**MOBILE 6.2.03**	**MOBILE 6.0**	
Year:	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999[2]**	**2000**	**2001**
Aircraft Sources									
Air carriers	4,271	4,317	3,861	3,781	4,150	4,471	4,183	4,202	3,707
Commuter aircraft	202	158	192	137	159	203	166	125	233
Cargo aircraft	213	257	332	363	262	254	286	284	267
General aviation	13	13	17	18	21	5	12	49	34
Total aircraft sources	4,699	4,745	4,402	4,299	4,592	4,933	4,647	4,660	4,241
GSE[3]	722	617	607	588	622	317	444	333	305
Motor Vehicles									
Ted Williams Tunnel through-traffic	N/A	N/A	N/A	N/A	N/A	N/A	28	26	22
Parking/curbside	25	24	24	24	24	37	39	52	46
On-airport vehicles[4]	240	239	229	257	244	372	449	425	369
Total motor vehicle sources	265	263	253	281	268	409	516	503	437
Other Sources									
Fuel storage/handling[5]	0	0	0	0	0	0	0	0	0
Miscellaneous sources[6]	278	330	320	275	244	284	165	211	185
Total other sources	278	330	320	275	244	284	165	211	185
Total Airport Sources	5,964	5,955	5,582	5,443	5,726	5,943	5,772	5,707	5,168

Source: KBE and Massport, 2019.
Notes: GSE – ground service equipment; N/A – not available; NOx – oxides of nitrogen.
Kg/day Kilograms per day. One kg/day is approximately equivalent to 0.40234 tons per year (tpy).
1 The emissions inventory for 1990 is shown in Chapter 7, *Air Quality/Emissions Reduction*. Emission inventories for 1991 and 1992 were not prepared.
2 Year 1999 emissions were last re-calculated using EDMS v4.21 in the 2004 ESPR Air Quality Analysis.
3 Beginning in 1996 and later, emissions include vehicles and equipment converted to alternative fuels. Auxiliary power unit (APU) emissions are also included.
4 1999 emissions inventory include reductions attributable to compressed natural gas (CNG) shuttle buses.
5 Fuel storage and handling facilities are not sources of NOx emissions.
6 Includes the Central Heating and Cooling Plant, emergency electricity generation, and other stationary sources. Fire Training emissions were included in 1999. Diesel snow melter usage was added in 1999.

Table I-17 Estimated NO_X Emissions (in kg/day) at Logan Airport 2002-2009

Aircraft/GSE Model:	EDMS v4.11		EDMS v4.21	EDMS v4.5		EDMS v5.0.1		EDMS v5.0.2		EDMS v5.1		EDMS v5.1.2
Motor Vehicle Model:	**MOBILE 6.0**	**MOBILE 6.2.01**	**MOBILE 6.2.03**									
Year:	**2002**	**2003**	**2004**	**2005**	**2006**		**2007**		**2008**		**2009**	
Aircraft Sources												
Air carriers	2,721	2,479	2,949	2,880	2,849	3,044	3,120	3,121	3,031	3,031	2,944	2,952
Commuter aircraft	208	185	245	225	195	256	353	354	319	319	309	234
Cargo aircraft	246	213	215	211	192	125	248	248	233	233	215	204
General aviation	38	45	49	50	49	60	56	56	43	43	27	23
Total aircraft sources	3,213	2,922	3,458	3,366	3,285	3,485	3,777	3,779	3,626	3,626	3,495	3,413
GSE[1]	322	291	333	312	280	300	299	299	257	257	219	219
Motor Vehicles												
Ted Williams Tunnel through-traffic	20	0[2]	0[2]	0[2]	0[2]	0[2]	0[2]	0[2]	0[2]	0[2]	0[2]	0[2]
Parking/curbside[3]	32	28	21	22	19	19	18	18	15	15	13	13
On-airport vehicles	341	302	267	269	238	238	233	233	182	182	153	153
Total motor vehicle sources	393	330	288	291	257	257	251	251	197	197	166	166
Other Sources												
Fuel storage/handling[4]	0	0	0	0	0	0	0	0	0	0	0	0
Miscellaneous sources[5]	175	151	211	218	109	109	128	128	124	124	181	181
Total other sources	175	151	211	218	109	109	128	128	124	124	181	181
Total Airport Sources	4,103	3,694	4,290	4,187	3,931	4,151	4,455	4,457	4,204	4,204	4,061	3,979

Source: KBE and Massport, 2019.

Notes: GSE – ground serice equipment; NOx – oxides of nitrogen.
Years 2006 to 2009 were computed with previous years EDMS version to provide for a common basis of comparison.

Kg/day Kilograms per day. One kg/day is approximately equivalent to 0.40234 tons per year (tpy).

1 GSE emissions include auxiliary power units (APUs) as well as vehicles and equipment converted to alternative fuels.

2 Due to the new roadway configuration and opening of the Ted Williams Tunnel there was no Ted Williams Tunnel through-traffic at Logan Airport beginning in 2003.

3 Parking/curbside data is based on vehicle miles traveled (VMT) analysis.

4 Fuel storage/handling facilities are not a source of NOx emissions.

5 Includes the Central Heating and Cooling Plant, emergency electricity generation, snow melter usage, and other stationary sources.

Table I-18 Estimated CO Emissions (in kg/day) at Logan Airport 1993-2001[1]

Aircraft/GSE Model:	Logan Dispersion Modeling System (LDMS)					EDMS v3.22	EDMS v4.21	EDMS v4.03	
Motor Vehicle Model:	**MOBILE5a**					**MOBILE 5a_h**	**MOBILE 6.2.03**	**MOBILE 6.0**	
Year:	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999[2]**	**2000**	**2001**
Aircraft Sources									
Air carriers	5,663	4,660	4,691	4,812	4,698	3,079	3,754	2,994	2,475
Commuter aircraft	1,309	927	934	859	770	482	1,404	1,188	1,072
Cargo aircraft	344	572	598	580	514	218	503	400	323
General aviation	353	356	339	549	654	269	940	295	407
Total aircraft sources	7,669	6,515	6,562	6,800	6,636	4,048	6,601	4,877	4,277
GSE[3]	7,482	6,187	6,029	5,740	6,098	5,113	4,532	5,335	5,193
Motor Vehicles									
Ted Williams Tunnel through-traffic	N/A	N/A	N/A	N/A	N/A	N/A	151	133	121
Parking/curbside	952	820	650	644	586	772	437	495	440
On-airport vehicles[4]	1,575	1,451	1,087	1,514	1,283	1,883	2,547	2,245	2,001
Total motor vehicle sources	2,527	2,271	1,737	2,158	1,869	2,655	3,135	2,873	2,562
Other Sources									
Fuel storage/handling[5]	0	0	0	0	0	0	0	0	0
Miscellaneous sources[6]	26	30	29	39	37	37	168	27	24
Total other sources	26	30	29	39	37	37	168	27	24
Total Airport Sources	17,704	15,003	14,357	14,737	14,640	11,853	14,436	13,112	12,056

Source: KBE and Massport, 2019.
Notes: CO – carbon monoxide; GSE – ground service equipment; N/A – not available.
Kg/day Kilograms per day. One kg/day is approximately equivalent to 0.40234 tons per year (tpy).
1 The emissions inventory for 1990 is shown in Chapter 7, *Air Quality/Emission Reduction*. Emission inventories for 1991 and 1992 were not prepared.
2 Year 1999 emissions were last re-calculated using EDMS v4.21 in the 2004 ESPR Air Quality Analysis.
3 Beginning in 1996 and later, emissions include vehicles and equipment converted to alternative fuels. Auxiliary power unit (APU) emissions are also included.
4 1999 emission inventory include reductions attributable to compressed natural gas (CNG) shuttle buses.
5 Fuel storage and handling facilities are not sources of CO emissions.
6 Includes the Central Heating and Cooling Plant, emergency electricity generation, and other stationary sources. Fire Training emissions were included in 1999. Diesel snow melter usage was added in 1999.

Table I-19 Estimated CO Emissions (in kg/day) at Logan Airport 2002-2009

Aircraft/GSE Model:	**EDMS v4.11**		**EDMS v4.21**	**EDMS v4.5**		**EDMS v5.0.1**		**EDMS v5.0.2**		**EDMS v5.1**		**EDMS v5.1.2**
Motor Vehicle Model:	**MOBILE 6.0**	**MOBILE 6.2.01**	**MOBILE 6.2.03**									
Year:	**2002**	**2003**	**2004**	**2005**	**2006**		**2007**		**2008**		**2009**	
Aircraft Sources												
Air carriers	2,156	2,128	2,985	2,895	2,828	3,167	2,973	2,973	2,710	2,710	2,460	2,448
Commuter aircraft	783	846	1,010	1,010	950	1,587	2,484	2,484	2,436	2,436	2,364	2,795
Cargo aircraft	285	209	229	174	138	158	241	241	255	255	256	266
General aviation	256	276	416	437	398	442	401	403	345	345	145	150
Total aircraft sources	3,480	3,459	4,640	4,516	4,314	5,354	6,099	6,101	5,746	5,746	5,225	5,659
Ground Service Equipment[1]	5,170	4,758	3,586	3,531	3,409	1,586	1,904	1,904	1,609	1,609	1,364	1,364
Motor Vehicles												
Ted Williams Tunnel through-traffic	112	0[2]	0[2]	0[2]	0[2]	0[2]	0[2]	0[2]	0[2]	0[2]	0[2]	0[2]
Parking/curbside[3]	295	253	180	179	144	144	139	139	117	117	107	107
On-airport vehicles	1,872	1,685	1,412	1,290	1,036	1,036	1,038	1,038	834	834	740	740
Total motor vehicle sources	2,279	1,938	1,592	1,469	1,180	1,180	1,177	1,177	951	951	847	847
Other Sources												
Fuel storage/handling[4]	0	0	0	0	0	0	0	0	0	0	0	0
Miscellaneous sources[5]	23	22	33	40	24	24	51	51	55	55	55	55
Total other sources	23	22	33	40	24	24	51	51	55	55	55	55
Total Airport Sources	10,952	10,177	9,851	9,556	8,927	8,144	9,231	9,233	8,361	8,361	7,491	7,925

Source: KBE and Massport, 2019.
Notes: CO – carbon monoxide; GSE – ground service equipment.
Kg/day Kilograms per day. One kg/day is approximately equivalent to 0.40234 tons per year (tpy).
Years 2006 to 2009 were computed with previous years EDMS version to provide for a common basis of comparison.
1 GSE emissions include auxiliary power units (APUs) as well as vehicles and equipment converted to alternative fuels.
2 Due to the new roadway configuration and opening of the Ted Williams Tunnel there was no Ted Williams Tunnel through-traffic at Logan Airport beginning in 2003.
3 Parking/curbside information is based on vehicle miles traveled (VMT) analysis.
4 Fuel storage/handling facilities are not a source of carbon monoxide (CO) emissions.
5 Includes the Central Heating and Cooling Plant, emergency electricity generation, snow melter usage, and other stationary sources.

Table I-20 Estimated $PM_{10}/PM_{2.5}$ Emissions (in kg/day) at Logan Airport, 2005-2009[1,2]

Aircraft/GSE Model:	EDMS v4.5	EDMS v5.0.1		EDMS v5.0.2		EDMS v5.1		EDMS v5.1.2	
Motor Vehicle Model:	MOBILE 6.2.03								
Year:	**2005**	**2006**		**2007**		**2008**		**2009**	
Aircraft Sources									
Air carriers	25	25	38	35	67	63	42	43	36
Commuter aircraft	1	1	2	6	14	11	6	5	5
Cargo aircraft	2	3	2	3	6	5	4	4	3
General aviation	2	2	2	2	5	5	4	2	2
Total aircraft sources	30	31	44	46	92	84	56	54	46
GSE[3]	11	9	9	10	10	8	15	14	14
Motor Vehicles									
Parking/curbside[4]	1	1	1	<1	<1	<1	<1	<1	<1
On-airport vehicles	8	8	8	9	9	7	7	6	6
Total motor vehicle sources	9	9	9	9	9	7	7	6	6
Other Sources									
Fuel storage/handling[5]	0	0	0	0	0	0	0	0	0
Miscellaneous sources[6]	34	16	16	17	17	3	3	5	5
Total other sources	34	16	16	17	17	3	3	5	5
Total Airport Sources	84	65	78	82	128	102	81	79	71

Source: KBE and Massport, 2019.
Notes: GSE – ground service equipment; PM – particulate matter.
Kg/day Kilograms per day. One kg/day is approximately equivalent to 0.40234 tons per year (tpy);
Years 2006 to 2009 were computed with previous years EDMS version to provide for a common basis of comparison.
1 It is assumed that all PM are less than 2.5 microns in diameter ($PM_{2.5}$).
2 2005 is the first year that $PM_{10}/PM_{2.5}$ emissions were included in the Logan Airport ESPR/EDR emission inventories.
3 GSE emissions include auxiliary power units (APUs) as well as vehicles and equipment converted to alternative fuels.
4 Parking/curbside is based on vehicle miles traveled (VMT) analysis.
5 Fuel storage and handling facilities are not sources of PM emissions.
6 Includes the Central Heating and Cooling Plant, emergency electricity generation, fire training, snow melters, and other stationary sources.

Greenhouse Gas (GHG) Emissions Inventory for 2017

The Massachusetts Executive Office of Energy and Environmental Affairs (EEA) has published the *MEPA Greenhouse Gas Emissions Policy and Protocol*.[2] These guidelines require that certain projects undergoing review under the Massachusetts Environmental Policy Act (MEPA) quantify the greenhouse gas (GHG) emissions generated by proposed projects, and identify measures to avoid, minimize, or mitigate such emissions.[3] Even though the *2017 ESPR* does not assess any proposed projects and is therefore not subject to the GHG policy, Massport has prepared an emission inventory of GHG emissions directly and indirectly associated with Logan Airport.

In April 2009, the Transportation Research Board Airport Cooperative Research Program (ACRP); published the *Guidebook on Preparing Airport Greenhouse Gas Emission Inventories (ACRP Report 11)*, which provides recommended instructions to airport operators on how to prepare an airport-specific GHG emissions inventory.[4] The 2017 GHG emissions estimates include aircraft (within the ground taxi/delay and up to 3,000 feet), GSE, APU, motor vehicles, a variety of stationary sources, and electricity usage. Aircraft cruise emissions over the 3,000-foot level were not included. This work was accomplished following the EEA guidelines and uses widely-accepted emission factors that are considered appropriate for this application, including International Organization for Standardization New England electricity-based values.

Methodology

Airport GHG emissions are calculated in much the same way as criteria pollutants,[5] through the use of input data such as activity levels or material throughput rates (i.e., fuel usage, VMT, electrical consumption) that are applied to appropriate emission factors (i.e., in units of GHG emissions per gallon of fuel).

In this case, the input data were either based on Massport records, or data and information derived from the latest version of the FAA AEDT (AEDT 2d). **Table I-21** summarizes the data and information used in the 2017 GHG inventory.

Massport will update the GHG Emissions Inventory for Logan Airport annually.

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2 Revised MEPA Greenhouse Gas Emissions Policy and Protocol, Massachusetts Executive Office of Energy and Environmental Affairs, effective May 10, 2010.

3 These GHGs are comprised primarily of carbon dioxide (CO_2), methane (CH_4), nitrous oxides (N_2O), and three groups of fluorinated gases (i.e., sulfur hexafluoride [SF_6], hydrofluorocarbons [HFCs], and perfluorocarbons [PFCs]). GHG emission sources associated with airports are generally limited to CO_2, CH_4, and N_2O.

4 Transportation Research Board, Airport Cooperative Research Panel, ACRP Report 11, Project 02-06, Guidebook on Preparing Airport Greenhouse Gas Emissions Inventories (in production). See http://onlinepubs.trb.org/onlinepubs/acrp/acrp_rpt_011.pdf for the full report.

5 Criteria pollutants are pollutants for which there are National Ambient Air Quality Standards (NAAQS) (i.e., carbon monoxide, sulfur dioxide, nitrogen dioxide, etc.).

Table I-21 Logan Airport Greenhouse Gas (GHG) Inventory Input Data and Information for 2017

Activity	Fuel Type	Usage	Units	Source
Aircraft				
Aircraft Taxi	Jet A[1]	20,614,471	gallons	AEDT 2d
	AvGas[2]	471	gallons	AEDT 2d
Engine Startup[6]	Jet A	476,387	gallons	AEDT 2d
Aircraft AGL to 3,000 feet	Jet A[1]	24,415,674	gallons	AEDT 2d
	AvGas[2]	558	gallons	AEDT 2d
Aircraft Support Equipment				
Ground Service Equipment (GSE)	Diesel	792,080	gallons	Massport
	Gasoline	667,637	gallons	Massport
	Propane	782	gallons	AEDT 2d
	CNG	0	ft^3	AEDT 2d
Auxiliary Power Units (APU)	Jet A	1,136,445	gallons	AEDT 2d
Motor Vehicles				
On-airport Vehicles	Composite[3]	71,723,449	VMT	Massport
On-airport Parking/Curbsides	Composite[3]	1,465,163	Idle hours	Massport
Massport Shuttle Bus	CNG	302,389	GEG	Massport
	Diesel	Defleeted 2014	gallons	Massport
Massport Express Bus	Diesel	534,761	gallons	Massport
Massport Fire Rescue	Diesel	20,000	gallons	Massport
Agricultural Equipment	Diesel	63,503	gallons	Massport
Massport Fleet Vehicles (Honda Civic)	CNG	423	GEG	Massport
Massport Fleet Vehicles (Fueled Onsite)	Gasoline	237,938	gallons	Massport
Massport Fleet Vehicles (Fueled Offsite)	Gasoline	85,501	gallons	Massport
Massport Fleet Vehicles (Fueled Onsite)	Diesel	86,365	gallons	Massport
Off-airport Vehicles (Public)	Composite[3]	220,681,409	VMT	Massport
Off-airport Vehicles (Airport Employees)	Composite[3]	5,866,364	VMT	Massport
Off-airport Vehicles (Tenant Employees)	Composite[3]	54,987,273	VMT	Massport

6 The EDMS fuel usage for Aircraft Engine Startup was reported as a surrogate because AEDT does not calculate this fuel usage.

Table I-21 Logan Airport Greenhouse Gas (GHG) Inventory Input Data and Information for 2017 (Continued)

Activity	Fuel Type	Usage	Units	Source
Stationary and Portable Sources				
Boilers and Space Heaters	No 2 Oil	115,878	gallons	Massport
	No 6 Oil	0	gallons	Massport
	Natural Gas	477	million ft^3	Massport
Generators	Diesel	36,330	gallons	Massport
Snow melters	ULSD	474	gallons	Massport
	CNG	5	million ft^3	Massport
Fire Training Facility	Tekflame	3,970	gallons	Massport
	AvGas	1,241	gallons	Massport
Electrical Consumption – Massport	-	16,074,695	kWh	Massport
Electrical Consumption – Tenant/Common Area	-	173,338,058	kWh	Massport

Sources: Massport and KBE, 2019.
Notes: AGL – above ground level; CNG – compressed natural gas; GEG – gasoline equivalent gallons; kWh – kilowatt hours; ULSD – ultra low sulfur diesel; VMT – vehicle miles traveled.
1 Jet A density of 6.84 pounds per gallon.
2 AvGas density of 6.0 pounds per gallon.
3 Composite means gasoline, diesel, CNG, and liquefied petroleum gas (LPG) fueled motor vehicles.

Emission factors were obtained from the U.S. Energy Information Administration, the Intergovernmental Panel on Climate Change (IPCC), EPA's MOVES, and the most recent version of EPA's GHG Emission Factors Hub (March 2018).[7,8,9,10] **Table I-22** presents emission factors for carbon dioxide (CO_2), nitrous oxide (N_2O), and methane (CH_4) for 2017.

7 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2, 2006, www.ipcc-nggip.iges.or.jp/public/2006gl/index.html.
8 U.S. Energy Information Administration, Voluntary Reporting of Greenhouse Gases Program. Fuel and Energy Source Codes and Emission Coefficients, www.eia.doe.gov/oiaf/1605/coefficients.html.
9 EPA, GHG Emissions Factors Hub (March 2018) https://www.epa.gov/climateleadership/center-corporate-climate-leadership-ghg-emission-factors-hub. The most recent version of the Emission Factors Hub includes updates to emission factors for stationary and mobile combustion sources, new electricity emission factors from EPA's Emissions & Generation Resource Integrated Database (eGRID) and the IPCC Fifth Assessment Report (AR4/AR5).
10 U.S. Environmental Protection Agency, MOVES Emissions Model, http://www.epa.gov/otaq/models/moves/.

Table I-22 Greenhouse Gas (GHG) Emission Factors for 2017

Sources	Fuel	CO_2	N_2O	CH_4	Units
Aircraft[1]	Jet A	21.5	0.00066	-[5]	lb/gallon
	AvGas	18.3	0.00024	0.01556	lb/gallon
Ground Support Equipment (GSE)/ Auxiliary Power Units (APUs)[1]	Diesel	22.5	0.00057	0.00126	lb/gallon
	Gasoline	19.4	0.00049	0.00110	lb/gallon
	CNG	120.0	0.00023	0.00226	lb/1000 ft^3
	Propane	12.6	0.00011	0.00060	lb/gallon
	Jet A	21.5	0.00066	-[5]	lb/gallon
Motor Vehicles[1,2]	Composite	463	0.00004	0.00324	g/mile
	Composite	3,400	0.00017	0.0135	g/hour
	CNG	120.0	0.00023	0.00226	lb/1000 ft^3
	Diesel	22.5	0.00057	0.00126	lb/gallon
	Gasoline	19.4	0.00018	0.0008	lb/gallon
Stationary and Portable[1]	No. 2 Oil	22.5	0.00018	0.00090	lb/gallon
	No. 6 Oil	24.8	0.00020	0.00099	lb/gallon
	Natural Gas	120.0	0.00023	0.00226	lb/1000 ft^3
	ULSD	22.5	0.00018	0.00090	lb/gallon
Fire Training Facility[1]	Tekflame[3]	12.6	0.00011	0.00060	lb/gallon
	AvGas	18.3	0.00024	0.01556	lb/gallon
Electrical Consumption[4]	-	0.56	0.000009	0.000012	lb/kW-hr

Sources: Massport and KBE, 2019.

Notes: CH_4 – methane; CNG – compressed natural gas; CO_2 – carbon dioxide; g- grams; kWh – kilowatt hour; lb – pound; N_2O – nitrous oxides; ULSD – Ultra Low Sulfur Diesel.

1 Environmental Protection Agency, GHG Emissions Factors Hub (March 2018), https://www.epa.gov/climateleadership/center-corporate-climate-leadership-ghg-emission-factors-hub.

2 EPA, MOVES2014b, http://www.epa.gov/otaq/models/moves/.

3 As propane.

4 Environmental Protection Agency, Emissions & Generation Resource Integrated Database (eGRID2016), February 2018, http://www.epa.gov/climateleadership/documents/emission-factors.pdf.

5 Contributions of CH_4 emissions from commercial aircraft are reported as zero. Years of scientific measurement campaigns conducted at the exhaust exit plane of commercial aircraft gas turbine engines have repeatedly indicated that CH_4 emissions are consumed over the full emission flight envelope [Reference: Aircraft Emissions of Methane and Nitrous Oxide during the Alternative Aviation Fuel Experiment, Santoni et al., Environ. Sci. Technol., July 2011, Volume 45, pp. 7075-7082]. As a result, EPA published that: "…methane is no longer considered to be an emission from aircraft gas turbine engines burning Jet A at higher power settings and is, in fact, consumed in net at these higher powers." [Reference: EPA, Recommended Best Practice for Quantifying Speciated Organic Gas Emissions from Aircraft Equipped with Turbofan, Turbojet, and Turboprop Engines, May 27, 2009 [EPA-420-R-09-901], http://www.epa.gov/otaq/aviation.htm]. In accordance with the following statements in the 2006 IPCC Guidelines (IPCC 2006), FAA does not calculate CH_4 emissions for either the domestic or international bunker commercial aircraft jet fuel emissions inventories. "Methane (CH_4) may be emitted by gas turbines during idle and by older technology engines, but recent data suggest that little or no CH_4 is emitted by modern engines." "Current scientific understanding does not allow other gases (e.g., N_2O and CH_4) to be included in calculation of cruise emissions." (IPCC 1999).

Results

Table I-23 presents the results of the 2017 GHG emissions inventory for Logan Airport by emission source (i.e., aircraft, GSE, motor vehicles, and stationary sources) and compound (i.e., CO_2, N_2O, and CH_4), respectively.

Table I-23 Greenhouse Gas (GHG) Emissions (MMT CO_2 Eq)[1] for 2017

Activity	CO_2	N_2O	CH_4	Total
Aircraft Sources				
Aircraft Taxi	0.20	<0.01	<0.01	0.20
Engine Startup	<0.01	<0.01	-[2]	<0.01
Aircraft AGL to 3,000 feet	0.24	<0.01	<0.01	0.24
Aircraft Support Equipment				
Ground Service Equipment (GSE)	0.01	<0.01	<0.01	0.01
Auxilary Power Unit (APU)	0.01	<0.01	-[2]	0.01
Motor Vehicles				
On-airport Vehicles	0.03	<0.01	<0.01	0.03
On-airport Parking/Curbsides	<0.01	<0.01	<0.01	<0.01
Massport Shuttle Buses	0.01	<0.01	<0.01	0.01
Massport Fleet Vehicles	0.01	<0.01	<0.01	0.01
Off-airport Vehicles (Public)	0.07	<0.01	<0.01	0.07
Off-airport Vehicles (Airport Employees)	<0.01	<0.01	<0.01	<0.01
Off-airport Vehicles (Tenant Employees)	0.03	<0.01	<0.01	0.03
Stationary Sources				
Boilers	0.03	<0.01	<0.01	0.03
Generators, Snow melters, etc.	<0.01	<0.01	<0.01	<0.01
Fire Training Facility	<0.01	<0.01	<0.01	<0.01
Electrical Consumption	0.05	<0.01	<0.01	0.05

Sources: Massport and KBE, 2019.
Notes: AGL – above ground level; CH_4 – methane; CO_2 – carbon dioxide; N_2O – nitrous oxides.
1 Units expressed as million metric tons of CO_2 equivalent (MMT CO2 Eq): 1 metric ton = 1.1 short tons.
2 Contributions of CH_4 emissions from commercial aircraft are reported as zero. Years of scientific measurement campaigns conducted at the exhaust exit plane of commercial aircraft gas turbine engines have repeatedly indicated that CH_4 emissions are consumed over the full emission flight envelope [Reference: Aircraft Emissions of Methane and Nitrous Oxide during the Alternative Aviation Fuel Experiment, Santoni et al., Environ. Sci. Technol., July 2011, Volume 45, pp. 7075-7082]. As a result, EPA published that: "…methane is no longer considered to be an emission from aircraft gas turbine engines burning Jet A at higher power settings and is, in fact, consumed in net at these higher powers." [Reference: EPA, Recommended Best Practice for Quantifying Speciated Organic Gas Emissions from Aircraft Equipped with Turbofan, Turbojet, and Turboprop Engines, May 27, 2009 [EPA-420-R-09-901], http://www.epa.gov/otaq/aviation.htm]. In accordance with the following statements in the 2006 IPCC Guidelines (IPCC 2006), FAA does not calculate CH_4 emissions for either the domestic or international bunker commercial aircraft jet fuel emissions inventories. "Methane (CH_4) may be emitted by gas turbines during idle and by older technology engines, but recent data suggest that little or no CH_4 is emitted by modern engines." "Current scientific understanding does not allow other gases (e.g., N_2O and CH_4) to be included in calculation of cruise emissions." (IPCC 1999).

Table I-24 compares the total GHG emission from Logan Airport in 2017 to the total GHG emissions for Massachusetts.

Table I-24 Logan Airport Greenhouse Gas (GHG) Emissions Compared to Massachusetts Totals[1]

	CO_2	N_2O	CH_4	Totals
Logan Airport Emissions (2017)[2]	0.70	<0.01	<0.01	0.71
Massachusetts[3]	71.78	0.8	1.2	73.77
Percent of Logan Airport to Massachusetts[4]	<1%	<1%	<1%	<1%

Sources: Massport and KBE, 2019.
Notes: CH_4 – methane; CO_2 – carbon dioxide; N_2O – nitrous oxides.
1 Units expressed as million metric tons of CO_2 equivalents (MMT CO_2 Eq): 1 metric ton = 1.1 short tons.
2 Total from Massport, tenants, and public categories.
3 Climate Analysis Indicators Tool (CAIT US) Version 4.0. (Washington, DC: World Resources Institute, 2015)
4 Percentages represent the relative amount Logan Airport-related emissions compared to the state totals.

Table I-25 provides a comparison between Airport-related GHG emissions from 2007 through 2017. Total GHG emissions in 2017 were slightly higher (8 percent) than 2016 levels. To equally compare to previous years, the 2017 emissions are summarized in a manner similar to previous years.

Table I-25 Comparison of Estimated Total Greenhouse Gas (GHG) Emissions (MMT of CO_2eq) at Logan Airport – 2007 through 2017

Source	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Direct Emissions[2]											
Aircraft[3]	0.22	0.21	0.19	0.18	0.19	0.19	0.19	0.20	0.21	0.19	0.21
GSE/APUs	0.08	0.08	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.01	0.03
Motor vehicles[4]	0.03	0.03	0.03	0.03	0.04	0.03	0.05	0.05	0.05	0.05	0.05
Other sources[5]	0.04	0.03	0.03	0.03	0.03	0.02	0.03	0.03	0.03	0.03	0.03
Total Direct Emissions	0.37	0.35	0.27	0.27	0.28	0.26	0.29	0.29	0.32	0.29	0.32
Indirect Emissions[6]											
Aircraft[7]	0.18	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.18	0.22	0.24
Motor vehicles[8]	0.05	0.05	0.05	0.05	0.06	0.05	0.08	0.07	0.08	0.09	0.10
Electrical consumption[9]	0.09	0.08	0.07	0.07	0.08	0.08	0.06	0.06	0.06	0.06	0.05
Total Indirect Emissions	0.32	0.30	0.29	0.29	0.30	0.30	0.31	0.30	0.32	0.36	0.39
Total Emissions[10]	0.69	0.65	0.56	0.56	0.58	0.57	0.60	0.60	0.63	0.65	0.71
Percent of State Totals[11]	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1

Sources: Massport and KBE, 2019.

Notes: APU – Auxiliary Power Unit; CH_4 – methane; CO_2 – carbon dioxide; GSE- Ground Service Equipment; N_2O – nitrous oxides. Totals may not add exactly due to rounding.

1 MMT – million metric tons of CO_2 equivalents (1 MMT = 1.1M Short Tons). CO_2 equivalents (CO_2eq) are bases for reporting the three primary GHGs (e.g., CO_2, N_2O and CH_4) in common units. Quantities are reported as "rounded" and truncated values for ease of addition.

2 Direct emissions are those that occur in areas located within the Airport's geographic boundaries.

3 Direct aircraft emissions-based engine start-up, taxi-in, taxi-out and ground-based delay emissions.

4 Direct motor vehicle emissions based on on-site vehicle miles traveled (VMT).

5 Other sources include Central Heating and Cooling Plant, emergency generators, snow melters and live fire training facility.

6 Indirect emissions are those that occur off the Airport site.

7 Indirect aircraft emissions are based on take-off, climb-out and landing emissions which occur up to an altitude of 3,000 ft., the limits of the landing and takeoff (LTO) cycle

8 Indirect motor vehicle emissions based on off-site Airport-related VMT and an average round trip distance of approximately 60 miles.

9 Electrical consumption emissions occur off-airport at power generating plants.

10 Total Emissions = Direct + Indirect.

11 Percentage based on relative amount of Airport total of direct emissions to statewide total from World Resources Institute (cait.wri.org).

Greenhouse Gas (GHG) Emissions Inventory for the Future Planning Horizon

Methodology

Airport GHG emissions for the Future Planning Horizon are calculated in the same manner as for 2017, through the use of input data such as activity levels or material throughput rates (i.e., fuel usage, VMT, electrical consumption) that are applied to appropriate emission factors (i.e., in units of GHG emissions per gallon of fuel). Activity levels and material throughput rates were estimated based on scaling the 2017 data (or recent five-year average) to the Future Planning Horizon as a function of the forecasted changes in aircraft operations, traffic volumes, passenger counts, terminal square footage, or similar matrices over this timeframe. Generally, these estimates represent a conservative calculation of the activity and material rates during the Future Planning Horizon and thus, a conservative estimate of the GHG emissions. **Table I-26** summarizes these data and information used in the future GHG emissions inventory

Table I-26 Logan Airport Greenhouse Gas (GHG) Inventory Input Data and Information for the Future Planning Horizon

Activity	Fuel Type	Usage	Units	Source
Aircraft				
Aircraft Taxi	Jet A[1]	24,227,870	gallons	AEDT 2d
	AvGas[2]	465	gallons	AEDT 2d
Engine Startup	Jet A	588,487	gallons	AEDT 2d
Aircraft AGL to 3,000 feet	Jet A[1]	33,463,625	gallons	AEDT 2d
	AvGas[2]	642	gallons	AEDT 2d
Aircraft Support Equipment				
Ground Service Equipment (GSE)	Diesel	79,208	gallons	Massport
	Gasoline	66,764	gallons	Massport
	Propane	0	gallons	AEDT 2d
	CNG	0	ft^3	AEDT 2d
Auxiliary Power Units (APU)	Jet A	1,173,139	gallons	AEDT 2d
Motor Vehicles				
On-airport Vehicles	Composite[3]	65,252,598	VMT	Massport
On-airport Parking/Curbsides	Composite[3]	1,714,049	Idle hours	Massport
Massport Shuttle Bus	CNG	394,505	GEG	Massport
	Diesel	Defleeted 2014	gallons	Massport
Massport Express Bus	Diesel	697,664	gallons	Massport

Table I-26 Logan Airport Greenhouse Gas (GHG) Inventory Input Data and Information for the Future Planning Horizon (Continued)

Massport Fire Rescue	Diesel	20,000	gallons	Massport
Agricultural Equipment	Diesel	76,950	gallons	Massport
Massport Fleet Vehicles (Honda Civic)	CNG	512	GEG	Massport
Massport Fleet Vehicles (Fueled Onsite)	Gasoline	216,242	gallons	Massport
Massport Fleet Vehicles (Fueled Offsite)	Gasoline	64,126	gallons	Massport
Massport Fleet Vehicles (Fueled Onsite)	Diesel	78,490	gallons	Massport
Off-airport Vehicles (Public)	Composite[3]	287,907,074	VMT	Massport
Off-airport Vehicles (Airport Employees)	Composite[3]	4,461,726	VMT	Massport
Off-airport Vehicles (Tenant Employees)	Composite[3]	60,263,172	VMT	Massport
Stationary and Portable Sources				
Boilers and Space Heaters	No 2 Oil	20,475	gallons	Massport
	No 6 Oil	0	gallons	Massport
	Natural Gas	534	million ft^3	Massport
Generators	Diesel	63,653	gallons	Massport
Snow melters	ULSD	474	gallons	Massport
	CNG	16	million ft^3	Massport
Fire Training Facility	Tekflame	4,984	gallons	Massport
	AvGas	643	gallons	Massport
Electrical Consumption – Massport	-	19,890,762	kWh	Massport
Electrical Consumption – Tenant/Common Area	-	214,487,805	kWh	Massport

Sources: Massport and KBE, 2019.
Notes: AGL – above ground level; CNG – compressed natural gas; GEG – gasoline equivalent gallons;; kWh – kilowatt hours; VMT – vehicle miles traveled; ULSD – ultra low sulfur diesel.
1 Jet A density of 6.84 pounds per gallon.
2 AvGas density of 6.0 pounds per gallon.
3 Composite means gasoline, diesel, CNG, and liquefied petroleum gas (LPG) fueled motor vehicles.

Results

Table I-27 presents the results of the future GHG emissions inventory for Logan Airport by emission source (i.e., aircraft, GSE, motor vehicles, and stationary sources) and compound (i.e., CO_2, N_2O, and CH_4).

Table I-27 Greenhouse Gas (GHG) Emissions (MMT CO_2 Eq)[1] for the Future Planning Horizon

Activity	CO_2	N_2O	CH_4	Total
Aircraft Sources				
Aircraft Taxi	0.24	<0.01	-[2]	0.24
Engine Startup	0.01	<0.01	-[2]	0.01
Aircraft AGL to 3,000 feet	0.33	<0.01	<0.01	0.33
Aircraft Support Equipment				
Ground Service Equipment (GSE)	<0.01	<0.01	<0.01	<0.01
Auxiliary Power Unit (APU)	0.01	<0.01	-[2]	0.01
Motor Vehicles				
On-airport Vehicles	0.03	<0.01	<0.01	0.03
On-airport Parking/Curbsides	0.01	<0.01	<0.01	0.01
Massport Shuttle Buses	0.02	<0.01	<0.01	0.02
Massport Fleet Vehicles	<0.01	<0.01	<0.01	<0.01
Off-airport Vehicles (Public)	0.11	<0.01	<0.01	0.11
Off-airport Vehicles (Airport Employees)	<0.01	<0.01	<0.01	<0.01
Off-airport Vehicles (Tenant Employees)	0.03	<0.01	<0.01	0.03
Stationary Sources				
Boilers	0.03	<0.01	<0.01	0.03
Generators, Snow melters, etc.	<0.01	<0.01	<0.01	<0.01
Fire Training Facility	<0.01	<0.01	<0.01	<0.01
Electrical Consumption	0.06	<0.01	<0.01	0.06

Sources: Massport and KBE, 2019.

Notes: AGL – above ground level; CH_4 – methane; CO_2 – carbon dioxide; N_2O – nitrous oxides.

1 Units expressed as million metric tons of CO_2 equivalent (MMT CO_2 Eq): 1 metric ton = 1.1 short tons.

2 Contributions of CH_4 emissions from commercial aircraft are reported as zero. Years of scientific measurement campaigns conducted at the exhaust exit plane of commercial aircraft gas turbine engines have repeatedly indicated that CH_4 emissions are consumed over the full emission flight envelope [Reference: Aircraft Emissions of Methane and Nitrous Oxide during the Alternative Aviation Fuel Experiment, Santoni et al., Environ. Sci. Technol., July 2011, Volume 45, pp. 7075-7082]. As a result, EPA published that: "…methane is no longer considered to be an emission from aircraft gas turbine engines burning Jet A at higher power settings and is, in fact, consumed in net at these higher powers." [Reference: EPA, Recommended Best Practice for Quantifying Speciated Organic Gas Emissions from Aircraft Equipped with Turbofan, Turbojet, and Turboprop Engines, May 27, 2009 [EPA-420-R-09-901], http://www.epa.gov/otaq/aviation.htm]. In accordance with the following statements in the 2006 IPCC Guidelines (IPCC 2006), FAA does not calculate CH_4 emissions for either the domestic or international bunker commercial aircraft jet fuel emissions inventories. "Methane (CH_4) may be emitted by gas turbines during idle and by older technology engines, but recent data suggest that little or no CH_4 is emitted by modern engines." "Current scientific understanding does not allow other gases (e.g., N_2O and CH_4) to be included in calculation of cruise emissions." (IPCC 1999).

Measured NO_2 Concentrations

This section presents the results of Massport's long-term ambient (i.e., outdoor) air quality monitoring program for NO_2 – a pollutant associated with aircraft activity and other fuel combustion sources. Between 1982 and 2011, Massport collected NO_2 concentration data at numerous locations both on the Airport and in neighboring residential communities. The purpose of this monitoring program was to track long-term trends in NO_2 levels and to compare the results to the NAAQS for this pollutant. In 2011, Massport determined that the Logan NO_2 Monitoring Program had achieved its objectives with the significant and stable decrease in NO_2 emissions since 1999 and thus discontinued the program in 2011.

When it was operational, this monitoring program used passive diffusion tube technology for a period of one week each month for 12 months of the year at each of the monitoring stations. The samples of NO_2, along with Quality Assurance/Quality Control (QA/QC) samples, were then analyzed in a laboratory.

Table I-28 presents the final year NO_2 monitoring data (i.e., 2011). For comparative purposes, historical data from 1999 are similarly shown in **Table I-28**. The table also includes NO_2 data collected under a separate effort by the Massachusetts Department of Environmental Protection (MassDEP) using continuous monitors at four Boston-area locations.

As shown on **Table I-28**, the 2011 NO_2 levels were somewhat higher than in 2010. However, this occurrence is consistent with the cyclical trend of the average levels over the past several years[11]. Importantly, there remains a long-term trend of decreasing NO_2 concentrations at both the Massport and MassDEP monitoring sites since 1999. Other notable observations of the 2011 data reveal the following:

- Annual NO_2 concentrations at all Massport and MassDEP monitoring locations were below the annual NO_2 NAAQS of 100 micrograms per cubic meter ($\mu g/m^3$) in 2011.
- The Massport-collected data compare relatively closely with data collected by the MassDEP. The average of all Massport monitoring sites was 29.8 $\mu g/m^3$ compared to 32.3 $\mu g/m^3$ for the four MassDEP Boston-area monitors.
- The highest NO_2 concentrations in 2011 from the Massport program occurred in areas characterized by high levels of motor vehicle traffic (i.e., Main Terminal Area [Site 8] and Maverick Square [Site 12]).

11 Spatial and temporal changes in measured NO_2 levels from year to year are typical and should not be used to define short-term results. Rather, NO_2 levels are better assessed by looking at the trends over several years.

Table I-28	Massport and MassDEP Annual NO_2 Concentration Monitoring Results (µg/m³)													
Monitoring Site	Site No.	Year												
		1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Massport Monitoring Sites														
Runway 9	1	61.0	58.2	41.6	45.8	33.9	30.1	35.0	31.9	17.3	31.3	32.2	32.3	38.7
Runway 4R	2	55.6	44.6	41.4	36.9	32.5	30.9	30.7	29.0	17.2	20.2	19.2	21.9	25.7
Runway 33L	3	47.7	42.6	39.4	33.3	30.8	25.4	24.5	26.3	24.2	21.6	16.9	25.0	29.8
Runway 27	4	42.9	37.8	35.8	30.3	25.5	24.1	22.7	22.3	16.9	18.3	17.6	19.4	23.3
Runaway 22L	5	47.5	39.8	38.2	33.8	27.8	23.7	22.1	24.9	17.1	21.3	20.1	21.9	29.0
Runway 22R	6	60.6	59.2	51.6	45.0	32.3	29.7	32.9	25.1	24.8	29.7	27.8	33.1	30.6
Runway 15R	7	47.0	43.4	44.3	42.6	40.8	28.7	27.7	28.7	20.5	24.2	23.9	26.7	29.7
Main Terminal Area	8	70.8	87.0	80.7	69.3	44.3	44.7	46.2	43.5	29.5	41.7	37.7	43.9	49.0
Webster St., Jeffries Point	11	52.4	45.5	43.4	39.1	32.5	28.3	31.3	31.3	22.7	25.2	23.9	27.0	30.1
Maverick Square, E. Bos	12	81.2	72.2	68.5	61.3	47.9	46.5	41.4	45.6	36.0	41.3	38.2	42.5	43.5
Bremen St., E. Boston	13	59.1	52.6	52.0	46.2	39.1	35.7	37.6	37.1	27.8	30.1	28.6	31.9	35.3
Shore St. E. Boston	14	45.7	38.5	38.8	35.0	27.2	24.0	24.9	22.4	18.1	19.7	18.3	20.7	26.7
Orient Heights Yacht Club	15	45.1	46.9	47.7	43.1	29.4	25.2	25.5	25.1	19.6	21.1	18.3	22.5	26.7
Bayswater St. E. Boston	16	45.2	45.5	48.3	41.2	28.4	22.8	30.4	23.1	18.4	20.2	17.8	21.0	25.9
Annavoy St. E. Boston	17	40.8	39.2	44.4	33.7	24.7	21.4	23.3	21.0	18.2	19.6	17.3	20.9	25.8
Pleasant St. Winthrop	18	42.0	39.3	37.8	32.3	27.9	22.6	23.4	21.4	17.8	20.2	17.7	20.1	24.4
Court Road, Winthrop	19	40.0	36.1	33.8	27.4	24.0	19.2	22.3	21.0	16.3	17.1	16.7	18.4	22.7
Cottage Park Yacht Club	20	37.1	50.9	45.9	36.7	22.5	19.1	27.7	21.4	16.3	18.4	17.8	17.8	22.5
Point Shirley, Winthrop	21	33.1	37.7	38.6	24.4	22.7	17.4	17.2	20.2	15.7	15.6	14.9	17.5	21.6
Deer Island	22	36.3	31.9	33.8	33.1	21.3	17.8	16.9	17.8	13.0	17.0	14.7	16.7	20.7
Runway 4R–9	23	42.2	66.0	42.3	33.4	28.6	24.1	27.1	26.3	19.2	22.4	21.2	21.6	26.5
Runway 33L–4R	24	44.3	41.7	41.8	33.5	28.1	24.3	22.3	25.7	20.9	25.2	20.0	23.6	26.2

Table I-28	Massport and MassDEP Annual NO_2 Concentration Monitoring Results ($\mu g/m^3$) (Continued)													
Monitoring Site	**Site No.**	**Year**												
		1999	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
Massport Monitoring Sites (continued)														
Runway 22R–33L	25	62.4	50.3	49.4	42.2	33.8	31.7	29.4	34.5	22.9	25.1	25.3	29.5	34.9
Jeffries Point Park/Marginal St.	26	68.6	49.8	45.0	42.0	35.2	30.5	32.5	31.7	24.4	27.0	25.6	28.6	33.1
Harborwalk	27	54.3	48.5	47.4	43.5	35.6	35.5	29.3	34.2	24.2	26.1	24.5	28.3	34.9
Logan Athletic Fields	29	NA	69.1	67.6	54.9	41.9	40.2	37.5	37.0	24.6	28.8	26.8	30.8	37.8
Brophy Park, Jeffries Point	30	NA	48.0	45.2	41.0	36.5	31.2	32.9	31.3	24.8	26.6	24.6	26.8	30.8
Average of all Monitoring Sites		**50.5**	**50.5**	**47.5**	**40.0**	**31.7**	**28.0**	**28.7**	**28.7**	**21.0**	**24.3**	**22.5**	**25.6**	**29.8**
MassDEP Monitoring Sites[1]														
Long Island Road	A	20.7	24.4	22.6	22.6	16.9	12.6	13.2	13.2	13.2	13.2	11.3	13.6	13.4
Harrison Avenue	B	NA	45.1	47.0	45.1	43.2	37.4	35.8	35.8	37.7	37.7	33.9	32.1	33.1
Kenmore Square	C	56.4	54.5	56.8	47.0	47.0	51.7	43.3	43.3	39.6	41.5	37.7	36.0	38.4
East First Street	D	39.5	37.6	43.2	39.5	39.5	36.8	33.9	39.6	37.7	30.2	28.3	24.0	25.4

Source: Massport and MassDEP.
Notes: MassDEP - Massachusetts Department of Environmental Protection; N/A – not available; NO_2 – oxides of nitrogen.
The National Ambient Air Quality Standard (NAAQS) is 100 $\mu g/m^3$.
Massport determined that the Logan Airport NO_2 Monitoring Program had achieved its objectives with the significant and stable decrease in NO_2 emissions since 1999 and thus discontinued the program in 2011.
$\mu g/m^3$ micrograms/cubic meter.
1 NO_2 monitoring sites operated by the MassDEP.

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J

Environmental Compliance and Management/Water Quality

This appendix provides detailed information in support of Chapter 8, *Environmental Compliance and Management/Water Quality*:

- Table J-1 Logan Airport National Pollutant Discharge Elimination System (NPDES) Permit (No. MA0000787) Stormwater Outfall Monitoring Requirements (2007)
- Table J-2 Fire Training Facility NPDES Permit (No. MA0032751) Stormwater Outfall Monitoring Requirements (2006)
- Table J-3 Logan Airport 2017 Monthly Monitoring Results for First Quarter — North, West, and Maverick Street Stormwater Outfalls
- Table J-4 Logan Airport 2017 Monthly Monitoring Results for First Quarter — Porter Street Stormwater Outfall
- Table J-5 Logan Airport 2017 Monthly Monitoring Results for Second Quarter — North, West, and Maverick Street Stormwater Outfalls
- Table J-6 Logan Airport 2017 Monthly Monitoring Results for Second Quarter — Porter Street Stormwater Outfall
- Table J-7 Logan Airport 2017 Monthly Monitoring Results for Third Quarter — North, West, and Maverick Street Stormwater Outfalls
- Table J-8 Logan Airport 2017 Monthly Monitoring Results for Third Quarter — Porter Street Stormwater Outfall
- Table J-9 Logan Airport 2017 Monthly Monitoring Results for Fourth Quarter — North, West, and Maverick Street Stormwater Outfalls
- Table J-10 Logan Airport 2017 Monthly Monitoring Results for Fourth Quarter — Porter Street Stormwater Outfall
- Table J-11 Logan Airport 2017 Quarterly Wet Weather Monitoring Results — North, West, Maverick Street, and Porter Street Stormwater Outfalls
- Table J-12 Logan Airport 2017 Quarterly Wet Weather Monitoring Results — Northwest and Runway/Perimeter Stormwater Outfalls

- Table J-13 Logan Airport February 2017 Wet Weather Deicing Monitoring Results — North, West, Porter Street, and Runway/Perimeter Stormwater Outfalls
- Table J-14 Logan Airport March 2017 Wet Weather Deicing Monitoring Results — North, West Porter Street, and Runway/Perimeter Stormwater Outfalls
- Table J-15 Logan Airport Stormwater Outfall NPDES Water Quality Monitoring Results — 1993 to 2017
- Table J-16 Logan Airport Oil and Hazardous Material Spills and Jet Fuel Handling — 1990 to 2017
- Table J-17 Type and Quantity of Oil and Hazardous Material Spills at Logan Airport — 1999 to 2017
- Table J-18 Massachusetts Contingency Plan (MCP) Closed Sites at Logan Airport
- Figure J-1 Massachusetts Contingency Plan Sites (Closed)
- EnviroNews/Sustainable Massport[1]

  Vol. 43, Issue 1 – May 2017

  Vol. 43, Issue 2 – September 2017

  Vol. 43, Issue 4 – December 2017
- Sustainable Massport Monthly Newsletters, 2018

  February 2018: Sustainable Transportation

  March 2018: Water Resources and Conservation

  April 2018: Health and Wellness

  May 2018: Parks and Open Space

  June 2018: Air Quality and Greenhouse Gas Reduction

  July 2018: Natural Resources

  August 2018: Climate Change Adaptation and Resiliency

  September 2018: Community Partnerships

  October 2018: Energy Efficiency

  November 2018: Waste Management and Recycling

  December 2018: Sustainable Tenants

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1 Only three *Sustainable Massport* Newsletters were published in 2017.

Table J-1 Logan Airport NPDES Permit (No. MA0000787) Stormwater Outfall Monitoring Requirements (2007)

Monitoring Event	North Outfall 001		West Outfall 002		Maverick Outfall 003	
	Field Measurement	Laboratory Analysis	Field Measurement	Laboratory Analysis	Field Measurement	Laboratory Analysis
Monthly Dry Weather	Not Required	Oil and Grease TSS[1] Benzene Surfactant Fecal Coliform *Enterococcus*	Not Required	Oil and Grease TSS[1] Benzene Surfactant Fecal Coliform *Enterococcus*	Not Required	Oil and Grease TSS[1] Benzene Surfactant Fecal Coliform *Enterococcus*
Monthly Wet Weather	pH Flow Rate[6]	Oil and Grease TSS[1] Benzene[2] Surfactant Fecal Coliform *Enterococcus*	pH Flow Rate[6]	Oil and Grease TSS[1] Benzene[2] Surfactant Fecal Coliform *Enterococcus*	pH Flow Rate[6]	Oil and Grease TSS[1] Benzene[2] Surfactant Fecal Coliform *Enterococcus*
Quarterly Wet Weather	pH Flow Rate[6]	PAHs[3]: - Benzo(a)anthracene - Benzo(a)pyrene - Benzo(b)fluoranthene - Benzo(k)fluoranthene - Chrysene -Dibenzo(a,h)anthracene - Indeno(1,2,3-cd)pyrene - Naphthalene	pH Flow Rate[6]	PAHs[3]: - Benzo(a)anthracene - Benzo(a)pyrene - Benzo(b)fluoranthene - Benzo(k)fluoranthene - Chrysene -Dibenzo(a,h)anthracene - Indeno(1,2,3-cd)pyrene - Naphthalene	pH Flow Rate[6]	PAHs[3]: - Benzo(a)anthracene - Benzo(a)pyrene - Benzo(b)fluoranthene - Benzo(k)fluoranthene - Chrysene -Dibenzo(a,h)anthracene - Indeno(1,2,3-cd)pyrene - Naphthalene
Deicing Episode (2/Deicing Season)	Not Required	Ethylene Glycol Propylene Glycol BOD5[4] COD[5] Total Ammonia Nitrogen Nonylphenol Tolyltriazole	Not Required	Ethylene Glycol Propylene Glycol BOD5[4] COD[5] Total Ammonia Nitrogen Nonylphenol Tolyltriazole	Not Required	Not Required
Whole Effluent Toxicity (1st and 3rd Year Deicing Season)	Not Required	Menidia beryllina Arbacia punctulata	Not Required	Menidia beryllina Arbacia punctulata	Not Required	Not Required
Treatment System Sampling (Internal Outfalls)[7]	pH Quantity, Gallons	Oil and Grease TSS[1] Benzene[2]	Not Required	Not Required	Not Required	Not Required

Table J-1 Logan Airport NPDES Permit (No. MA0000787) Stormwater Outfall Monitoring Requirements (2007) (Continued)

Monitoring Event	Northwest Outfall 005		Porter Outfall 003 (3 upstream locations)		Select Runway/Perimeter Outfalls	
	Field Measurement	Laboratory Analysis	Field Measurement	Laboratory Analysis	Field Measurement	Laboratory Analysis
Monthly Dry Weather	Not Required	Not Required	Not Required	Oil and Grease TSS[1] Benzene Surfactant Fecal Coliform *Enterococcus*	Not Required	Not Required
Monthly Wet Weather	Not Required	Not Required	pH Flow Rate	Oil and Grease TSS[1] Benzene[2] Surfactant Fecal Coliform *Enterococcus*	Not Required	Not Required
Quarterly Wet Weather	pH Flow Rate[6]	Oil and Grease TSS[1] Benzene[2]	pH Flow Rate[6]	PAHs[3]: - Benzo(a)anthracene - Benzo(a)pyrene - Benzo(b)fluoranthene - Benzo(k)fluoranthene - Chrysene -Dibenzo(a,h)anthracene - Indeno(1,2,3-cd)pyrene - Naphthalene	pH	Oil and Grease TSS[1] Benzene[2]
Deicing Episode (2/Deicing Season)	Not Required	Not Required	Not Required	Ethylene Glycol Propylene Glycol BOD5[4] COD[5] Total Ammonia Nitrogen Nonylphenol Tolytriazole	Not Required	Ethylene Glycol Propylene Glycol BOD5[4] COD[5] Total Ammonia Nitrogen Nonylphenol Tolytriazole
Whole Effluent Toxicity (1st and 3rd Year Deicing Season)	Not Required	Not Required	Not Required	Menidia beryllina Arbacia punctulata	Not Required	Not Required
Treatment System Sampling (Internal Outfalls)[7]	Not Required	Not Required	Not Required	Not Required	Not Required	Not Required

Source: Massport

Notes: Requirements are from NPDES Permit MA0000787, issued July 31, 2007.

1 TSS - Total Suspended Solids

2 Benzene must be collected with HDPE bailer.

3 PAH - Polycyclic Aromatic Hydrocarbons

4 BOD - Biological Oxygen Demand

5 COD - Chemical Oxygen Demand

6 Flow Rate will be estimated based on measured precipitation and the hydraulic model developed for the Logan Airport drainage system.

7 Outfalls 001D and 001E samples collected by Swissport.

Table J-2 Fire Training Facility NPDES Permit (No. MA0032751) Stormwater Outfall Monitoring Requirements (2014)

Monitoring Event	Outfall Serial Number 001	
	Field Measurement	Laboratory Analysis
Each Discharge Event[1]	Flow Rate[2] pH	TSS[3] Oil and Grease[4] Total BTEX[5] Toluene Benzene Ethylbenzene Xylene PAHs[5,6]
Whole Effluent Toxicity (once per year during discharge event)	Not Required	Acute Toxicity[7]

Source: Massport

Notes: Requirements are from NPDES Permit MA0032751, issued November 1, 2006.

All samples, except for wet testing, shall be collected after treatment and prior to discharge from above ground holding tank.

1 Flows from more than one training session may be held in treatment train for several weeks. Treatment and subsequent discharge through Outfall 001 is usually triggered by tank levels. Sampling will be conducted during each discharge event with the sampling point after the GAC unit and prior to discharge from the above ground holding tank. Each sample shall be a composite of three equally weighted (same volume) grab samples taken at the bottom, middle, and top of the above ground tank.

2 Total flow volume shall be reported monthly in gallons and the maximum flow rate in gallons per minute shall be reported for each month.

3 TSS - Total Suspended Solids

4 Oil and grease is measured using EPA Method 1664.

5 BTEX and PAH compounds shall be analyzed using EPA approved methods. Testing method used and method detection level for each parameter will be included in each DMR submittal.

6 PAH - Polycyclic Aromatic Hydrocarbons

7 The permittee shall conduct one acute toxicity test per year. The test results shall be submitted by the last day of the full month following completion of the test in accordance with protocols defined in the permit.

Table J-3 Logan Airport 2017 Monthly Monitoring Results for First Quarter — North, West, and Maverick Street Stormwater Outfalls

	Date	Event	Maximum Daily Flow (MGD)	Average Monthly Flow (MGD)	pH (S.U.)	Oil and Grease (mg/L)	TSS (mg/L)	Benzene (µg/L)	Surfactants (mg/L)	Fecal Coliform (cfu/100mL)	*Enterococcus* (cfu/100mL)	*Klebsiella* (cfu/100mL)
001A – North Outfall	1/23/2017	Wet Weather	4.24	0.617	7.44	<4.0	25	<1.0	0.290	34,000	350	24,000
002A – West Outfall	1/23/2017	Wet Weather	14.43	1.516	8.03	<4.0	18	<1.0	0.190	2,500	300	NA
004A – Maverick Street Outfall	1/23/2017	Wet Weather	0.966	0.079	7.04	<4.0	<5.0	<1.0	0.090	2,100	1,000	NA
001C – North Outfall	1/17/2017	Dry Weather				<4.0	12	<1.0	0.170	620	50	NA
002C – West Outfall	1/17/2017	Dry Weather				<4.0	13	<1.0	0.130	40	10	NA
004C – Maverick Street Outfall	1/17/2017	Dry Weather				<4.0	16	<1.0	0.110	50	10	NA
001A – North Outfall	2/7/2017	Wet Weather	2.59	1.16	7.40	<4.0	45	<1.0	0.360	3,900	60	NA
002A – West Outfall	2/7/2017	Wet Weather	7.314	1.326	6.79	<4.0	22	<1.0	0.290	30	<10	NA
004A – Maverick Street Outfall	2/7/2017	Wet Weather	0.215	0.045	6.81	7.3	74	<1.0	0.240	3,100	2,300	NA
001C – North Outfall	2/21/2017	Dry Weather				<4.0	21	<1.0	0.120	3,600	50	NA
002C – West Outfall	2/21/2017	Dry Weather				<4.0	16	<1.0	0.110	300	90	NA
004C – Maverick Street Outfall	2/21/2017	Dry Weather				<4.0	<5.0	<1.0	0.170	5,000	3,100	NA
001A – North Outfall	3/27/2017	Wet Weather	2.31	0.864	8.44	<4.0	18	<1.0	0.250	30	40	NA
002A – West Outfall	3/27/2017	Wet Weather	9.95	1.33	7.62	5.1	27	<1.0	0.310	280	430	NA
004A – Maverick Street Outfall	3/27/2017	Wet Weather	0.912	0.102	7.17	<4.0	54	<1.0	0.340	650	150	NA
001C – North Outfall	3/7/2017	Dry Weather				<4.0	16	<1.0	0.120	<10	50	NA
002C – West Outfall	3/7/2017	Dry Weather				<4.0	<5.0	<1.0	0.150	650	55	NA
004C – Maverick Street Outfall	3/7/2017	Dry Weather				<4.0	8.4	<1.0	0.130	3,000	450	NA
Requirements are from NPDES Permit MA0000787, issued July 31, 2007.												
Discharge Limitations												
Maximum Daily			Report	Report	6.0 to 8.5	15 mg/L	100 mg/L	Report	Report	Report	Report	
Average Monthly			Report	Report	6.0 to 8.5	—	Report	Report	Report	Report	Report	

Source: Massport.
Notes: Flow rates were estimated for outfalls 001, 002, and 004 by using the SWMM model developed for Logan Airport.
1 *Klebsiella* is an indication of non-fecal coliform bacteria and is tested for at the North Outfall when fecal coliform concentration exceeds 5,000 cfu/100ml.
NA Not Analyzed.
TSS Total Suspended Solids.

Table J-4 Logan Airport 2017 Monthly Monitoring Results for First Quarter — Porter Street Stormwater Outfall

	Date	Event	Maximum Daily Flow (MGD)	Average Monthly Flow (MGD)	pH (S.U.)	Oil and Grease (mg/L)	TSS (mg/L)	Benzene (µg/L)	Surfactants (mg/L)	Fecal Coliform (cfu/100mL)	*Enterococcus* (cfu/100mL)
003 - Porter Street Outfall 1	1/23/2017	Wet Weather	-	-	7.99	<4.0	7.8	<1.0	0.260	<10	2,400
003 - Porter Street Outfall 2	1/23/2017	Wet Weather	-	-	8.05	<4.0	20	<1.0	0.190	130	100
003 - Porter Street Outfall 3	1/23/2017	Wet Weather	-	-	7.82	<4.0	72	<1.0	0.160	<10	<10
003 - Porter Street Outfall Average		Wet Weather	2.223	0.314	7.95	0.0	33	0.0	0.203	5.1	62
003 - Porter Street Outfall 1	1/17/2017	Dry Weather				<4.0	170	<1.0	0.220	<10	10
003 - Porter Street Outfall 2	1/17/2017	Dry Weather				15	31	<1.0	0.090	10	460
003 - Porter Street Outfall 3	1/17/2017	Dry Weather				<4.0	75	<1.0	0.160	<10	20
003 - Porter Street Outfall Average		Dry Weather				5.0	92	0.0	0.157	2.2	45
003 - Porter Street Outfall 1	2/7/2017	Wet Weather	-	-	7.29	4.1	130	<1.0	0.170	160	150
003 - Porter Street Outfall 2	2/7/2017	Wet Weather	-	-	7.05	8.7	13	<1.0	0.100	<10	20
003 - Porter Street Outfall 3	2/7/2017	Wet Weather	-	-	7.51	<4.0	40	<1.0	0.120	<10	20
003 - Porter Street Outfall Average		Wet Weather	1.693	1.693	7.28	4.3	61	0.0	0.130	5.4	39
003 - Porter Street Outfall 1	2/21/2017	Dry Weather				<4.0	8	<1.0	0.250	<10	<10
003 - Porter Street Outfall 2	2/21/2017	Dry Weather				<4.0	47	<1.0	0.140	<10	40
003 - Porter Street Outfall 3	2/21/2017	Dry Weather				<4.0	6.1	<1.0	0.150	<10	<10
003 - Porter Street Outfall Average		Dry Weather				0.0	20	0.0	0.180	1.0	3.4
003 - Porter Street Outfall 1	3/27/2017	Wet Weather	-	-	7.44	<4.0	190	<1.0	0.330	290	1,000
003 - Porter Street Outfall 2	3/27/2017	Wet Weather	-	-	6.28	8.8	58	<1.0	0.220	<10	50
003 - Porter Street Outfall 3	3/27/2017	Wet Weather	-	-	5.15	5.0	230	<1.0	0.170	10	2,800
003 - Porter Street Outfall Average		Wet Weather	1.909	0.178	6.29	4.6	159	0.0	0.240	14	519
003 - Porter Street Outfall 1	3/7/2017	Dry Weather				<4.0	<5.0	<1.0	0.310	<10	<10
003 - Porter Street Outfall 2	3/7/2017	Dry Weather				<4.0	5.4	<1.0	0.810	<10	<10
003 - Porter Street Outfall 3	3/7/2017	Dry Weather				<4.0	48	<1.0	0.230	<10	<10
003 - Porter Street Outfall Average		Dry Weather				0.0	18	0.0	0.450	1.0	1.0
Requirements are from NPDES Permit MA0000787, issued July 31, 2007.											
Discharge Limitations											
Maximum Daily			Report	Report	6.0 to 8.5	Report	Report	Report	Report	Report	Report
Average Monthly			Report	Report	6.0 to 8.5	—	Report	Report	Report	Report	Report

Source: Massport.

Notes: Flow rates were estimated for outfalls 001, 002, 003 and 004 by using the SWMM model developed for Logan Airport.
For averaging calculations, a value of zero was employed for those results measured below the laboratory detection limit. For geometric mean calculations (fecal coliform and Enterococcus) a value of 1 was employed for those results measured below the laboratory detection limit.

TSS Total Suspended Solids.

NA Not Analyzed.

Table J-5 Logan Airport 2017 Monthly Monitoring Results for Second Quarter — North, West, and Maverick Street Stormwater Outfalls

	Date	Event	Maximum Daily Flow (MGD)	Average Monthly Flow (MGD)	pH (S.U.)	Oil and Grease (mg/L)	TSS (mg/L)	Benzene (µg/L)	Surfactants (mg/L)	Fecal Coliform (cfu/100mL)	*Enterococcus* (cfu/100mL)	*Klebsiella*[1] (cfu/100mL)
001A – North Outfall	4/21/2017	Wet Weather	6.54	0.773	7.08	<4.0	6.6	<1.0	0.180	70	90	NA
002A – West Outfall	4/21/2017	Wet Weather	25.5	2.496	7.28	<4.0	14	<1.0	0.330	350	200	NA
004A – Maverick Street Outfall	4/21/2017	Wet Weather	1.55	0.147	6.83	<4.0	10	<1.0	0.280	6,600	1,600	NA
001C – North Outfall	4/11/2017	Dry Weather				<4.0	25	<1.0	0.100	<10	20	NA
002C – West Outfall	4/11/2017	Dry Weather				<4.0	17	<1.0	0.100	210	200	NA
004C – Maverick Street Outfall	4/11/2017	Dry Weather				<4.0	<5.0	<1.0	0.070	180	30	NA
001A – North Outfall	5/5/2017	Wet Weather	2.94	0.343	8.42	<4.0	10	<1.0	0.130	<10	<10	NA
002A – West Outfall	5/5/2017	Wet Weather	9.48	1.122	8.48	<4.0	12	<1.0	0.100	410	410	NA
004A – Maverick Street Outfall	5/5/2017	Wet Weather	0.736	0.090	7.61	<4.0	6.3	<1.0	0.120	2,400	370	NA
001C – North Outfall	5/11/2017	Dry Weather				<4.0	11	<1.0	0.100	120	<10	NA
002C – West Outfall	5/11/2017	Dry Weather				<4.0	17	<1.0	0.090	770	180	NA
004C – Maverick Street Outfall	5/11/2017	Dry Weather				<4.0	14	<1.0	0.080	50	<10	NA
001A – North Outfall	---	Wet Weather	7.57	0.515	NS	NS	NS	NS	NS	NS	NS	NS
002A – West Outfall	---	Wet Weather	23.05	1.728	NS	NS	NS	NS	NS	NS	NS	NS
004A – Maverick Street Outfall	---	Wet Weather	1.887	0.124	NS	NS	NS	NS	NS	NS	NS	NS
001C – North Outfall	6/19/2017	Dry Weather				<4.0	10	<1.0	0.120	110	60	NA
002C – West Outfall	6/19/2017	Dry Weather				<4.0	13	<1.0	0.140	4,600	1,400	NA
004C – Maverick Street Outfall	6/19/2017	Dry Weather				<4.0	9.2	<1.0	0.120	400	200	NA
Requirements are from NPDES Permit MA0000787, issued July 31, 2007.												
Discharge Limitations												
Maximum Daily			Report	Report	6.0 to 8.5	15 mg/L	100 mg/L	Report	Report	Report	Report	
Average Monthly			Report	Report	6.0 to 8.5	—	Report	Report	Report	Report	Report	

Source: Massport.

Notes: Flow rates were estimated for outfalls 001, 002, 003 and 004 by using the SWMM model developed for Logan Airport.

1 *Klebsiella* is an indication of non-fecal coliform bacteria and is tested for at the North Outfall when fecal coliform concentration exceeds 5,000 cfu/100ml.

TSS Total Suspended Solids.

NA Not Analyzed.

NS Not Sampled. A wet weather sampling event was not conducted during the month of June 2017. During the month of June, several attempts were made to mobilize for a wet weather event based on forecasted precipitation; however, in each case, either total accumulation measured less than the required 0.1 inches, precipitation occurred outside of the low tide window or in the evening, thunderstorms were forecasted, or antecedent dry weather conditions were not met. Sampling cannot be conducted during thunderstorms due to safety concerns.

Table J-6 Logan Airport 2017 Monthly Monitoring Results for Second Quarter — Porter Street Stormwater Outfall

	Date	Event	Maximum Daily Flow (MGD)	Average Monthly Flow (MGD)	pH (S.U.)	Oil and Grease (mg/L)	TSS (mg/L)	Benzene (µg/L)	Surfactants (mg/L)	Fecal Coliform (cfu/100mL)	*Enterococcus* (cfu/100mL)
003 - Porter Street Outfall 1	4/21/2017	Wet Weather	-	-	7.46	<4.0	21	<1.0	0.180	350	640
003 - Porter Street Outfall 2	4/21/2017	Wet Weather	-	-	7.15	<4.0	7.6	<1.0	0.100	<10	20
003 - Porter Street Outfall 3	4/21/2017	Wet Weather	-	-	6.70	<4.0	<10	<1.0	0.120	10	60
003 - Porter Street Outfall Average		Wet Weather	4.66	0.505	7.10	0.0	10	0.0	0.133	15	92
003 - Porter Street Outfall 1	4/11/2017	Dry Weather				<4.0	11	<1.0	0.210	<10	20
003 - Porter Street Outfall 2	4/11/2017	Dry Weather				<4.0	32	<1.0	0.070	60	<10
003 - Porter Street Outfall 3	4/11/2017	Dry Weather				<4.0	6.1	<1.0	0.170	<10	10
003 - Porter Street Outfall Average		Dry Weather				0.0	16	0.0	0.150	3.9	5.8
003 - Porter Street Outfall 1	5/5/2017	Wet Weather	-	-	8.34	<4.0	84	<1.0	0.190	160	130
003 - Porter Street Outfall 2	5/5/2017	Wet Weather	-	-	8.46	<4.0	79	<1.0	0.160	<10	30
003 - Porter Street Outfall 3	5/5/2017	Wet Weather	-	-	7.81	<4.0	11	<1.0	0.090	80	260
003 - Porter Street Outfall Average		Wet Weather	2.101	0.217	8.20	0.0	58	0.0	0.147	23	100
003 - Porter Street Outfall 1	5/11/2017	Dry Weather				<4.0	9.8	<1.0	0.140	<10	<10
003 - Porter Street Outfall 2	5/11/2017	Dry Weather				<4.0	24	<1.0	0.130	<10	<10
003 - Porter Street Outfall 3	5/11/2017	Dry Weather				<4.0	42	<1.0	0.100	<10	<10
003 - Porter Street Outfall Average		Dry Weather				0.0	25	0.0	0.123	1.0	1.0
003 - Porter Street Outfall 1	---	Wet Weather	-	-	NS	NS	NS	NS	NS	NS	NS
003 - Porter Street Outfall 2	---	Wet Weather	-	-	NS	NS	NS	NS	NS	NS	NS
003 - Porter Street Outfall 3	---	Wet Weather	-	-	NS	NS	NS	NS	NS	NS	NS
003 - Porter Street Outfall Average		Wet Weather	4.801	0.356	NS	NS	NS	NS	NS	NS	NS
003 - Porter Street Outfall 1	6/19/2017	Dry Weather				<4.0	31	<1.0	0.280	35,000	50
003 - Porter Street Outfall 2	6/19/2017	Dry Weather				<4.0	<5.0	<1.0	0.070	240	50
003 - Porter Street Outfall 3	6/19/2017	Dry Weather				<4.0	16	<1.0	0.200	30	<10
003 - Porter Street Outfall Average		Dry Weather				0.0	16	0.0	0.183	632	14
Requirements are from NPDES Permit MA0000787, issued July 31, 2007.											
Discharge Limitations											
Maximum Daily			Report	Report	6.0 to 8.5	Report	Report	Report	Report	Report	Report
Average Monthly			Report	Report	6.0 to 8.5	—	Report	Report	Report	Report	Report

Source: Massport.

Notes: Flow rates were estimated for outfalls 001, 002, 003, and 0034 by using the SWMM model developed for Logan Airport.
For averaging calculations, a value of zero was employed for those results measured below the laboratory detection limit. For geometric mean calculations (fecal coliform and Enterococcus) a value of 1 was employed for those results measured below the laboratory detection limit.

TSS Total Suspended Solids.

NS Not Sampled. A wet weather sampling event was not conducted during the month of June 2017 due to lack of precipitation (see description in Table J-5 above).

Table J-7 Logan Airport 2017 Monthly Monitoring Results for Third Quarter — North, West, and Maverick Street Stormwater Outfalls

	Date	Event	Maximum Daily Flow (MGD)	Average Monthly Flow (MGD)	pH (S.U.)	Oil and Grease (mg/L)	TSS (mg/L)	Benzene (µg/L)	Surfactants (mg/L)	Fecal Coliform (cfu/100mL)	*Enterococcus* (cfu/100mL)	*Klebsiella*[1] (cfu/100mL)
001A – North Outfall	7/7/2017	Wet Weather	4.726	0.416	7.07	<4.0	16	<1.0	0.840	570	110	NA
002A – West Outfall	7/7/2017	Wet Weather	15.35	1.45	7.93	<4.0	16	<1.0	0.390	12,000	1,900	NA
004A – Maverick Street Outfall	7/7/2017	Wet Weather	1.21	0.077	7.16	<4.0	18	<1.0	0.220	570	3,400	NA
001C – North Outfall	7/18/2017	Dry Weather				<4.0	17	<1.0	0.150	3,500	530	NA
002C – West Outfall	7/18/2017	Dry Weather				<4.0	13	<1.0	0.120	16,000	900	NA
004C – Maverick Street Outfall	7/18/2017	Dry Weather				<4.0	10	<1.0	0.090	20	60	NA
001A – North Outfall	8/30/2017	Wet Weather	3.05	0.148	8.03	<4.0	12	<1.0	0.760	4,900	420	NA
002A – West Outfall	8/30/2017	Wet Weather	8.44	0.500	7.68	<4.0	13	<1.0	0.390	>80,000	1,700	NA
004A – Maverick Street Outfall	8/30/2017	Wet Weather	0.705	0.011	6.67	<4.0	11	<1.0	0.080	4,900	250	NA
001C – North Outfall	8/1/2017	Dry Weather				<4.0	14	<1.0	0.150	630	80	NA
002C – West Outfall	8/1/2017	Dry Weather				<4.0	13	<1.0	0.140	>80,000	1,500	NA
004C – Maverick Street Outfall	8/1/2017	Dry Weather				<4.0	10	<1.0	0.090	170	<10	NA
001A – North Outfall	9/30/2017	Wet Weather	5.28	0.367	6.79	<4.0	<5.0	<1.0	0.140	2,000	2,900	NA
002A – West Outfall	9/30/2017	Wet Weather	16.4	1.21	NS	NS	NS	NS	NS	NS	NS	NS
004A – Maverick Street Outfall	9/30/2017	Wet Weather	1.279	0.071	6.99	<4.0	<5.0	<1.0	0.140	6,300	4,500	NA
001C – North Outfall	9/11/2017	Dry Weather				<4.0	14	<1.0	0.130	140	55	NA
002C – West Outfall	9/11/2017	Dry Weather				<4.0	11	<1.0	0.220	3,700	70	NA
004C – Maverick Street Outfall	9/11/2017	Dry Weather				<4.0	11	<1.0	0.090	380	100	NA
Requirements are from NPDES Permit MA0000787, issued July 31, 2007.												
Discharge Limitations												
Maximum Daily			Report	Report	6.0 to 8.5	15 mg/L	100 mg/L	Report	Report	Report	Report	Report
Average Monthly			Report	Report	6.0 to 8.5	—	Report	Report	Report	Report	Report	Report

Source: Massport
Notes: Flow rates were estimated for outfalls 001, 002, and 004 by using the SWMM model developed for Logan Airport.
1 *Klebsiella* is an indication of non-fecal coliform bacteria and is tested for at the North Outfall when fecal coliform concentration exceeds 5,000 cfu/100ml.
TSS Total Suspended Solids.
NA Not Analyzed.
NS Not Sampled. A wet weather sample was not conducted at the West Outfall during the month of September 2017 due to outfall access restrictions.

Table J-8 Logan Airport 2017 Monthly Monitoring Results for Third Quarter — Porter Street Stormwater Outfall

	Date	Event	Maximum Daily Flow (MGD)	Average Monthly Flow (MGD)	pH (S.U.)	Oil and Grease (mg/L)	TSS (mg/L)	Benzene (µg/L)	Surfactants (mg/L)	Fecal Coliform (cfu/100mL)	*Enterococcus* (cfu/100mL)
003 - Porter Street Outfall 1	7/7/2017	Wet Weather	-	-	7.22	<4.0	240	<1.0	0.660	250	1,800
003 - Porter Street Outfall 2	7/7/2017	Wet Weather	-	-	8.05	<4.0	5.0	<1.0	0.460	50	1,700
003 - Porter Street Outfall 3	7/7/2017	Wet Weather	-	-	8.06	<4.0	8.9	<1.0	0.270	40	2,900
003 - Porter Street Outfall Average		Wet Weather	3.081	0.315	7.78	0.0	85	0.0	0.463	79	2,070
003 - Porter Street Outfall 1	7/18/2017	Dry Weather				<4.0	13	<1.0	0.130	210	90
003 - Porter Street Outfall 2	7/18/2017	Dry Weather				<4.0	5.6	<1.0	0.070	30	<10
003 - Porter Street Outfall 3	7/18/2017	Dry Weather				<4.0	<5.0	<1.0	0.200	40	20
003 - Porter Street Outfall Average		Dry Weather				0.0	6.2	0.0	0.133	63	12
003 - Porter Street Outfall 1	8/30/2017	Wet Weather	-	-	7.70	<4.0	59	<1.0	0.270	620	250
003 - Porter Street Outfall 2	8/30/2017	Wet Weather	-	-	8.28	<4.0	<5.0	<1.0	0.120	6,300	80
003 - Porter Street Outfall 3	8/30/2017	Wet Weather	-	-	7.27	<4.0	6.1	<1.0	0.200	280	2,400
003 - Porter Street Outfall Average		Wet Weather	0.926	0.106	7.75	0.0	22	0.00	0.197	1,030	363
003 - Porter Street Outfall 1	8/1/2017	Dry Weather				<4.0	47	<1.0	0.120	910	110
003 - Porter Street Outfall 2	8/1/2017	Dry Weather				<4.0	5.4	<1.0	0.070	<10	40
003 - Porter Street Outfall 3	8/1/2017	Dry Weather				<4.0	5.1	<1.0	0.140	<10	60
003 - Porter Street Outfall Average		Dry Weather				0.0	19	0.0	0.110	10	64
003 - Porter Street Outfall 1	9/30/2017	Wet Weather	-	-	7.28	<4.0	11	<1.0	0.140	1,100	170,000
003 - Porter Street Outfall 2	9/30/2017	Wet Weather	-	-	7.19	<4.0	<5.0	<1.0	0.080	20	10
003 - Porter Street Outfall 3	9/30/2017	Wet Weather	-	-	6.90	<4.0	<5.0	<1.0	0.140	390	230
003 - Porter Street Outfall Average		Wet Weather	2.216	0.206	7.12	0.0	3.7	0.00	0.120	205	726
003 - Porter Street Outfall 1	9/11/2017	Dry Weather				<4.0	26	<1.0	0.100	170	70
003 - Porter Street Outfall 2	9/11/2017	Dry Weather				<4.0	11	<1.0	0.080	50	80
003 - Porter Street Outfall 3	9/11/2017	Dry Weather				<4.0	6.7	<1.0	0.210	260	490
003 - Porter Street Outfall Average		Dry Weather				0.0	15	0.0	0.130	130	140
Requirements are from NPDES Permit MA0000787, issued July 31, 2007.											
Discharge Limitations											
Maximum Daily			Report	Report	6.0 to 8.5	Report	Report	Report	Report	Report	Report
Average Monthly			Report	Report	6.0 to 8.5	—	Report	Report	Report	Report	Report

Source: Massport.

Notes: Flow rates were estimated for outfall 003 by using the SWMM model developed for Logan Airport.
For averaging calculations, a value of zero was employed for those results measured below the laboratory detection limit. For geometric mean calculations (fecal coliform and Enterococcus) a value of 1 was employed for those results measured below the laboratory detection limit.

TSS Total Suspended Solids.

Table J-9 Logan Airport 2017 Monthly Monitoring Results for Fourth Quarter — North, West, and Maverick Street Stormwater Outfalls

	Date	Event	Maximum Daily Flow (MGD)	Average Monthly Flow (MGD)	pH (S.U.)	Oil and Grease (mg/L)	TSS (mg/L)	Benzene (µg/L)	Surfactants (mg/L)	Fecal Coliform (cfu/100mL)	*Enterococcus* (cfu/100mL)	*Klebsiella*[1] (cfu/100mL)
001A – North Outfall	10/25/2017	Wet Weather	4.545	0.440	7.31	<4.0	<5.0	<1.0	0.090	1,100	13,000	NA
002A – West Outfall	10/25/2017	Wet Weather	20.13	1.61	8.50	<4.0	29	<1.0	0.150	41,000	25,000	NA
004A – Maverick Street Outfall	10/25/2017	Wet Weather	1.067	0.091	7.73	<4.0	11	<1.0	0.110	7,500	20,000	NA
001C – North Outfall	10/6/2017	Dry Weather				<4.0	23	<1.0	0.150	800	50	NA
002C – West Outfall	10/6/2017	Dry Weather				<4.0	8.7	<10	0.110	3,400	900	NA
004C – Maverick Street Outfall	10/6/2017	Dry Weather				<4.0	7.7	<1.0	0.070	2,200	140	NA
001A – North Outfall	11/22/2017	Wet Weather	2.82	0.172	7.23	<4.0	30.0	<1.0	0.180	60	400	NA
002A – West Outfall	11/22/2017	Wet Weather	9.94	0.632	7.13	<4.0	17	<1.0	0.220	1,700	1,700	NA
004A – Maverick Street Outfall	11/22/2017	Wet Weather	0.789	0.024	7.36	<4.0	25	<1.0	0.180	1,400	1,600	NA
001C – North Outfall	11/13/2017	Dry Weather				<4.0	20	<1.0	0.160	<10	20	NA
002C – West Outfall	11/13/2017	Dry Weather				<4.0	13	<1.0	0.150	20,000	310	NA
004C – Maverick Street Outfall	11/13/2016	Dry Weather				<4.0	10	<1.0	0.090	1,900	160	NA
001A – North Outfall	12/6/2017	Wet Weather	1.76	0.510	6.16	<4.0	<5.0	<1.0	0.100	290	5,000	NA
002A – West Outfall	12/6/2017	Wet Weather	5.87	0.823	7.45	<4.0	12	<1.0	0.100	5,800	7,300	NA
004A – Maverick Street Outfall	12/6/2017	Wet Weather	0.453	0.008	6.79	<4.0	8.5	<1.0	0.090	700	830	NA
001C – North Outfall	12/5/2017	Dry Weather				<4.0	9.5	<1.0	0.120	60	10	NA
002C – West Outfall	12/5/2017	Dry Weather				<4.0	11	<1.0	0.160	>80,000	30,000	NA
004C – Maverick Street Outfall	12/5/2017	Dry Weather				<4.0	54	<1.0	0.060	630	100	NA
Requirements are from NPDES Permit MA0000787, issued July 31, 2007.												
Discharge Limitations												
Maximum Daily			Report	Report	6.0 to 8.5	15 mg/L	100 mg/L	Report	Report	Report	Report	Report
Average Monthly			Report	Report	6.0 to 8.5	—	Report	Report	Report	Report	Report	Report

Source: Massport.
Notes: Flow rates were estimated for outfalls 001, 002, and 004 by using the SWMM model developed for Logan Airport.
1 *Klebsiella* is an indication of non-fecal coliform bacteria and is tested for at the North Outfall when fecal coliform concentration exceeds 5,000 cfu/100ml.
TSS Total Suspended Solids.
NA Not Analyzed.

Table J-10 Logan Airport 2017 Monthly Monitoring Results for Fourth Quarter — Porter Street Stormwater Outfall

	Date	Event	Maximum Daily Flow (MGD)	Average Monthly Flow (MGD)	pH (S.U.)	Oil and Grease (mg/L)	TSS (mg/L)	Benzene (µg/L)	Surfactants (mg/L)	Fecal Coliform (cfu/100mL)	*Enterococcus* (cfu/100mL)
003 - Porter Street Outfall 1	10/25/2017	Wet Weather	-	-	7.79	<4.0	12	<1.0	0.110	6,400	18,000
003 - Porter Street Outfall 2	10/25/2017	Wet Weather	-	-	7.76	<4.0	<5.0	<1.0	0.070	120	460
003 - Porter Street Outfall 3	10/25/2017	Wet Weather	-	-	8.04	<4.0	<5.0	<1.0	0.080	670	4,700
003 - Porter Street Outfall Average		Wet Weather	4.339	0.352	7.86	0.0	4.0	0.0	0.087	801	3389
003 - Porter Street Outfall 1	10/6/2017	Dry Weather				< 4.0	16	< 1.0	0.120	<10	320
003 - Porter Street Outfall 2	10/6/2017	Dry Weather				< 4.0	<5.0	< 1.0	0.070	30	10
003 - Porter Street Outfall 3	10/6/2017	Dry Weather				< 4.0	<5.0	< 1.0	0.180	20	2,200
003 - Porter Street Outfall Average		Dry Weather				0.0	5.3	0.0	0.123	8.4	192
003 - Porter Street Outfall 1	11/22/2017	Wet Weather	-	-	7.00	<4.0	28	<1.0	0.120	80	1,900
003 - Porter Street Outfall 2	11/22/2017	Wet Weather	-	-	6.21	<4.0	25	<1.0	0.060	<10	100
003 - Porter Street Outfall 3	11/22/2017	Wet Weather	-	-	6.16	<4.0	6.6	<1.0	<0.050	160	900
003 - Porter Street Outfall Average		Wet Weather	1.838	0.152	6.46	0.0	20	0.0	0.060	23	555
003 - Porter Street Outfall 1	11/22/2017	Dry Weather				<4.0	8.8	<1.0	0.110	20	60
003 - Porter Street Outfall 2	11/22/2017	Dry Weather				<4.0	8.3	<1.0	0.250	<10	<10
003 - Porter Street Outfall 3	11/22/2017	Dry Weather				<4.0	8.2	<1.0	0.210	<10	50
003 - Porter Street Outfall Average		Dry Weather				0.0	8.4	0.0	0.190	2.7	14
003 - Porter Street Outfall 1	12/6/2017	Wet Weather	-	-	7.76	<4.0	12	<1.0	0.080	120	780
003 - Porter Street Outfall 2	12/6/2017	Wet Weather	-	-	7.66	<4.0	5.5	<1.0	0.090	20	420
003 - Porter Street Outfall 3	12/6/2017	Wet Weather	-	-	7.80	<4.0	<5.0	<1.0	0.160	<10	100
003 - Porter Street Outfall Average		Wet Weather	1.301	0.149	7.74	0.0	5.8	0.0	0.110	13	320
003 - Porter Street Outfall 1	12/5/2017	Dry Weather				4.3	130	<1.0	<0.250	10	170
003 - Porter Street Outfall 2	12/5/2017	Dry Weather				<4.0	21	<1.0	0.200	40	480
003 - Porter Street Outfall 3	12/5/2017	Dry Weather				<4.0	12	<1.0	0.190	<10	70
003 - Porter Street Outfall Average		Dry Weather				1.4	54	0.0	0.130	7.4	179
Requirements are from NPDES Permit MA0000787, issued July 31, 2007.											
Discharge Limitations											
Maximum Daily			Report	Report	6.0 to 8.5	Report	Report	Report	Report	Report	Report
Average Monthly			Report	Report	6.0 to 8.5	—	Report	Report	Report	Report	Report

Source: Massport.

Notes: Flow rates were estimated for outfall 003 using the SWMM model developed for Logan Airport.

For averaging calculations, a value of zero was employed for those results measured below the laboratory detection limit. For geometric mean calculations (fecal coliform and Enterococcus) a value of 1 was employed for those results measured below the laboratory detection limit.

Table J-11 Logan Airport 2017 Quarterly Wet Weather Monitoring Results – North, West, Maverick Street, and Porter Street Stormwater Outfalls

	Date	pH (S.U.)	Benzo(a)-anthracene (µg/L)	Benzo(a)-pyrene (µg/L)	Benzo(b)-fluoranthene (µg/L)	Benzo(k)-fluoranthene (µg/L)	Chrysene (µg/L)	Dibenzo(a,h,)-anthracene (µg/L)	Indeno(1,2,3-cd)-pyrene (µg/L)	Naphthalene (µg/L)	Total PAHs (µg/L)
001Q - North Outfall	3/10/2017	6.86	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	ND
002Q - West Outfall	3/10/2017	7.37	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	ND
004Q - Maverick Street Outfall	3/10/2017	6.89	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	ND
003Q - Porter Street Outfall 1	3/10/2017	7.01	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	ND
003Q - Porter Street Outfall 2	3/10/2017	7.69	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	ND
003Q - Porter Street Outfall 3	3/10/2017	7.27	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	ND
003Q - Porter Street Outfall Average		7.32	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
001Q - North Outfall	7/7/2017	7.07	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	ND
002Q - West Outfall	7/7/2017	7.93	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	ND
004Q - Maverick Street Outfall	7/7/2017	7.16	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	ND
003Q - Porter Street Outfall 1	7/7/2017	7.22	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	ND
003Q - Porter Street Outfall 2	7/7/2017	8.05	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	ND
003Q - Porter Street Outfall 3	7/7/2017	8.06	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	ND
003Q - Porter Street Outfall Average		7.78	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
001Q - North Outfall	9/30/2017	6.79	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	ND
002Q - West Outfall	9/30/2017	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
004Q - Maverick Street Outfall	9/30/2017	6.99	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	ND
003Q - Porter Street Outfall 1	9/30/2017	7.28	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	ND
003Q - Porter Street Outfall 2	9/30/2017	7.19	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	ND
003Q - Porter Street Outfall 3	9/30/2017	6.90	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	ND
003Q - Porter Street Outfall Average		7.12	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
001Q - North Outfall	12/6/2017	6.16	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	ND
002Q - West Outfall	12/6/2017	7.45	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	ND
004Q - Maverick Street Outfall	12/6/2017	6.79	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	ND
003Q - Porter Street Outfall 1	12/6/2017	7.76	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	ND
003Q - Porter Street Outfall 2	12/6/2017	7.66	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	ND
003Q - Porter Street Outfall 3	12/6/2017	7.80	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	ND
003Q - Porter Street Outfall Average		7.74	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Requirements are from NPDES Permit MA0000787, issued July 31, 2007.											
Discharge Limitations											
Maximum Daily		6.0 to 8.5	Report	Report	Report	Report	Report	Report	Report	Report	Total

Source: Massport
Notes: For averaging calculations, a value of zero was employed for those results measures below the laboratory detection limit.
PAHs Polynuclear Aromatic Hydrocarbons
ND Not Detected
TSS Total Suspended Solids.
NS Not Sampled. A wet weather sample was not conducted at the West Outfall during the month of September 2017 due to outfall access restrictions.

Table J-12 Logan Airport 2017 Quarterly Wet Weather Monitoring Results – Northwest and Runway/Perimeter Stormwater Outfalls

	Date	Maximum Daily Flow (MGD)	Average Monthly Flow (MGD)	pH (SU)	Oil and Grease (mg/L)	TSS (mg/L)	Benzene (µg/L)
005Q - Northwest Outfall	3/10/2017	0.29	0.05	6.74	<4.0	18	<1.0
006Q- Runway/ Perimeter Outfall (A9)	3/10/2017	0.17	0.05	7.57	<4.0	11	<1.0
006Q- Runway/ Perimeter Outfall (A15)	3/10/2017	0.06	0.01	8.83	<4.0	400	<1.0
006Q- Runway/ Perimeter Outfall (A19)	3/10/2017	0.04	0.005	7.61	<4.0	170	<1.0
006Q- Runway/ Perimeter Outfall (A21)	3/10/2017	1.06	0.30	7.61	<4.0	9.6	<1.0
006Q- Runway/ Perimeter Outfall (A23)	3/10/2017	0.15	0.03	8.06	<4.0	12	<1.0
006Q- Runway/ Perimeter Outfall (A34)	3/10/2017	0.30	0.12	8.51	<4.0	13	<1.0
006Q- Runway/ Perimeter Outfall (A38)	3/10/2017	0.14	0.04	8.12	<4.0	<5.0	<1.0
006- Runway/Perimeter Outfall Average		0.27	0.08	8.04	0.0	88	0.0
005Q - Northwest Outfall	7/7/2017	1.03	0.07	6.92	<4.0	26	<1.0
006Q- Runway/ Perimeter Outfall (A8)	7/7/2017	0.60	0.04	7.15	<4.0	<5.0	<1.0
006Q- Runway/ Perimeter Outfall (A21)	7/7/2017	4.32	0.34	7.16	<4.0	42	<1.0
006Q- Runway/ Perimeter Outfall (A22)	7/7/2017	2.17	0.16	7.10	<4.4	13	<1.0
006Q- Runway/ Perimeter Outfall (A23)	7/7/2017	0.34	0.03	7.06	<4.0	8.0	<1.0
006Q- Runway/ Perimeter Outfall (A31)	7/7/2017	0.40	0.27	7.18	<4.0	20	<1.0
006Q- Runway/ Perimeter Outfall (A33)	7/7/2017	0.20	0.03	7.19	<4.0	9.5	<1.0
006Q- Runway/ Perimeter Outfall (A38)	7/7/2017	0.70	0.05	6.83	<4.0	<5.0	<1.0
006- Runway/Perimeter Outfall Average		1.25	0.13	7.10	0.0	13	0.0
005Q - Northwest Outfall	9/30/2017	0.70	0.05	7.02	<4.0	58	<1.0
006Q- Runway/ Perimeter Outfall (A9)	9/30/2017	0.31	0.023	6.81	<4.0	6.0	<1.0
006Q- Runway/ Perimeter Outfall (A16)	9/30/2017	0.14	0.009	6.06	<4.0	<5.0	<1.0
006Q- Runway/ Perimeter Outfall (A18)	9/30/2017	0.04	0.003	6.77	<4.0	<5.0	<1.0
006Q- Runway/ Perimeter Outfall (A21)	9/30/2017	2.96	0.173	6.90	<4.0	9.0	<1.0
006Q- Runway/ Perimeter Outfall (A23)	9/30/2017	0.24	0.018	6.53	<4.0	<5.0	<1.0
006Q- Runway/ Perimeter Outfall (A33)	9/30/2017	0.16	0.013	6.36	<4.0	5.7	<1.0
006- Runway/Perimeter Outfall Average		0.61	0.037	6.61	0.0	110	0.0
005Q - Northwest Outfall	12/6/2017	0.216	0.022	NS	NS	NS	NS
006Q- Runway/ Perimeter Outfall (A8)	12/6/2017	0.096	0.015	7.24	<4.0	<5.0	<1.0
006Q- Runway/ Perimeter Outfall (A16)	12/6/2017	0.038	0.006	NS	NS	NS	NS
006Q- Runway/ Perimeter Outfall (A18)	12/6/2017	0.019	0.003	NS	NS	NS	NS
006Q- Runway/ Perimeter Outfall (A21)	12/6/2017	0.778	0.111	NS	NS	NS	NS
006Q- Runway/ Perimeter Outfall (A23)	12/6/2017	0.092	0.014	NS	NS	<5.0	NS
006Q- Runway/ Perimeter Outfall (A33)	12/6/2017	0.080	0.014	NS	NS	NS	NS
006Q- Runway/ Perimeter Outfall (A38)	12/6/2017	0.090	0.012	NS	NS	NS	NS
006- Runway/Perimeter Outfall Average		0.170	0.025	7.24	0.0	0.0	0.0
Discharge Limitations		Report	Report	Report	Report	Report	Report

Source: Massport

Notes: For averaging calculations, a value of zero was employed for those results measures below the laboratory detection limit.
Requirements are from NPDES Permit MA 0000787, issued July 31, 2007.

TSS Total Suspended Solids

NS Not Sampled. A wet weather sample was not conducted at the Northwest Outfall and nearly all of the Runway/Perimeter Outfalls during the month of December 2017 due to insufficient outfall flow.

Table J-13 Logan Airport February 2017 Wet Weather Deicing Monitoring Results – North, West, Porter Street, and Runway/Perimeter Stormwater Outfalls

	Date	Ethylene Glycol, Total (mg/L)	Propylene Glycol, Total (mg/L)	BOD5 (mg/L)	COD (mg/L)	Ammonia Nitrogen (mg/L)	Nonylphenol (µg/L)	4-Methyl-1-H-benzotriazole (µg/L)	5-Methyl-1-H-benzotriazole (µg/L)	Tolytriazole (µg/L)
001B - North Outfall	2/1/2017	<10.0	297	2,500	830	2.56	<0.020	37.86	38.36	76.22
002B - West Outfall	2/1/2017	<50.0	1,850	1,900	5,000	1.68	<0.020	18.93	10.12	29.05
003B - Porter Street Outfall 1	2/1/2017	<10.0	93.5	24	190	1.76	<0.020	1.15	0.96 J	2.11
003B - Porter Street Outfall 2	2/1/2017	<2.0	67.7	290	560	0.172	<0.020	<1.00	<1.00	ND
003B - Porter Street Outfall 3	2/1/2017	<2.0	20.6	30	260	1.06	<0.020	<1.00	0.57 J	0.57 J
003B - Porter Street Outfall Average		0.0	61	115	337	1.00	0.0	0.38	0.51	0.89
006B- Runway/ Perimeter (A8)	2/1/2017	<2.0	5.37	<2.0	47	0.787	<0.020	1.57	0.26 J	1.83
006B- Runway/ Perimeter (A21)	2/1/2017	<2.0	<2.0	2.1	63	1.61	<0.020	6.41	1.17	7.58
006B- Runway/ Perimeter (A22)	2/1/2017	<2.0	<2.0	<5.0	<20	3.12	<0.020	8.31	1.93	10.24
006B- Runway/ Perimeter (A23)	2/1/2017	<2.0	<2.0	2.2	45	1.76	<0.020	9.35	1.39	10.74
006B- Runway/ Perimeter (A31)	2/1/2017	<2.0	14.7	42	72	3.88	<0.020	13.79	4.43	18.22
006B- Runway/ Perimeter (A34)	2/1/2017	<2.0	<2.0	2.8	54	3.35	<0.020	11.67	2.59	14.26
006B- Runway/ Perimeter (A38)	2/1/2017	<2.0	<2.0	<2.0	47	0.286	<0.020	<1.00	<1.00	0.00
006B- Runway/Perimeter Outfall Average		0.00	2.9	7.0	47	2.11	0.0	7.30	1.68	8.98
Requirements are from NPDES Permit MA0000787, issued July 31, 2007.										
Discharge Limitations										
Average Monthly		Report	Report	Report	Report	Report	Report	Report	Report	Report
Maximum Daily		Report	Report	Report	Report	Report	Report	Report	Report	Report

Source: Massport

Notes: For averaging calculations, a value of zero was employed for those results measured below the laboratory detection limit.
J = value is an estimate calculated by the lab from the response factors of the other two triazole compounds.
Tolytriazole concentrations calculated as sum of 4-Methly-1-H-benzotriazole and 5-Methyl-1-H-benzotriazole.

BOD5 Five-day Biochemical Oxygen Demand
COD Chemical Oxygen Demand
ND Not Detected

Table J-14 Logan Airport March 2017 Wet Weather Deicing Monitoring Results – North, West, Porter Street, and Runway/Perimeter Stormwater Outfalls

	Date	Ethylene Glycol, Total (mg/L)	Propylene Glycol, Total (mg/L)	BOD5 (mg/L)	COD (mg/L)	Ammonia Nitrogen (mg/L)	Nonylphenol (µg/L)	4-Methyl-1-H-benzotriazole (µg/L)	5-Methyl-1-H-benzotriazole (µg/L)	Tolytriazole (µg/L)
001B - North Outfall	3/10/2017	5.10	3,730	3,500	7,300	1.99	<0.020	63.72	55.58	119.30
002B - West Outfall	3/10/2017	<2.0	9,940	8,200	20,000	1.46	4.163	17.66	19.11	36.77
003B - Porter Street Outfall 1	3/10/2017	<2.0	3.88	7.8	440	1.91	<0.020	2.01	1.73	3.74
003B - Porter Street Outfall 2	3/10/2017	<2.0	20.9	45	140	0.15	<0.020	25.07	14.85	39.92
003B - Porter Street Outfall 3	3/10/2017	<2.0	4.34	24	110	0.15	<0.020	<1.0	<1.00	ND
003B - Porter Street Outfall Average		0.0	10	26	230	0.74	0.0	9.03	5.53	14.6
006B- Runway/ Perimeter (A9)	3/10/2017	<2.0	2.80	<40	170	0.341	<0.020	<1.00	2.48	2.48
006B- Runway/ Perimeter (A15)	3/10/2017	<2.0	<2.0	21	77	3.22	<0.020	<1.00	8.22	8.22
006B- Runway/ Perimeter (A19)	3/10/2017	<2.0	<2.0	13	500	5.39	<0.020	4.74	14.14	18.88
006B- Runway/ Perimeter (A21)	3/10/2017	<2.0	16.8	33	570	1.56	<0.020	1.76	6.77	8.53
006B- Runway/ Perimeter (A23)	3/10/2017	<2.0	<2.0	9.8	220	2.31	<0.020	2.41	11.86	14.27
006B- Runway/ Perimeter (A34)	3/10/2017	<2.0	4.27	19	110	3.10	<0.020	3.43	11.44	14.87
006B- Runway/ Perimeter (A38)	3/10/2017	<2.0	<2.0	<2.0	120	0.314	<0.020	<1.00	<1.00	ND
006B- Runway/Perimeter Outfall Average		0.00	3.41	14	252	2.32	0.0	1.76	7.84	9.61
Requirements are from NPDES Permit MA0000787, issued July 31, 2007.										
Discharge Limitations										
Average Monthly		Report	Report	Report	Report	Report	Report	Report	Report	Report
Maximum Daily		Report	Report	Report	Report	Report	Report	Report	Report	Report

Source: Massport.
Notes: For averaging calculations, a value of zero was employed for those results measured below the laboratory detection limit.
Tolytriazole concentrations calculated as sum of 4-Methly-1-H-benzotriazole and 5-Methyl-1-H-benzotriazole.
BOD5 Five-day Biochemical Oxygen Demand
COD Chemical Oxygen Demand
ND Not Detected

Table J-15 Logan Airport Stormwater Outfall NPDES Water Quality Monitoring Results – 1993 to 2017

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
# / # = Number of samples at or below NPDES limits / Total number of samples taken[1]																									
Oil and Grease (mg/L)																									
North Outfall	30/31	35/36	33/35	29/35	30/35	35/36	29/30	34/36	28/28	36/36	30/32	32/34	33/35	33/33	29/29	23/23	24/24	24/24	24/24	21/21	20/20	21/21	19/20	23/23	23/23
West Outfall	29/30	36/36	34/34	36/36	34/35	36/36	30/30	35/35	27/28	36/36	31/32	33/34	35/35	32/33	28/28	22/23	24/24	24/24	22/24	21/21	21/21	21/21	19/19	23/23	22/22
Maverick Street Outfall	29/29	36/36	35/35	36/36	35/35	35/36	30/30	34/34	26/28	35/36	32/32	34/34	35/35	32/33	29/29	22/23	20/21	19/19	23/23	15/15	4/4	20/20	18/18	23/23	23/23
Settable Solids[2] (mg/L)																									
North Outfall	19/19	34/35	34/35	32/35	31/34	34/36	30/30	34/36	29/29	32/36	32/32	34/34	33/35	32/34	22/22	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
West Outfall	19/19	32/36	34/34	35/36	34/34	35/36	29/30	36/36	27/28	36/36	31/32	34/34	32/35	33/33	22/22	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
TSS (mg/L)																									
North Outfall	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6/6	24/24	24/24	22/23	24/24	21/21	20/21	21/21	20/20	23/23	23/23
West Outfall	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5/6	24/24	24/24	23/23	22/24	20/22	21/21	20/21	18/19	23/23	22/22
Maverick Street Outfall	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4/6	22/24	20/21	18/19	20/23	14/15	4/4	19/20	18/18	22/23	23/23
pH																									
North Outfall	34/35	33/36	35/35	35/35	35/35	36/36	30/30	36/36	29/29	36/36	32/32	34/34	35/35	34/34	26/26	12/12	16/16	11/11	12/12	9/9	8/8	8/8	8/8	10/11	8/8
West Outfall	34/34	28/36	33/34	35/36	35/35	36/36	30/30	36/36	29/29	36/36	32/32	34/34	35/35	33/33	26/26	12/12	16/16	11/11	12/12	9/9	9/9	8/8	8/8	11/11	7/7
Porter Street Outfall	35/35	30/36	34/34	36/36	35/35	36/36	30/30	36/36	28/28	36/36	32/32	34/34	35/35	33/33	22/22	21/21	48/48	24/24	23/23	26/27	24/27	24/24	19/23	33/33	33/33
Maverick Street Outfall	35/35	35/36	35/35	36/36	34/35	36/36	30/30	35/35	28/28	36/36	32/32	34/34	35/35	33/33	26/26	10/10	16/16	10/10	11/11	6/6	2/2	7/7	7/7	10/11	8/8

Source: Massport

Notes: Sampling requirements changed in 2007 with the issuance of a new NPDES permit. Results through 2007 are based on NPDES Permit MA0000787, issued March 1, 1978. Stormwater outfall water quality monitoring results collected in accordance with the requirements of former NPDES permit. A portion of the Porter Street Drainage Area was incorporated into the West Drainage Area as part of roadway construction projects at Logan Airport.

N/A Not available.

1 The total number of samples at each outfall varies year to year. In some years, fewer samples are taken due to factors such as construction, weather, and/or tidal conditions.

2 Settleable solids analyses were replaced with TSS in 2008.

Table J-16 Logan Airport Oil and Hazardous Material Spills[1] and Jet Fuel Handling – 1990 to 2017

Year	Total Number of all Spills	Total Number of all Spills >10 gallons	Total Volume of all Spills (Gallons)	Estimated Volume of Jet Fuel Handled (Gallons)	Total Volume of Jet Fuel Spilled (Gallons)
1990	173	N/A	N/A	438,100,000	3,745
1991	186	N/A	N/A	N/A	2,471
1992	195	N/A	N/A	N/A	4,355
1993	188	N/A	N/A	451,900,000	3,131
1994	217	N/A	N/A	476,700,000	4,046
1995	161	N/A	N/A	309,200,000	21,412[2]
1996	159	N/A	N/A	346,700,000	1,321
1997	147	N/A	N/A	377,488,161	2,029[3]
1998	191	N/A	N/A	387,224,004	10,047[4]
1999	196	43	7,151	425,937,051	7,012[5]
2000	136	20	1,318	441,901,932	1,227
2001	139	37	1,924	416,748,819	1,771
2002	101	16	653	358,190,362	559
2003	128	19	10,364	319,439,910	10,188[6]
2004	126	18	894	373,996,141	574
2005	97	15	2,319	368,645,932	585
2006	92	11	752	364,450,864	644
2007	108	7	604	367,585,187	361
2008	99	20	944	345,631,788	662
2009	95	6	1004	327,358,619	915
2010	87	15	476	335,693,997	360
2011	108	12	572	340,421,373	337
2012	132	5	593	343,731,127	439
2013	94	6	452	349,397,940	351
2014	129	17	2,785	370,222,342	785
2015	196	16	1,278	374,985,216	885
2016	231	14	1,158	456,003,328	558
2017	176	8	2,310[7]	472,229,047	315

Source: Massport Fire-Rescue Department.
Notes:
N/A Not available.
1 Materials include: jet fuel, hydraulic oil, diesel fuel, gasoline, and other materials such as glycol and paint.
2 One tenant spill, which occurred on October 15, 1995, totaled 18,000 gallons (84 percent of the annual spill total). The spill did not enter the Airport's storm drain system.
3 On October 23, 1997, a fuel line on an aircraft failed, resulting in the release of approximately 2,500 gallons, all but 60 gallons of which were recovered in drums before reaching the ground. Only the 60 gallons is included in the 1997 total.
4 Includes a 7,200-gallon spill that was discovered on September 2, 1998, and a 1,300-gallon spill that occurred on June 3, 1998. Neither spill entered the Airport's storm drain system.
5 Includes a 5,000-gallon spill, none of which entered the Airport's storm drainage system.
6 In 2003, one fuel spill comprised 9,460 gallons or 94 percent of the total volume of the MassDEP/MCP reportable spills that year. The fuel spill was contained and did not enter the drainage system.
7 Includes 1,750 gallons of deicing fluid.

Table J-17 Type and Quantity of Oil and Hazardous Material Spills at Logan Airport – 1999 to 2017

	Jet Fuel			Hydraulic Oil			Diesel Fuel			Gasoline			Other		
Year	No. of Spills	Quantity (Gallons)	No. of Spills ⩾ 10 Gallons	No. of Spills	Quantity (Gallons)	No. of Spills ⩾ 10 Gallons	No. of Spills	Quantity (Gallons)	No. of Spills ⩾ 10 Gallons	No. of Spills	Quantity (Gallons)	No. of Spills ⩾ 10 Gallons	No. of Spills	Quantity (Gallons)	No. of Spills ⩾ 10 Gallons
1999	151	7,012	40	24	67	1	13	49	2	5	7	0	3	16	0
2000	115	1,227	18	8	59	2	3	11	0	8	16	0	2	5	0
2001	104	1,771	32	21	92	3	5	30	1	6	26	1	3	5	0
2002	79	559	15	7	38	0	8	37	18	4	8	0	3	11	0
2003	89	10,188	15	15	91	3	15	30	0	7	24	0	2	31	1
2004	82	574	12	17	189	4	14	52	0	7	26	0	6[1]	53[2]	2[3]
2005	66	585	12	14	78	1	7	1,610	2	7	45	0	3[4]	1	0
2006	65	644	9	10	25	0	6	57	1	4	9	0	7	17	1
2007	66	361	4	16	37	0	16	57	1	3	8	0	7	141[5]	2
2008	74	662	19	15	56	2	5	14	0	1	7	0	4	205[6]	1
2009	95	915	6	21	51	0	9	20	0	3	3	0	11	15	0
2010	54	360	12	17	50	1	5	56	2	2	3	0	7	7	0
2011	69	337	10	21	149	1	7	55	1	4	16	0	7	15	0
2012	80	439	4	25	79	1	17	38	0	2	12	0	8	25	0
2013	56	351	5	15	51	0	13	32	0	2	<2	0	7	10	0
2014	81	785	13	24	98	1	17	1,810	2	4	9	0	3	83	1
2015	110	885	10	43	149	3	16	151	2	7	46	1	20	47	0
2016	94	558	8	73	224	4	30	300	2	6	12	0	28	64	0
2017	103	315	5	36	101	1	13	59	2	4	14	0	20	1,821[7]	0

Source: Massport
1 Includes two Unknown spills (14 gallons), plus one spill of each of the following: Ethylene Glycol, Propylene Glycol, AVGAS, and Paint.
2 Ethylene Glycol (25 gallons), Propylene Glycol (10 gallons), AVGAS (1 gallon) and Paint (3 gallons).
3 One spill of Ethylene Glycol; one spill of Propylene Glycol.
4 Includes two spills of an unknown substance and volume.
5 Includes one spill of motor oil (4 gallons); one spill of kerosene (5 gallons); one spill of cooking oil (120 gallons); one spill of fuel oil (10 gallons); one spill from a battery (1 gallon); two spills of an unknown substance (1 gallon).
6 Includes one spill of transformer oil (200 gallons).
7 Includes 1,750 gallons of deicing fluid (vehicle accident).

Table J-18 Massport Contingency Plan (MCP) Closed Sites at Logan Airport

Location (RTN) and MassDEP Reporting Status	Action/Status
1. North Outfall (3-4837) – CLOSED 12/27/2012	
Phase II and Phase III Reports filed in March 1997	Indicated petroleum contamination present at the site was likely the result of decades of airport operation; risk assessment reported no significant risk to human health, or to the aquatic and avian community.
RAO submitted in March 1998	Class C RAO using a Temporary Solution (periodic site monitoring and assessment); remediation steps included (not limited to) installation of a new fuel distribution system and decommissioning of certain fuel lines, and natural biodegradation processes; goal is to have petroleum contamination reduced to an area less than 1,000 square feet. Installation of the new fuel distribution system and decommissioning of sections of the old system were completed. Massport initiated site evaluation to document the reduction of petroleum contamination following the decommissioning of the North Fuel Farm and fuel distribution system.
Post Class C RAO evaluation report submitted in December 2002	Massport has eliminated substantial hazards at this site and submitted a Class C RAO statement. In accordance with applicable regulations, Massport will conduct a periodic evaluation at five-year intervals until a Permanent Solution has been achieved. The next periodic evaluation was scheduled for 2007.
2004	Evaluation report indicated that a "Condition of No Significant Risk" has not been achieved at this site. Massport scheduled another assessment in 2007.
2005	No change in status for 2005.
2006	Massport prepared the five-year review of the Class C RAO for this site, which was due in December 2007.
2007	Massport completed its five-year review of the Class C RAO and transmitted it to MassDEP in December 2007. It was determined that a "Condition of No Significant Risk" has not been achieved at this site at this time. The next five-year re-evaluation will be conducted in 2012.
2008	No change in status.
2009	No change in status.
2010	No change in status.
2011	No change in status. Massport provided updated data for the MassDEP website.
2012	Response Action Outcome submitted to MassDEP on December 27, 2012. No further MCP response action is required.
2. Former Robie Park (3-10027) - CLOSED 09/21/2016	
2005	A Phase I was completed in 2005 with a RAO retraction. The RAO had been completed by the former property owner.
2006	No change in status for 2006.
2007	No change in status for 2007.
2008	A Phase II Scope of Work was prepared on May 9, 2008. A RAM Plan was submitted to MassDEP on September 16, 2008.
2009	A Phase V Remedy Operation Status Plan was submitted on March 31, 2010.
2010	Two Remedy Operation Status Reports were submitted on September 29, 2010 and March 28, 2011. The next status report was scheduled for September 30, 2011.
2011	Phase IV Project Status Reports 2 and 3 were submitted in March and September 2011, respectively.
2012	Phase V Status Reports 4 and 5 were submitted in March and September 2012, respectively.
2013	Phase V Status Reports 6 and 7 were submitted in March and September 2013, respectively.
2014	Phase V Status Reports 8 and 9 were submitted in March and September 2014, respectively.
2015	Phase V Reports 10 and 11 were submitted in March and September 2015, respectively.
2016	A Permanent Solution Statement was submitted in 2016.
3. Former Robie Property (3-23493) - CLOSED 01/04/2010	
2005	A Phase I was completed in 2005.
2006	No change in status for 2006.
2007	No change in status for 2007.
2008	A Phase II was submitted to MassDEP on October 21, 2008.
2009	An Activity and Use Limitation (AUL) was recorded with the Suffolk County Registry of Deeds for the site on December 16, 2009.

Table J-18 Massport Contingency Plan (MCP) Closed Sites at Logan Airport (Continued)

Location (RTN) and MassDEP Reporting Status	Action/Status
3. Former Robie Property (3-23493) - CLOSED 01/04/2010 (Continued)	
2010	A Class A-3 RAO was submitted on January 4, 2010, corresponding with the recording of an AUL. On May 21, 2010, a RAM Plan for the Economy Parking Structure was submitted. The first RAM Status Report was submitted on September 21, 2010. An AUL Amendment was recorded on December 9, 2010.
2011	A RAM Completion Statement was submitted on March 15, 2011. Regulatory closure has been achieved. No further response actions are required.
4. Tomahawk Drive (3-27068) - CLOSED 08/20/2008	
2007	Release notification form submitted in August 2007.
2008	A Class B-1 RAO was submitted to MassDEP on January 9, 2009. No further response actions were required.
2009	No further response actions were required.
2011	No further response actions required.
5. Southwest Service Area Overflow Lot/Tomahawk Drive (3-28792) – CLOSED 10/18/2018	
2009	Release notification form was submitted to MassDEP/BWSC on October 8, 2009.
2010	A Class B-1 RAO was submitted to MassDEP on October 18, 2010. No further response actions required.
2011	No further response actions required.
6. Taxiway D (3-29716) – CLOSED 12/21/2011	
2010	Release notification form was submitted on December 22, 2010.
2011	A Class A-1 RAO was submitted on December 23, 2011. No further response actions required.
7. West Outfall Release (3-29792) – CLOSED 02/07/2012	
2011	Release notification form was submitted on April 8, 2011. Two IRA Status Reports were submitted to MassDEP on June 9 and December 5, 2011. A RAO was submitted on February 13, 2012. No further response actions required.
8. Hertz Parking Lot Site (3-30260) – CLOSED 09/05/2012	
2011	Release notification form was submitted on August 29, 2011. A RAM Plan was submitted to MassDEP on September 1, 2011.
2012	A Class A-2 RAO was submitted on September 10, 2012. No Further response actions required.
9. Former Butler Aviation Hangar (3-30654) – CLOSED 11/12/2014	
2012	Verbal notification of a release was provided to MassDEP on February 14, 2012, when Rental Car Center construction encountered an unidentified underground storage, and a Release Notification Form was submitted on April 23, 2012. An IRA Plan was submitted May 21, 2012 and IRA Status Reports were submitted on June 18 and December 26, 2012.
2013	Phase I Report and Tier Classification submitted February 21, 2013 and IRA Completion Report submitted on July 11, 2013.
2014	A Permanent Solution Statement was submitted in October 2014. No further response actions required.
10. Southwest Service Area/Porter Street @ Harborside Drive (3-32022) – CLOSED 11/20/2017	
2014	MassDEP notified of 72-hour Reportable Condition on March 10, 2014
2015	Phase I Report and Tier Classification submitted March 9, 2015.
2016	Permanent Solution Statement scheduled to be submitted in 2017
2017	A Permanent Solution Statement and AUL were submitted November 2017.
11. Former Hangar Building 16 (3-32351) – CLOSED 01/21/2016	
2014	Release Notification Form Submitted August 4, 2014.
2015	A RAM Plan was submitted on January 29, 2015; a Phase I Report and Tier Classification were submitted on August 3, 2015; a RAM Completion Report was submitted November 16, 2015; and a Permanent Solution Statement was submitted on January 21, 2016. No further response actions are required.

Source: Massport

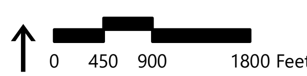
Notes: RTN = Release Tracking Number. This list includes Massport MCP sites only. Additional sites are the responsibility of Logan Airport tenants. Refer to Figure 8-2 in Chapter 8, *Environmental Compliance and Management/Water Quality,* for location of active MCP sites.

AUL Activity and Use Limitation
FDS Fuel Distribution System
IRA Immediate Response Action
MCP Massachusetts Contingency Plan
Phase I Initial Site Investigation
Phase II Comprehensive Site Assessment
Phase III Identification, Evaluation, and Selection of Comprehensive Remedial Actions
Phase IV Implementation of Selected Remediation Action
Phase V Operation, Maintenance and/or Monitoring
RAM Release Abatement Measure
RAO Response Action Outcome

FIGURE J-1 **Massachusetts Contingency Plan Sites (Closed)**

2017 Environmental Status and Planning Report

1. North Outfall (3-4837)
2. Former Robie Park (3-10027)
3. Former Robie Property (3-23493)
4. Tomahawk Drive (3-27068)
5. Southwest Service Area Overflow Lot/ Tomahawk Drive (3-28792)
6. Taxiway D (3-29716)
7. West Outfall Release (3-29792)
8. Hertz Parking Lot Site (3-30260)
9. Former Butler Aviation Hangar (3-30654)
10. Southwest Service Area/Porter Street @ Harborside Drive (3-32022)
11. Former Hangar Building 16 (3-32351)



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Sustainable Massport

A NEWSLETTER PUBLISHED QUARTERLY FOR MASSPORT AND ITS TENANTS I VOL 43, ISSUE 1, May 2017

Upcoming Events

Monday, May 15, 2017
Tuesday, May 16, 2017
Logan Facilities EMS Recertification Audit

Friday, May 19, 2017
Bike to Work Day

Thursday, June 1, 2017
Start of Hurricane Season

Monday, June 5, 2017
World Environment Day

Thursday, June 8, 2017
World Oceans Day

Wednesday, June 14, 2017
Flag Day

Food Waste Collection at the LOC

Food Waste Container

The Logan Office Center expanded its food waste collection program in March to encompass the entire building after a successful pilot program. In addition to collection in the Café, each department's kitchen has a food waste collection bin. Food waste is collected by Massport's waste hauler and taken to a farm in Saugus where it is converted to compost.

Currently the Logan Office Center has a 50% recycling rate. With successful implementation of food waste collection and improved recycling, the Logan Office Center will strive for a recycling rate of 60% by the end of 2017. If your organization is interested in collecting food waste, please contact Jacob at JGlickel@massport.com.

What goes in a food waste bin:

- Coffee pods and tea bags,
- Flowers and plant clippings
- Apple cores and banana peels
- Vegetables
- Meats and cheeses
- Bread and pizza

Compliance Corner - Emergency Engines

Increasingly as facilities are being built or upgraded, diesel fired emergency generators or fire pumps are installed. Many Massport tenants currently operate one or more emergency engines at their facility but are not familiar the recordkeeping or reporting requirements. Beginning in 2006, all stationary emergency engines greater than 37 kW engine output (49 HP) are regulated by MassDEP. Emergency engines require notification to MassDEP within 60 days of first operation, documentation to prove that they meet current emission restrictions and ongoing recordkeeping to ensure that use is limited to 300 hrs per year.

Additional requirements include minimum exhaust stack height and keeping of records documenting that proper ongoing maintenance has been performed and only the proper grade of diesel fuel is used. Emergency engines must also be located in an area that will not impact building air intakes or cause poor air quality in the surrounding area.

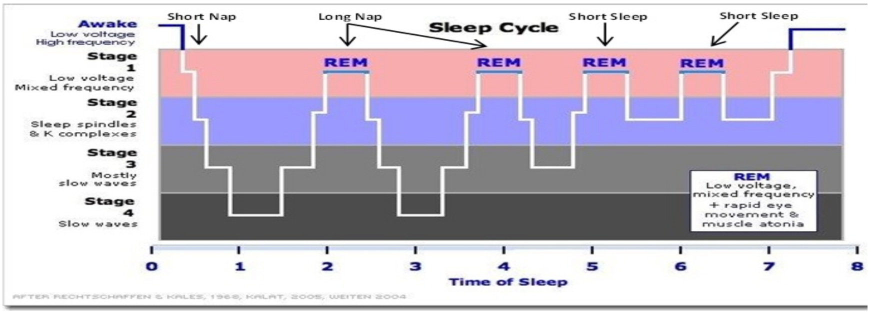
More information can be found on the MassDEP website at:

http://www.mass.gov/eea/agencies/massdep/air/approvals/stationary-engines-and-turbines.html

If you have any questions or concerns about hazardous waste compliance, contact the Massport Environmental Management.

Emergency Diesel Generator at Building 15, Logan Airport

Managing Fatigue in the Workplace



Caption goes here.

Getting plenty of sleep is a very important part of your personal safety. How did you sleep last night? Did you get enough sleep? How do you know? It is very important to be aware of yourself. Most people need 7-8 hours of sleep each 24-hour day. Sleep loss built up slowly over several nights can be as harmful as sleep loss in one night. Both produce a decline in performance such as slower reaction times, failure to respond to changes, the inability to concentrate, and make reasonable judgments.

Testing of fatigued persons against persons with blood alcohol levels concluded that 17 hours awake is equivalent to a blood alcohol content of 0.05. Twenty-one hours awake is equivalent to a blood alcohol content of 0.08 and 24-25 hours awake is equivalent to a blood alcohol content of 0.10.

EFFECTS OF FATIGUE:

- Higher likelihood of a musculoskeletal pain and other injuries.
- Higher risk of vehicular accidents.
- Lower morale and decreased motivation and productivity.

TIPS FOR REDUCING FATIGUE:

- Muscular Activity - Stand up or take a walk on a break to improve alertness.
- Environmental Light - Take a break in an area with bright lights (outdoor or indoor).
- Temperature – Cool, dry air, especially on your face can help keep you alert
- Sound – Irregular or variable sounds, such as radios, conversation or horns can stimulate alertness. Talk to a co-worker for a few minutes to stimulate your mind.
- Aroma – Studies have actually found that the smell of peppermint makes people more alert.
- Food/Snacks – Snack on pretzels, fruit or vegetables which have complex carbohydrates. Avoid candy and other sugary food. Avoid large meals before bedtime which can make it difficult to fall asleep.

Getting plenty of sleep is a very important part of your personal safety.

- Sleep - Develop a schedule for sleep and stick to it. The average person does best with 7.5-8 hours of sleep or 4-5 REM cycles. Keep the room dark with no distractions.
- Avoid – Before going to sleep avoid caffeine and nicotine which can make it harder to fall sleep and alcohol which may help you fall asleep, but reduces to quality and amount of REM sleep.
- Phones/Tablets/TV – Set phone/tablet display to night setting. The blue light from phones and TVs can stimulate the brain and keep you awake.
- Recovering – Two full sleep cycles should reset your system and reduce fatigue.
- Exercise - Regular exercise will reduce the amount of time it takes you to fall asleep.

**Naps are best if they are very short (15-20 minutes) or very long (about 90 minutes). Naps between 20 and 90 minutes allow your body to fall into a deep sleep, but do not let you finish the sleep cycle, leaving you feeling groggy and disoriented when you awake.*

New Climate Mitigation and Resiliency Manager

Please welcome Peter DeBruin to Massport as the new Climate Mitigation & Resiliency Manager. Peter is part of Capital Programs & Environmental Affairs, reporting to Brenda Enos. His work focuses on ensuring that Massport's infrastructure and assets are protected from

Peter will collaborate with teams across Massport

severe weather such as stormwater flooding and sea level rise, while reducing environmental impact from operations and enhancing performance. Peter will collaborate with teams across Massport to achieve the mission of reducing environmental risk and impact, and further advancing the positive environmental results that can be achieved through a focus on buildings and operations. Upcoming efforts for Peter include coordinating the testing of the deployment of flood barriers to protect critical assets, ensuring that Massport-wide flood operations plans are fully operational, and working with Capital Planning project managers to incorporate guidelines into the planning of projects. He was previously the Global Program Manager for State Street Corporation's Office of Environmental Sustainability, and prior to that worked at Fidelity Investments and Xerox Corporation. He has a bachelor's degree from the University of Maine at Orono, and a Masters in Business Administration from Michigan State University.

MASSPORT CONTACTS

Safety	Environmental Compliance	Sustainability	Recycling
Brian Dinneen I 617.568.7427	Ian Campbell I 617.568.3508	Jacob Glickel I 617.568.3558	Jacob Glickel I 617.568.3558
bdinneen@massport.com	icampbell@masspot.com	jglickel@massport.com	jglickel@massport.com

Sustainable Massport

A NEWSLETTER PUBLISHED QUARTERLY FOR MASSPORT AND ITS TENANTS I VOL 43, ISSUE 2, SEPTEMBER 2017

Upcoming Events

September
National Preparedness Month
www.ready.gov/september

Wednesday, September 20, 2017
Logan Safety Fair

October
Energy Awareness Month
www.masssave.com

Wednesday, November 15, 2017
America Recycles Day

Terminal E Project gets Green Recognition

Terminal E

The recently completed John A. Volpe Terminal E New Large Aircraft Wing has received LEED (Leadership in Energy and Environmental Design) Gold certification for Commercial Interiors from the US Green Building Council.

This project provides expanded hold room space for 3 international gates that can accommodate large aircraft such as the A380 double-decker planes. Massport is an environmental leader through the incorporation of sustainability standards within our projects and has set ambitious goals to obtain LEED certification for all of our major building projects.

The 31,465 square feet of Terminal E Departures Level 3 of the New Large Aircraft Wing was certified under the Commercial Interior rating system in August 2017. Some sustainable project highlights include:

- Reduced water efficiency by 38% using low flow water fixtures and water closets
- Lighting power reduced by 43% and HVAC energy use reduced by 19% below code
- 83% of construction waste, about 862 tons, was diverted from landfills and incineration facilities
- The open space and windows in the concourse provides over 90 degree views of the outside achieving an exemplary performance credit
- 95% of wood used was certified in accordance with the Forest Stewardship Council which encourages environmentally responsible forest management.

Universal Waste — Light Bulbs — Compliance Reminder

Massachusetts has bans on the disposal of certain hazardous and recyclable items. Included in this list are mercury and mercury-containing products and those containing polychlorinated byphenyls (or PCBs). These products must be separated from trash, contained during transport and storage, and disposed of properly. Many pieces of equipment that you encounter on a daily basis contain mercury, such as fluorescent light bulbs and thermostats, and PCBs can be found in lighting ballasts. During normal use of these items, small amounts of mercury and PCBs contained within pose no harm to you or the public. However, when mishandled or improperly disposed, the chemicals can be released into the environment.

The following steps should be followed to properly handle, store and dispose of those items containing mercury or PCBs:

1. PLACE items in a container, such as a plastic bin or cardboard box.

   a. Reinserting in the original box (for instance, in the case of spent fluorescent bulbs) is acceptable.

   b. Broken bulbs must be stored in a sealed container (such as a 5 gallon bucket with a lid) marked as "Hazardous Waste", since the mercury has now been released from its original manufacturer's sealed condition.

2. LABEL the container as to its contents and date collection begins.
3. STORE the container within the Universal Waste Storage Area.

In case of breakage, a spill cleanup kit should be readily available.

Reclaimed debris from breakage or spills should be placed in a sealed container.

Each terminal has a single designated storage are for "Universal Waste". All mercury containing items will be consolidated in these areas at the end of each work shift and retrieved by a reclamation contractor on a quarterly basis.

Together, we can effectively manage our mercury containing refuse, protect our working environment, and ensure a clean sustainable environment for future generations.

What is the 20-20-20 Safety Initiative?

Each employee needs to have a situational awareness of the dangers associated with their own work as well as work being performed around them by others. Here is a simple act you can do to help; 20-20-20:

Workplace hazards and environmental risks can exist all around you and conditions are constantly changing. Each employee needs to have a situational awareness of the dangers associated with their own work as well as work being performed around them by others. Here is a simple act you can do to help; **20**-**20**-**20**:

Take **20** seconds, every **20** minutes and look **20** feet around you for safety. Look up, down and in every direction around you. Correct safety and environmental issues if possible. If you can't correct the issue, report issues to your Supervisor or Company Safety Officer. Some items you can look for include:

- Where are my exit routes?
- Are aisles around me clear and are floors in good shape?
- Are ceilings and signs secured?
- Is there enough light for my work?
- Are my walking surfaces slippery?
- Are ladders being used properly?
- Do I see unlabeled chemicals?
- Are flammables stored properly?
- Do I see guards on equipment missing or damaged?
- Am I working under any hazards?
- Am I wearing my PPE? What about the people around me?
- Are traffic control devices effective for road work?
- Are electric cords safe?
- Is fall protection being used when required?

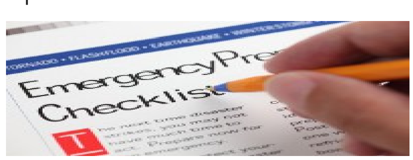
This safety mindset will help you to be aware of your surroundings. It is a proactive and preventative action that will help you own the area around you for your safety and the safety of everyone. If you need any assistance with implementing **20**-**20**-**20** or you would like to share a **20**-**20**-**20** success story, please reach out to a member of the Massport Safety Unit.

September – National Preparedness Month

September is National Preparedness Month, and with a busy hurricane season, it is important to plan ahead and prepare for emergencies before they happen. There are a number of resources including the National Hurricane Center website at http://www.nhc.noaa.gov/prepare/ready.php and Massachusetts Emergency Management Agency www.mass.gov/mema/hurricanes.

These sites include information about how to sign up for alerts and notifications, what evacuation zone you may live in, how to prepare a family emergency plan, and what to include in an emergency kit. Hurricanes have the power to cause widespread devastation and can affect both coastal and inland areas.

Although the Atlantic hurricane season is officially June 1 through November 30, the most active time for these storms in Massachusetts is late August through September.



jetBlue AIRWAYS

BOSTON-LOGAN INT'L AIRPORT FIRE MASSPORT RESCUE COMMITTED TO EXCELLENCE

FAAST Federal Aviation Administration SAFETY TEAM

icampbell@masspot.com

Sustainable Massport

A NEWSLETTER PUBLISHED QUARTERLY FOR MASSPORT AND ITS TENANTS I VOL 43, ISSUE 4, DECEMBER 2017

Upcoming Events

January, 2018
2018 Sustainability Calendar

January 23, 2018
Construction Safety Partnership Mtg

January 26, 2018
Health and Wellness Fair

April 22, 2018
Earth Day

2018 Massport Calendar

The 2018 Sustainable Massport Calendar is now available for all Massport employees and tenants. The 2018 calendar showcases sustainability efforts across all Massport facilities, including: Hanscom Field, Worcester Regional Airport, Parks, Real Estate Holdings, and the Port of Boston. The annual Sustainable Massport Calendar is part of the engagement strategies laid out in the Logan Airport Sustainable Management Plan (SMP), published in 2015.

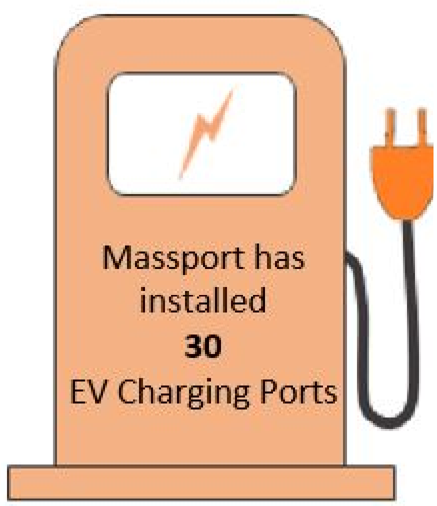
The Logan SMP serves as a roadmap to advance Massport's leadership and commitment to sustainability, by prioritizing and implementing initiatives that emphasize economic viability, operational efficiency, natural resource conservation, and social responsibility. The Sustainable Massport Calendar is one tool to share Massport's sustainability successes, and raise awareness about the organization's commitment to sustainability. Each month within the calendar will highlight a different sustainability- related topic,associated activities which Massport has undertaken and its progress, as well as ideas of programs and actions which individuals can participate in to improve personal sustainability at work and home.

If you like to receive a 2018 Calendar or would like additional copies to distribute, please contact Jacob Glickel at jglickel@massport.com

Fish Pier & Black Falcon Terminal Achieve Environmental Certification

The Fish Pier and Black Falcon Terminal have joined the Conley Terminal in achieving the globally recognized environmental risk and performance management standard ISO 14001. The certification at the two additional locations was achieved based on the identification of significant environmental impacts, and then setting objectives and measurable targets to manage those impacts. Through a series of preparatory compliance reviews and audits that engaged stakeholders throughout Marine Operations, the Fish Pier and Black Falcon Terminal then passed a final audit in mid-December, and became certified shortly after the audit.

Little known fact:



Recycling Corner

Contamination happens when incorrect items are placed into single-stream recycling bins. Contaminated recycling jeopardizes the success of the whole program since it can cause the entire load to be redirected to landfill—even if there are recyclable items mixed in there! Please help us recycle responsibly. Common contaminants that **CANNOT** be recycled include:

- **Black or colored bags**
- **Latex gloves**
- **Food waste**
- **Styrofoam**
- **Plastic Shrink-wrap**
- **Paper towels/Napkins**
- **Fabric (E.g., blankets, pillows, clothing)**

Compliance Corner - Annual Tier 2 Reporting

Many Massport tenants are required to submit annual reports to satisfy the Emergency Preparedness and Community Right to know Act (EPCRA). For 2017 there are changes in the way that chemicals are reported. For facilities reporting hazardous chemicals under sections 311 and 312 of EPCRA, Chemical reporting must be done using the OSHA Globally Harmonized Standard (GHS) beginning in 2017. Submissions must utilize GHS compliant Safety Data Sheets or a chemical list utilizing the revised OSHA HAZCOM hazard categories. For chemical mixtures, facility owners may need to develop their own SDS for each mixture. Don't wait until the deadline to find out what the changes mean to you.

Chemicals store above Tier 2 thresholds must be report annually by March 1st to the Local Emergency Planning Committee (LEPC) or regional Emergency Planning Committee (REPC) AND to the local fire department.

More information on Massachusetts Tier 2 reporting requirements can be found at:

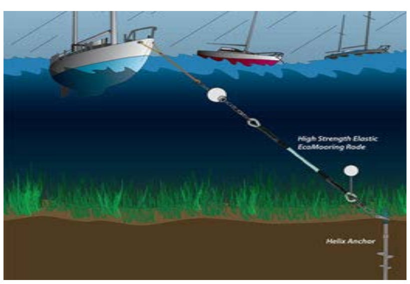
http://www.mass.gov/eopss/agencies/mema/resources/serc/

And at the EPA website:

https://www.epa.gov/epcra/tier-ii-forms-and-instructions

If you have any questions or concerns about hazardous waste compliance, contact the Massport Environmental Department.

Massport's Environmental Mitigation for Logan's Runway Safety Area Improvement Project is Flourishing!



Conservation mooring schematic

In 2014, Massport began its Conservation Mooring Program in five separate harbors as an alternative mitigation strategy for the loss of an eelgrass meadow when the critically important Logan Runway Safety Area was constructed for Runways 33L. Over the past three years, Massport, with field support from Massachusetts Division of Marine Fisheries, has been annually assessing the environmental recovery of eelgrass in scars formed from convention boat moorings. By funding the replacement of 218 conventional moorings (typically block and chain) with conservation moorings, the footprint on the harbor bottom is essentially eliminated. In addition, the neutrally buoyant mooring rode eliminates bottom drag which can damage eelgrass. Over the past three years, signs of eelgrass recovery have been observed and this year, the harbor-wide scar area has measurably declined in each harbor. An additional benefit includes a reduction in localized turbidity which makes for an improved habitat for shellfish and fish.

Eelgrass filling in the mooring scar at Gloucester helix anchor DC-13-19. Division of Marine Fisheries scientist assessing eelgrass growth.

Eelgrass growing up to the West Falmouth Harbor #156 helix anchor

Safe Winter Driving - The Three P's of Safe Winter Driving:

PREPARE for the trip;
PROTECT yourself; and
PREVENT crashes on the road

PREPARE

- Check tire tread, headlights, brake lights, windshield wipers and windshield washer fluid prior to driving.
- Completely clear snow and ice off your car – including windows, mirrors, lights, reflectors, hood, roof and trunk.
- Have a snow brush and ice scraper in the vehicle.

PROTECT YOURSELF

- Always use your seat belt while driving or when you are a passenger in a moving vehicle.
- Watch for ice when stepping in and out of the vehicle. Most falls happen when getting in and out of vehicles during the winter months. Use three three points of contact while getting in and out and use caution.
- Always wear high visibility clothing when working around vehicles at roadways, garages, container yards and ramp areas.
- Make sure your exhaust pipe is clear of snow. There is danger of carbon monoxide poisoning if snow blocks the pipe while idling. Remember- do not idle more than 5 minutes per MassDEP regulation.

PREVENT CRASHES

- Stopping distances are longer on snow and ice. Slow down and increase distances between cars.
- Keep your eyes open for pedestrians walking in the road. Visibility can be low during snow storms. Ensure you use caution around terminal and ramp areas or near the road.
- Drive with your headlights on, and be sure to keep them clean to improve visibility.
- Use caution when snow banks limit your view of oncoming traffic.
- Be cautious on bridges and overpasses as they are commonly the first areas to become icy.
- Remember that speed limits are meant for dry roads, not roads covered in snow and ice. You should reduce your speed and increase your following distance as road conditions and visibility worsen.

Recycling Christmas Trees

Don't throw your real Christmas tree in the trash after the holidays. Real trees are biodegradable, which means they can be easily reused or recycled. Consider giving your tree a second life as compost, mulch, or chips to be used later in a garden or landscape project. Other options include: reusing your tree for bird feeders, or for a soil erosion barrier. The Massachusetts Christmas Tree Association provides a link to locations of Christmas Tree Recycling Centers in Massachusetts

Visit http://www.christmas-trees.org to get recycling center locations for Christmas trees as well and other materials.

Real Christmas Trees can be easily reused or recycled.

Remember to also recycle Christmas wrapping paper and boxes. Bows and ribbons cannot be recycled, so instead should be reused and ultimately put in the trash.

Holiday Safety Tips

Winter Holidays are often a time for fun and festivity. Too often, they also mean accidents and injury. Tens of Thousands of people are injured over the Holiday Season. Accidents range from fires to fall hanging decoration. Please remember *The 12 Days of Safety* that is published by the National Safety Council. Enjoy the Season!

February is sustainable transportation month as part of Sustainable Massport. Massport is dedicated to providing Massport staff multiple ways to get to work without having to drive their own vehicle. Every car that isn't coming to Logan or other Massport facilities, reduces stress on existing roadways and reduces greenhouse gas emissions.

How to Put the Brakes on Driving Alone to Work

Transit and Vanpool Discounts

- All full, part-time, and job share employees are eligible for 50% reduction off the cost of their public transportation commuting costs, up to $100 per month.
- Employees can take advantage of this program either through reimbursement or on a pretax basis from your paycheck.
- Eligible mass transportation options include MBTA transit, Logan Express buses, Inner Harbor Ferry, Commuter Boat, vanpool and privately operated scheduled buses. For more information, please contact Emily Navarro at x3937, except regarding Vanpools. Matt Carrai of Rideshare by Enterprise can be contacted at Matthew.d.carrai@ehi.com or 508-259-8959 for information on establishing a vanpool.

Massport Shuttles

- Shuttles circulate the airport, making it easy to connect to the Blue Line (Airport Station), the Silver Line, Logan Express, privately operated scheduled buses, and water transportation
- Shuttles run during the work week between the LOC, Terminal C and the Blue Line every 15 minutes from 7:30 - 9:30 AM and 2:00 - 6:00 PM.

Logan Express

- Employee discounts on fares and parking are available at all Logan Express locations, including Framingham, Braintree, Woburn, and Peabody. Discounts are also available on the Back Bay Logan Express.
- For tickets, please contact Emily Navarro at x3937.

Water transportation

- Massport employees can ride the water taxi free of charge Monday – Friday from 7:15 – 9:15 AM and 3:30 – 5:30 PM with a Massport badge all-year round.
- Pre-paid vouchers are also available for work-related travel during other hours. For more information, contact Jamila Richardson at x1756.
- Valid for transportation between the following docks: Logan, Long Wharf, Central Wharf, Rowes Wharf, Moakley Court House, and World Trade Center.

Biking or Walking

- Massport offers bike racks around Logan airport and at other facilities for convenient bike parking.
- Shower facilities are available at the LOC (for badged employees) and may be available at other facilities (check with your supervisor for access and availability).

The Recycling Corner

Test Your Recycling Knowledge! Take our short quiz and find out if you are an expert on the dos and don'ts of recycling at Massport. All of your responses will be anonymous.

TAKE THE QUIZ

Massport's Sustainability Mission:

"Massport will maintain its role as an innovative industry leader through continuous improvement in operational efficiency, facility design and construction, and environmental stewardship while engaging passengers, employees, and the community in a sustainable manner."

Massport's Sustainability Mission

Massport will maintain its role as an innovative industry leader through continuous improvement in operational efficiency, facility design and construction, and environmental stewardship while engaging passengers, employees, and the community in a sustainable manner.

SUSTAINABLE MASSPORT MONTHLY NEWSLETTER

March 2018: Water Resources and Conservation

March is Water Resources and Conservation month as part of *Sustainable Massport*! Massport has taken significant steps to track and reduce water at our facilities. At Hanscom Field, a tenant project by Boston MedFlight built a new hangar reusing on-site groundwater to minimize dust created during construction.

Water Reuse Project at Hanscom Field

Conserve Water at Home

There are easy steps you can do at home to reduce your own water use.

- Turn off the tap while brushing your teeth or shaving: save 4-10 gallons a day.
- Never use your toilet as a wastebasket: save 1.5-4 gallons per flush.
- Don't take marathon showers: five minutes will get you clean. Save 3-7 gallons per shower.
- Close your tub drain before turning on the water: save 3 gallons or more.
- Fill your bathtub only halfway: save 5 gallons or more. You will save hot water costs, too.
- Faucets typically use 2 to 5 gallons per minute. Installing a low-flow faucet aerator can reduce the flow by as much as 25% or up to a gallon and a half per minute.

The Massachusetts Water Resource Authority (MWRA) provides information about water conservation at www.MWRA.com, and will also provide a water saving kit if you live in a MWRA customer community.

In 1986, MWRA customers used a total of 330 million gallons of water per day. Thanks to daily water conservation efforts, demand has been reduced to 195 million gallons per day in 2017. Saving water keeps supplies level and has helped the region control water, sewer and energy costs.

THE RECYCLING CORNER

COMMON CONTAMINANT » FOOD WASTE

Please do not put food waste into Massport's single-stream recycling bins.

Empty and rinse food containers before recycling.

Massport's Sustainability Mission
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SUSTAINABLE MASSPORT MONTHLY NEWSLETTER

April 2018: Health and Wellness

April is Health and Wellness month as part of *Sustainable Massport*! In its commitment to enhancing the health and well-being of its employees, Massport is currently offering the following programs:

<u>Employee Health and Wellness</u>

- **HR Open House** will be held on Wednesday, April 11 from 11-2 @ LOC. Open Enrollment will run April 4-May 2 with an effective date of July 1st.
- **Health & Wellness related classes** are available in April and throughout the year as a part of the Health & Wellness Incentive Program including:
  - April 4 - Post-Overdose Response
  - April 11 - Diabetes Awareness
  - April 24 – Work Addiction
- The Human Resources Department would like to remind employees about the partnership we have with Blue Cross Blue Shield of Massachusetts (BCBS) that brings **<u>all</u>** of our employees (including those who do not have health coverage through BCBS) a health & wellness online offering via BCBS's **wellness website** www.ahealthyme.com/login. If you need assistance with creating an account, please contact Tonya Walker at extension 7436.
  - *A few of the website highlights include:*
    - A health assessment that looks at eight different areas of your health and provides you with a personalized wellness score
    - Self-paced on-line workshops on a wide range of topics
    - Tools to help you stay on a healthy track, including nutrition and exercise logs, a recipe library, and a meal planner

<u>Community Events</u>

- **East Boston Little League Opening Day** will be held on April 28th at Massport's Festa Field.

THE RECYCLING CORNER

RECYCLE THIS, NOT THAT

A Case of Bottled Water in Plastic Wrap Packaging

Massport Recycles

RECYCLE

Plastic Bottles
(no liquids)

Cardboard
(clean, flattened)

Questions? Contact Lauren Laskey
(LLaskey@massport.com, 617-568-3542)

TRASH

Plastic Wrap Packaging

The stretchy plastic wrap packaging that surrounds the outside of a multi-pack of bottles CANNOT be placed into Massport's single-stream recycling containers.

Many stores offer special recycling programs for plastic wrap. Find store drop-off locations: http://www.how2recycle.info/sdo

Massport's Sustainability Mission
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SUSTAINABLE MASSPORT MONTHLY NEWSLETTER

May 2018: Parks and Open Space

May is Parks and Open Space month, as part of Sustainable Massport. Massport owns and operates over 30 acres of parks that provide open space, playgrounds, and waterfront views to our neighbors. In addition, our parks also provide critical environmental benefits such as tree canopy and carbon absorption that protect human health and physical property.

Massport parks and open space have offer a great benefit to the community and employees including events and activities for the whole family.

East Boston Parks

- Take a lunch time walk to Piers Park, Navy Fuel Pier, Neptune Road Buffer, Maverick Mothers Pocket Park, and the East Boston Greenway
- The Sailing Center located at Piers Park had its opening day on April 28, and local residents enjoyed sailboat rides and learned about the summer programs at the center
- Starting in July, Zumix, a local non-profit, will be holding free concerts at Piers Park every Sunday at 6pm through the end of August
- The water fountain at Bremen Park will start on the first day of summer vacation for Boston public schools
- Bremen Park has a community gardens section where residents grow flowers, fruit and vegetables all summer long

Piers Park in Bloom

South Boston Parks

- Food trucks operate at South Boston Maritime Park five days a week, Monday – Friday. The trucks are stationed on Northern Avenue from 11:00AM-3:00PM. In addition to the trucks, corn hole boards and Adirondack chairs are in the park for all to enjoy.

Massport's Sustainability Mission
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SUSTAINABLE MASSPORT MONTHLY NEWSLETTER

June 2018: Air Quality and Greenhouse Gas Reduction

June is Air Quality and Greenhouse Gas Reduction month, as part of Sustainable Massport. As Massport upgrades our buildings and operations, we are making great strides to invest in air quality and greenhouse gas reduction improvement technologies. These critical improvements will benefit neighboring communities and improve the efficiency of Massport operations.

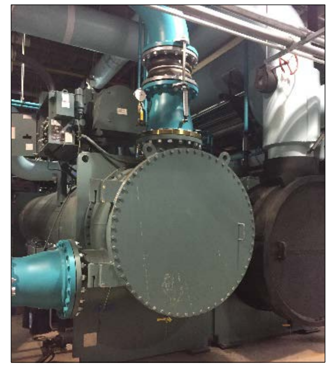
Examples of air quality improvements and greenhouse gas reductions related projects at Massport include:

Boston Logan International Airport

- 2 new chillers at the Central Heating and Cooling Plant are 30% more efficient than their replacements
    - Last year, new cooling tower extensions were installed at the plant, increase cooling capacity by 15%
- As part of the relocation of the taxi lot to Harborside Drive, Massport is installing four fast charging electrical vehicle charging stations at the new taxi lot.
- 65 new dual charging stations for airline ground service equipment will be installed as part of the Terminal B Optimization project in early 2019.

Conley Terminal

- Five rubber tired gantry (RTG) cranes are being upgraded to tier four engines this summer. Air quality improvements from these upgrades will result in a 90% reduction in nitrous oxides and a 13% reduction in particulate matter.



New Chiller at Central Heating and Cooling Plant

RTG crane engine

massport Recycles

Questions?
Contact **Lauren Laskey**
LLaskey@massport.com
617-568-3542

Find out where you can recycle styrofoam:
www.foamfacts.com/recycling/

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SUSTAINABLE MASSPORT MONTHLY NEWSLETTER

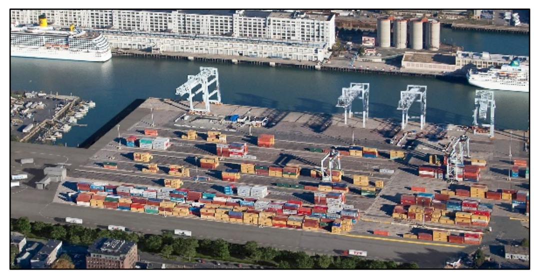
July 2018: Natural Resources

July is Natural Resources month, as part of *Sustainable Massport*. Massport's natural resources, including wetlands, creeks, woods, tidal salt marshes, and mud flats, provide habitat for a wide variety of plants and wildlife. Massport continuously seeks to protect our regions' natural resources while maintaining safe aircraft and vessel operations.

Snowy Owl Trap and Relocation

The Massport Wildlife Management Department partners with a certified airport wildlife biologist to assess and manage all wildlife at Logan Airport. Between November 2017 and July 2018, 94 snowy owls have been trapped and relocated from Logan's airfield through a cooperative relationship between Mass Audubon, the USDA-APHIS Wildlife Services, and Massport. Since the early 1990's, this partnership helped to protect snowy owls, improved our understanding of the species, and promoted aviation safety. Before releasing them back into the wild, researchers attach bands and transmitters to the owls. This allows researchers to learn more about their migratory and behavioral patterns, which had been relatively unknown due to their remote Artic habitat.

Berth 10 at Conley Terminal Soil Remediation



Berth 10 Rendering

The new Berth 10 project at Conley Terminal will restore a former oil terminal to active marine use by removing dilapidated pier structures and constructing a new modern facility. In addition to constructing a pile-supported concrete pier and installing new cranes, this project will remove oil-impacted soil and install a new bulkhead to contain any remaining contamination onsite and prevent oil from seeping into the harbor. Oil-impacted soils will be excavated from the shoreline and dredged from the harbor at Berth 10. In addition to constructing the steel bulkhead, the project will create an additional containment barrier behind the bulkhead using a soil stabilization method.

SUSTAINABLE MASSPORT MONTHLY NEWSLETTER

August 2018: Climate Change Adaptation and Resiliency

August is Climate Change Adaptation and Resiliency month as part of *Sustainable Massport.* The Boston region is in the middle of Hurricane Season (June 1 – November 30) and Massport has been implementing various resilience measures to ensure that staff and facilities are protected from potential effects of severe weather. Examples of efforts include enhancing critical infrastructure through permanent and temporary flood-proofing as well as conducting exercises to increase operational preparedness for storms.

The March Nor'easter

In March 2018, a nor'easter heavily impacted the Boston region. In preparation, Massport deployed temporary flood barriers at Maritime properties. This was Massport's first 'real-life' emergency deployment of barriers. Barrier installations were successful and effectively protected assets from surrounding floodwaters.

High Water at the Fish Pier

Test Deployment of Temporary Flood Barriers

The team has been developing strategies to continuously improve the program and address issues encountered during the March nor'easter, such as communication and logistical challenges. Some resilience initiatives include:

- Conducting a test deployment of temporary flood barriers at the MPA Pumping Station (Electrical Telecom Building) at Logan Airport in June. Routine trainings help to increase efficiency and preparedness for deployments.
- Developing a *Massport Flood Resiliency Application* through internal collaboration to improve communication and logistics during deployments.
- Evaluating 'next level' priorities and opportunities for improving flood and disaster resiliency at vulnerable locations

Test Deployment at the Fish Pier

Be Prepared at Home

It is important to be prepared for storms at home too! The *Red Cross Flood and Hurricane Safety Checklists* provide resources and tips that can help to keep your family and home safe. Additional resources are available on the Massport Resiliency Sharepoint Page.

Massport's Sustainability Mission
Massport will maintain its role as an innovative industry leader through continuous improvement in operational efficiency, facility design and construction, and environmental stewardship while engaging passengers, employees, and the community in a sustainable manner.

SUSTAINABLE MASSPORT MONTHLY NEWSLETTER

September 2018: Community Partnerships

September is Community Partnerships month as part of *Sustainable Massport*! The support and well-being of the broader community and its schools is an important component of Logan Airport's sustainability goals. Community investment enhances the communities' ability to prosper and invest in their own development. In recognition of all the valuable community work undertaken this summer by dedicated Massport staff, here are highlights of the programs and projects we support.

Massport Backpack Program
Each summer, Massport coordinates a backpack drive for homeless and in-need children between the ages of 4 and 17. This year, Massport sponsored children at the Crossroads Family Center in East Boston, the Joseph M. Tierney Learning Center in South Boston and Heading Home in Charlestown. In August, 65 children received backpacks filled with school supplies and a new outfit for their first day of school- our highest response yet by Massport employees! This program is invaluable in strengthening the children's self-esteem, encourages them to look forward to the new school year, and sends a strong message that others care about them and their education.

Massport Food Drive
Each fall, Massport coordinates a food drive to help those less fortunate. For the upcoming Thanksgiving season, Massport is assisting three organizations: The Crossroads Family Center, The Winthrop Food Pantry and The South Boston Community Health Center (SBCHC) Food Pantry. Collections will begin on Monday, October 8, 2018 and end on Friday, November 9, 2018. An announcement will be made in October with the full details of the Massport Food Drive.

"Love Your Block" Neighborhood Cleanup
Massport proudly supports the City of Boston's "Love Your Block" neighborhood cleanup initiative. Each spring, Massport employees volunteer time to help beautify our neighboring communities by cleaning streets, painting, planting and weeding.

Massport's Sustainability Mission
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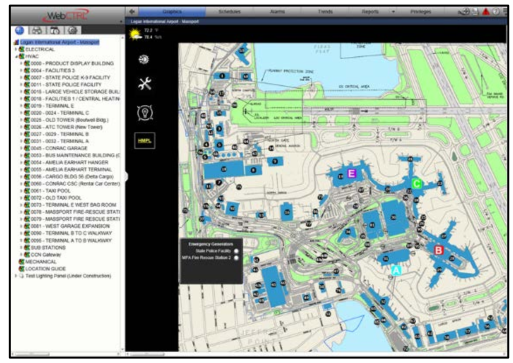
SUSTAINABLE MASSPORT MONTHLY NEWSLETTER

October 2018: Energy Efficiency

October is Energy Efficiency Month as part of *Sustainable Massport*! As Massport builds and upgrades facilities to keep up with passenger growth, we continue to invest in sustainable and energy reduction systems.

Master Building Control

Massport is expanding the ability to monitor and control all Logan Airport building operations remotely through a Master Building Control System (MBCS). This ensures peak operational performance of all HVAC and lighting systems, while expanding the opportunity to reduce energy consumption. Massport is converting and integrating our older building control systems onto the MBCS and new building systems are installed on the MBCS. As the MBCS encompasses more operations, staff are being trained to monitor the system remotely to more easily ensure peak performance for lighting and HVAC systems. The MBCS will also provide the opportunity for Massport to retro-commission the HVAC and lighting systems to reduce energy use.



Online Portal for Master Building Control System

Lighting Retrofits

- Conley Container Terminal recently retrofitted their high mast yard lighting with LEDs, cutting their energy use by half and resulting in over 175,000 kWh of energy savings.
- Since 2016, Massport has retrofitted over 6,200 lighting fixtures with energy efficient LEDs at Boston Logan Airport. The retrofits included lighting in the terminals, parking garages, streetlights, and airport facilities as part of a program designed to reduce energy use and improve lighting performance. The result is annual savings of 2,600 MWh of annual savings and a reduction of 890 metric tons of greenhouse gas (GHG) emissions!

Retrofitting streetlights with LEDs

THE RECYCLING CORNER

THANK YOU FOR RECYCLING THESE ITEMS

Scan the QR Code to learn more about the new statewide list of recyclable & non-recyclable items!

Metal

Food and Beverage Cans
empty and rinse

Plastic

Bottles, Jars, Jugs and Tubs
empty and replace cap

Glass

Bottles and Jars
empty and rinse

Paper & Cardboard

Mixed Paper, Newspaper, Magazines, Boxes
empty and flatten

Questions? Contact **Lauren Laskey** (LLaskey@massport.com; 617-568-3542)

massport Recycles

Massport's Sustainability Mission

Massport will maintain its role as an innovative industry leader through continuous improvement in operational efficiency, facility design and construction, and environmental stewardship while engaging passengers, employees, and the community in a sustainable manner.

SUSTAINABLE MASSPORT MONTHLY NEWSLETTER

November 2018: Waste Management and Recycling

November is Waste Management and Recycling Month as part of *Sustainable Massport*! Massport has been developing solutions to encourage waste reduction, reduce the level of contamination in the recycling stream, and increase the amount of materials properly recycled, despite industry-wide challenges.

Logan Airport Waste Assessment

Massport is conducting a comprehensive waste assessment of Logan Airport to augment our understanding of the waste streams, identify challenges, and develop recommendations for improving the waste management and recycling program. A robust plan is being developed, which will identify multi-pronged strategies to successfully implement recommended initiatives and promote continuous improvement of the waste management and diversion system.

Team conducts waste audit

Prevent Contamination and Recycle Right

Contamination occurs when improper items are placed into recycling containers. A small amount of contamination can cause all of the materials within a container to be diverted as trash to landfills--- even if there are 'good' recyclable items mixed in there! Therefore, it is important to learn what you can and cannot put into single-stream recycling.

If you are unsure if an item is recyclable, please throw it in the trash.

Please DO place these items in your blue bins!

Please do NOT place these common contaminants in your blue bins!

Questions? Contact Lauren Laskey (llaskey@massport.com; 617-568-3542)

Massport's Sustainability Mission
Massport will maintain its role as an innovative industry leader through continuous improvement in operational efficiency, facility design and construction, and environmental stewardship while engaging passengers, employees, and the community in a sustainable manner.

SUSTAINABLE MASSPORT MONTHLY NEWSLETTER
December 2018: Sustainable Tenants

December is Tenant Month as part of *Sustainable Massport*! Massport is proud to support our tenants' sustainable business initiatives. Examples of sustainable tenants at Logan Airport include but are not limited to: Legal Sea Foods and the Hilton Hotel.

Legal Sea Foods

To help protect the environment, Legal Sea Foods has adopted a variety of sustainable practices at Logan Airport. In May 2018, Legal Sea Foods eliminated the use of Styrofoam boxes for seafood deliveries to their six restaurants at the Airport. This initiative has significant environmental benefits by preventing roughly 20,000 non-recyclable Styrofoam boxes from entering landfill each year. In addition, their new cardboard box delivery method will contribute to improving the recycling rate at the Airport. In an effort to reduce the use of single-use plastics, the restaurants began offering paper, compostable straws in July 2018.

Hilton Hotel

The Hilton Hotel at Logan Airport has implemented a variety of sustainability initiatives to reduce environmental impacts. In March 2018, the hotel initiated a large-scale composting program for food waste collected in kitchens. Within the first six months, the program helped to divert more than 95,000 lbs. of organic materials from landfill. This equals 47.5 tons or almost 10 elephants! Compost created through this program is used to enrich soil and grow fresh vegetable gardens at roughly 50 schools and colleges in the region.

In addition to these efforts, Hilton aims to minimize the use of disposable plastic materials by providing guests with compostable alternatives for straws, cups, and more.

For more resources, visit the Massport Recycling Sharepoint Page: http://sharepoint/CapitalPrograms/Sustainability/SitePages/Recycling.aspx

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Peak Period Pricing Monitoring Reports

- 2017 Peak Period Pricing Monitoring Report
- 2018 Peak Period Pricing Monitoring Report
- 2019 Peak Period Pricing Monitoring Report
- Memorandum from Edward C. Freni, Massport Director of Aviation, to the Boston Airline Committee (BAC), Regarding Boston-Logan International Airport Peak Period Surcharge Regulation Monitoring Report. Dated June 5, 2019.

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BOSTON-LOGAN INTERNATIONAL AIRPORT MONITORING REPORT ON SCHEDULED AND NON-SCHEDULED FLIGHT ACTIVITY

Peak Period Surcharge Regulation
740 CMR 27:00: Massachusetts Port Authority

Report Number:	**014**
Monitoring Period:	**Through Sept. 2017**
Report Issue Date:	**May 2017**

Note: This report reflects the Boston-Logan Airport flight activity monitoring under 740 CMR 27.03 Peak Period Surcharge Regulation on Aircraft Operations at Boston-Logan International Airport.

Findings: This report includes actual and projected activity data **through September 2017**. Current and projected near-term flight levels at Boston Logan are well below Logan's good weather (VFR) throughput of approximately 120 flights per hour. **As a result, average VFR delays are projected to be minimal and well below the 15 minutes threshold through the analysis period.**

In the event demand conditions at the airport change significantly from the current projection, Massport will issue updates to this report.

Attachments

Table 1: Summary Overview of Peak Period Surcharge Program

Table 2: Summary Overview of Forecast Methodology

Table 3: Projected Aircraft Operations at Logan Airport Projected

Table 4: Projected Hourly Operations, Average Weekday

Table 5: Forecast Logan Average Weekday Operations

Massport Contact:

Mr. Flavio Leo
Director, Aviation Planning and Strategy
617-568-3528
fleo@massport.com

Table 1: Summary Overview of Peak Period Surcharge Program

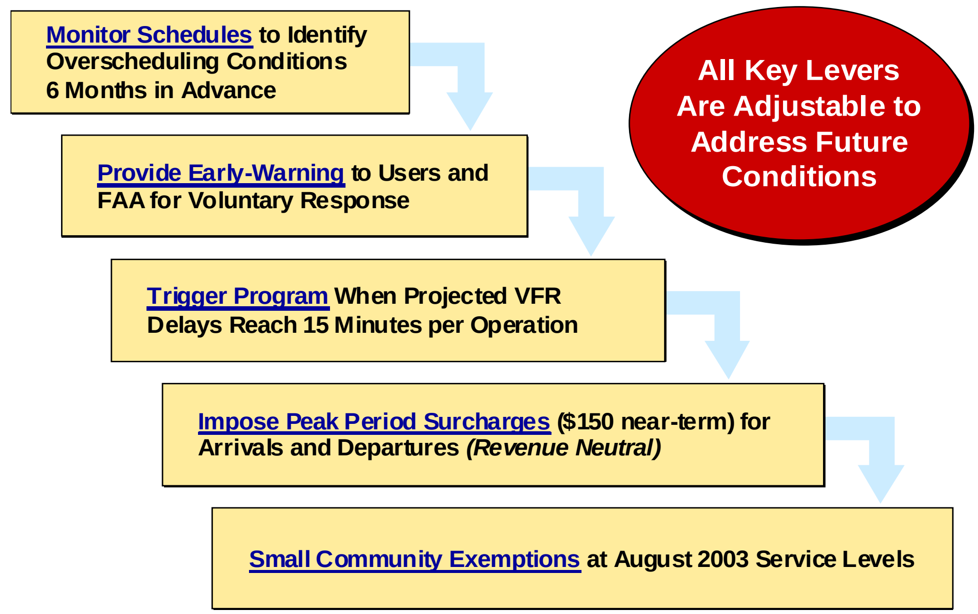
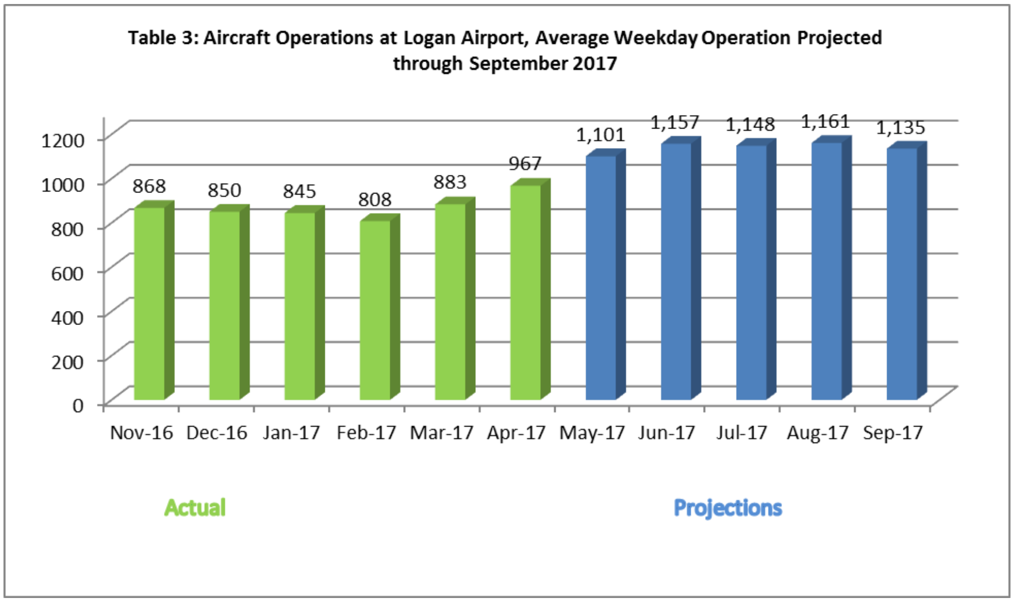


Table 2: Summary Overview of Forecast Methodology

- Scheduled passenger airline flights represent more than 93 percent of total aircraft operations. Passenger airline activity for the Spring and Summer periods were projected based on published advance airline schedules
- Forecasts of monthly activity for other segments (GA, Cargo, Charter) are based on the past three months of actual flight volume and historic patterns of monthly seasonality
- Day-of-week and time of day distributions for non-scheduled segments are based on analysis of Logan radar data
- Projections for each segment were combined to produce the forecast pattern of hourly flight activity for an average weekday, Saturday, and Sunday for the period from February through September

Table 3: Aircraft Operations at Logan Airport

Note: Actual Operations are based on Massport data/air carrier reports and reflect flight cancellations due to weather and other operational impacts.



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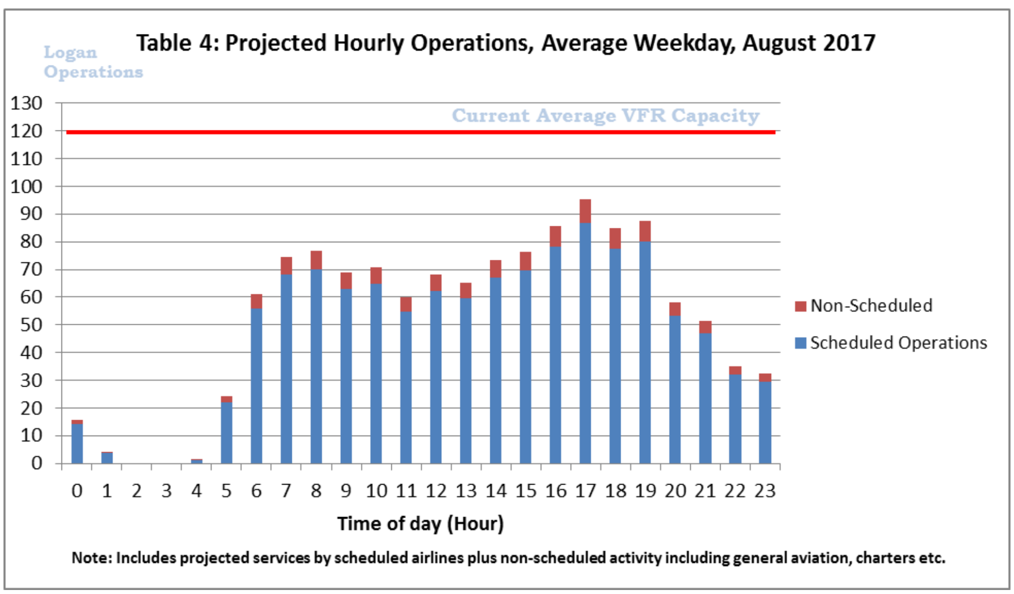

Table 5: Forecast Logan Average Weekday Operations, *Feb. – Sep.*

Forecast Daily Operations								
Hour Range	**Feb-17**	**Mar-17**	**Apr-17**	**May-17**	**Jun-17**	**Jul-17**	**Aug-17**	**Sep-17**
0	9	14	12	11	15	16	14	12
1	3	4	3	5	5	5	4	3
2	0	1	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0
4	2	2	0	0	0	0	1	1
5	12	17	18	21	27	30	22	18
6	39	47	54	53	55	52	56	52
7	46	49	61	64	66	66	68	76
8	44	47	80	67	67	64	70	66
9	45	52	66	64	65	63	63	65
10	43	47	48	62	68	66	65	58
11	44	43	53	50	52	53	55	56
12	37	39	55	60	62	62	62	62
13	41	45	56	63	61	57	59	65
14	42	45	57	63	68	68	67	63
15	48	50	62	66	70	67	70	62
16	57	55	70	78	77	82	78	79
17	57	58	83	77	87	86	87	87
18	52	59	79	74	75	69	78	78
19	51	56	67	77	82	81	80	75
20	48	52	55	43	48	52	53	48
21	40	41	36	44	47	46	47	45
22	27	34	26	34	35	33	32	33
23	20	25	31	25	28	28	30	29
Total	**808**	**883**	**1,071**	**1,101**	**1,157**	**1,148**	**1,161**	**1,135**
	February - Apr are actual data							
	May - September is forecast data							

BOSTON-LOGAN INTERNATIONAL AIRPORT MONITORING REPORT ON SCHEDULED AND NON-SCHEDULED FLIGHT ACTIVITY

Peak Period Surcharge Regulation
740 CMR 27:00: Massachusetts Port Authority

Report Number:	**015**
Monitoring Period:	**Through Sept. 2018**
Report Issue Date:	**May 2018**

<u>Note</u>: This report reflects the Boston-Logan Airport flight activity monitoring under 740 CMR 27.03 Peak Period Surcharge Regulation on Aircraft Operations at Boston-Logan International Airport.

<u>Findings</u>: This report includes actual and projected activity data **<u>through September 2018</u>**. Current and projected near-term flight levels at Boston Logan are well below Logan's good weather (VFR) throughput of approximately 120 flights per hour. **As a result, average VFR delays are projected to be minimal and well below the 15 minutes threshold through the analysis period.**

In the event demand conditions at the airport change significantly from the current projection, Massport will issue updates to this report.

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Mr. Flavio Leo
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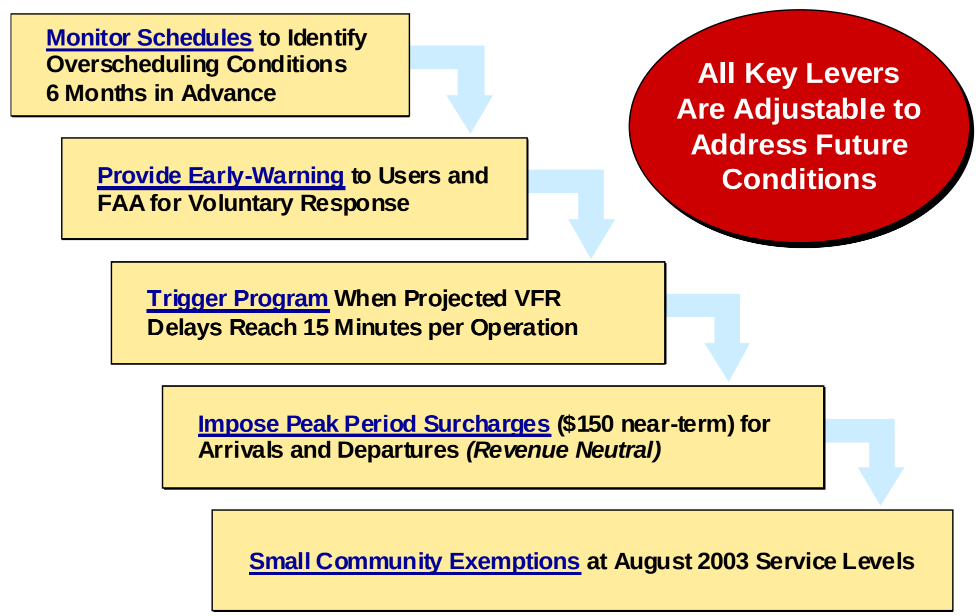

Table 2: Summary Overview of Forecast Methodology

- Scheduled passenger airline flights represent about 93 percent of total aircraft operations. Passenger airline activity for the Spring and Summer periods were projected based on published advance airline schedules

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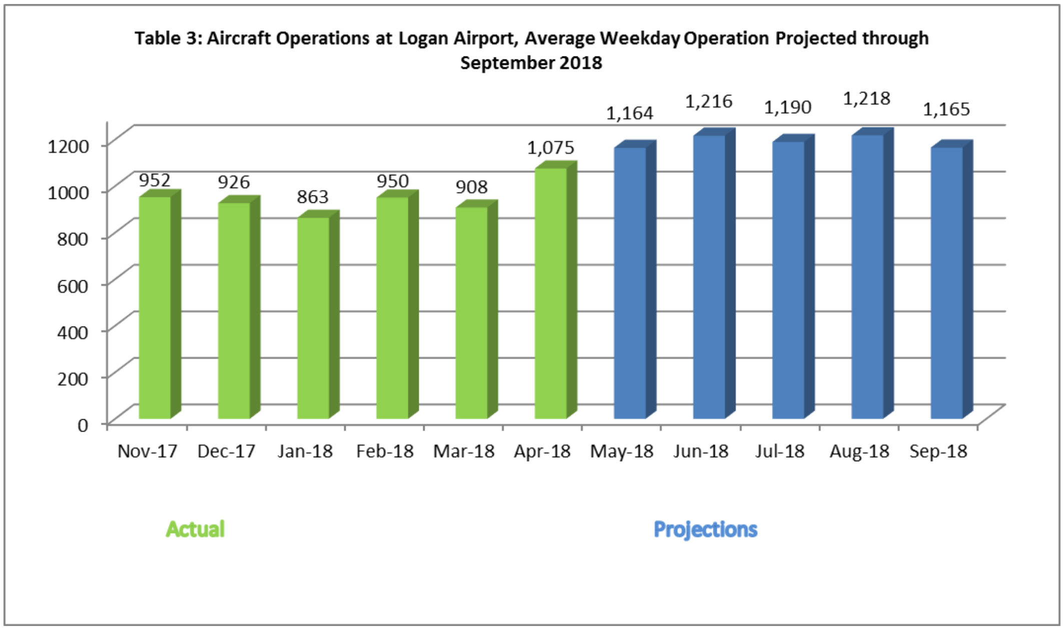
- Day-of-week and time of day distributions for non-scheduled segments are based on analysis of Logan radar data

- Projections for each segment were combined to produce the forecast pattern of hourly flight activity for an average weekday, Saturday, and Sunday for the period from February through September

Table 3: Aircraft Operations at Logan Airport

Note: Actual Operations are based on Massport data/air carrier reports and reflect flight cancellations due to weather and other operational impacts. Projections, scheduled activity only.



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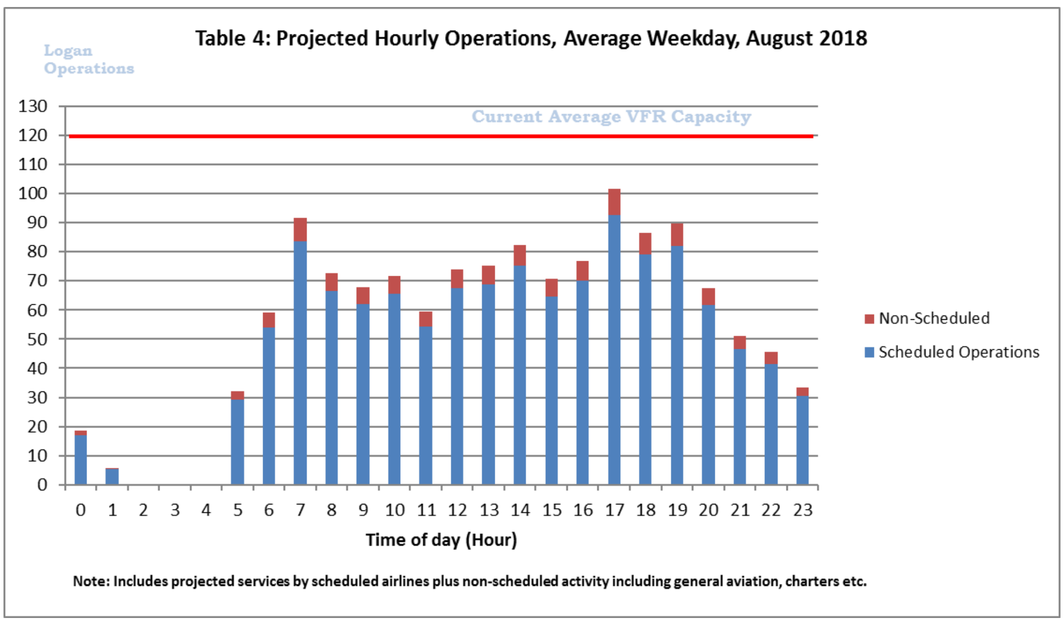

Table 5: Forecast Logan Average Weekday Operations, *Feb. – Sep.*

Forecast Daily Operations								
Hour Range	Feb-18	Mar-18	Apr-18	May-18	Jun-18	Jul-18	Aug-18	Sep-18
0	12	16	20	20	19	16	17	17
1	4	6	8	4	6	6	5	5
2	1	2	2	0	0	0	0	0
3	0	1	1	0	0	0	0	0
4	4	2	3	0	0	0	0	2
5	20	18	24	27	29	30	29	21
6	47	42	51	59	58	52	54	55
7	59	53	65	73	80	82	84	78
8	55	50	61	64	66	66	66	62
9	56	56	63	65	71	63	62	65
10	48	46	56	64	67	63	66	64
11	45	46	50	48	52	54	54	53
12	44	45	49	66	67	66	68	65
13	53	51	60	73	69	65	69	68
14	54	53	58	67	70	72	75	71
15	55	49	56	64	67	64	65	62
16	56	52	56	70	70	69	70	68
17	58	57	64	84	93	90	93	93
18	64	60	67	76	73	73	79	79
19	60	53	66	75	75	79	82	75
20	54	52	62	49	61	61	62	53
21	43	39	51	51	52	46	47	49
22	35	34	48	38	41	42	42	37
23	24	27	35	27	30	29	30	25
Total	**950**	**908**	**1,075**	**1,164**	**1,216**	**1,190**	**1,218**	**1,165**

February - April are actual data
May - September is forecast scheduled activity only

BOSTON-LOGAN INTERNATIONAL AIRPORT MONITORING REPORT ON SCHEDULED AND NON-SCHEDULED FLIGHT ACTIVITY

Peak Period Surcharge Regulation 740 CMR 27:00: Massachusetts Port Authority

Report Number:	**016**
Monitoring Period:	**Through Sept. 2019**
Report Issue Date:	**June 2019**

Note: This report reflects the Boston-Logan Airport flight activity monitoring under 740 CMR 27.03 Peak Period Surcharge Regulation on Aircraft Operations at Boston-Logan International Airport.

Findings: This report includes actual and projected activity data **through September 2019**. Current and projected near-term flight levels at Boston Logan are well below Logan's good weather (VFR) throughput of approximately 120 flights per hour. **As a result, average VFR delays are projected to be minimal and well below the 15 minutes threshold through the analysis period.**

In the event demand conditions at the airport change significantly from the current projection, Massport will issue updates to this report.

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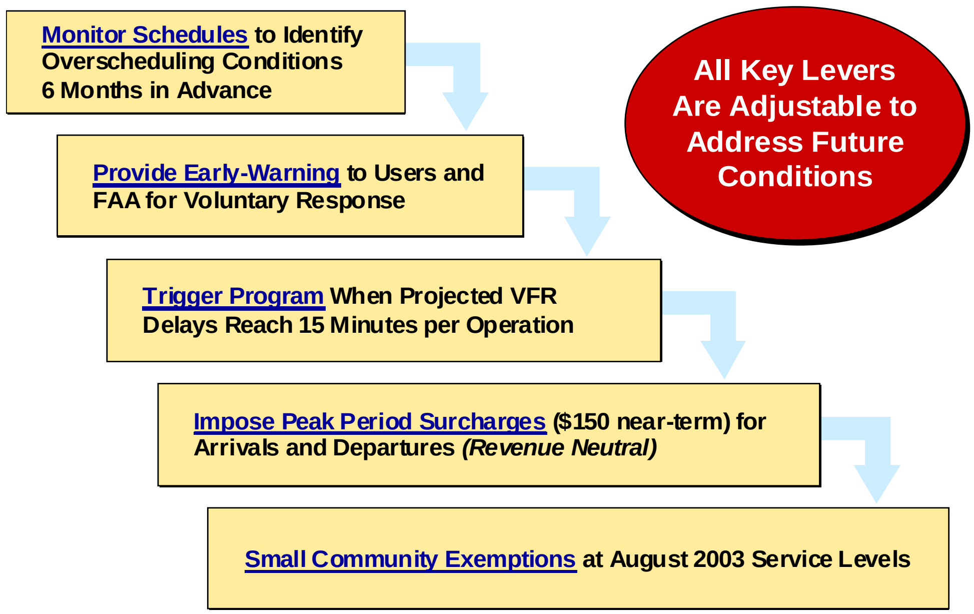

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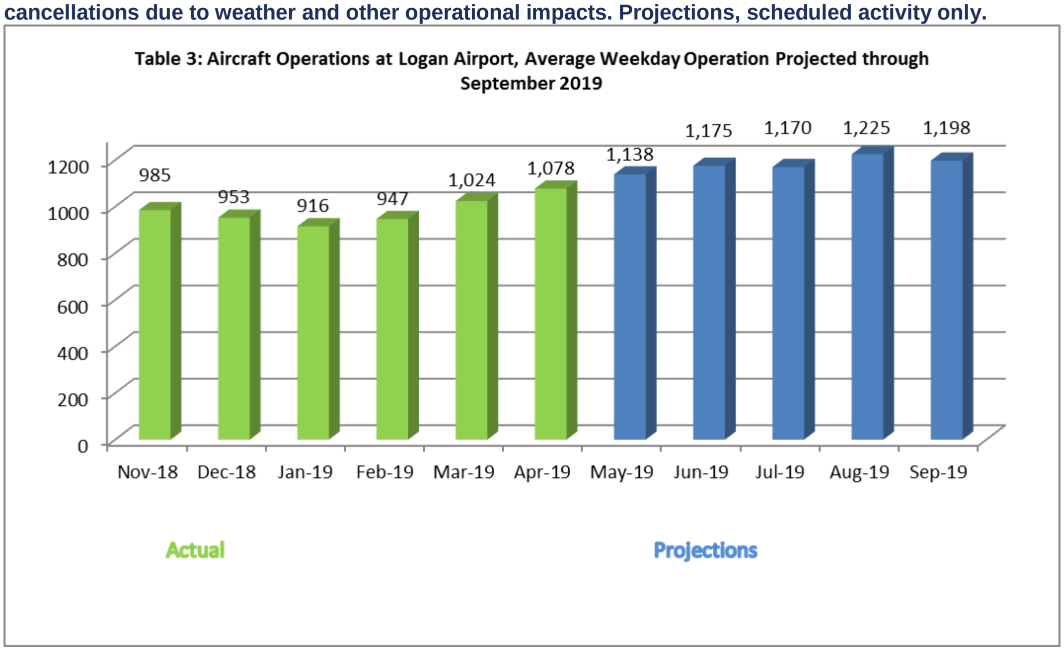

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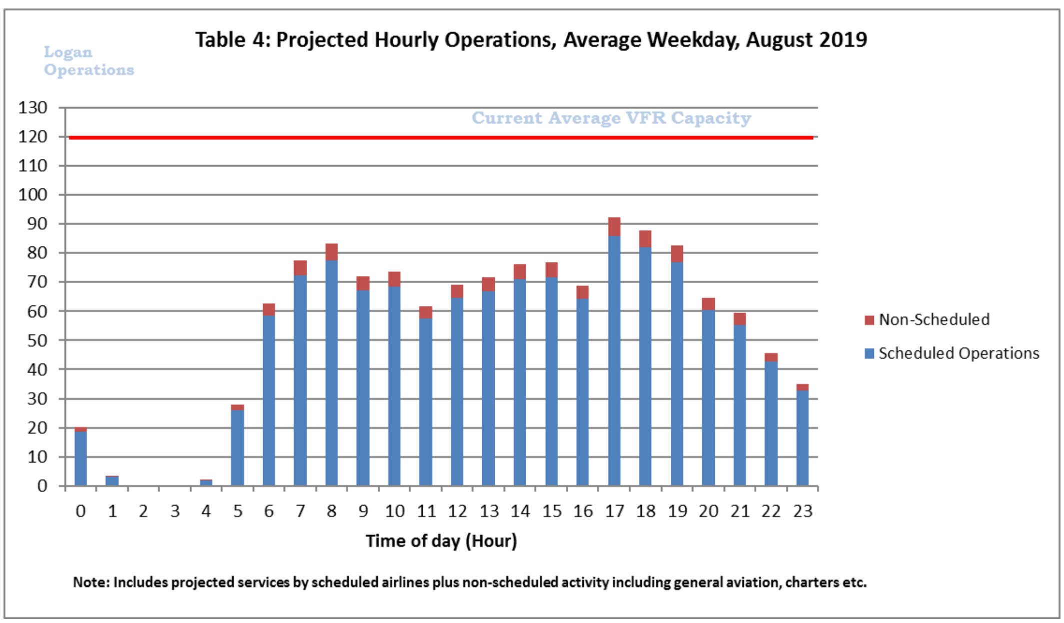

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Forecast Daily Operations								
Hour Range	Feb-19	Mar-19	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19
0	14	15	17	16	15	15	19	11
1	6	7	7	5	5	5	3	4
2	2	2	2	0	0	0	0	0
3	2	2	1	0	0	0	0	0
4	4	4	4	4	3	2	2	2
5	19	23	27	25	26	27	26	20
6	44	49	51	50	55	55	59	55
7	56	59	61	71	69	68	72	71
8	50	54	61	68	74	73	78	81
9	53	57	61	68	66	65	67	61
10	50	56	62	64	65	63	69	69
11	49	53	57	50	52	55	58	57
12	47	44	48	59	62	62	65	64
13	49	53	55	58	62	62	67	68
14	54	56	55	74	69	71	71	70
15	54	57	57	66	73	70	72	70
16	58	60	62	52	58	62	64	69
17	57	63	61	87	83	82	86	83
18	59	68	69	81	80	78	82	81
19	57	59	61	65	70	75	77	71
20	48	60	60	49	57	57	60	61
21	46	51	57	55	54	51	55	54
22	45	41	47	42	44	41	43	41
23	26	31	35	30	32	31	33	34
Total	**947**	**1,024**	**1,078**	**1,138**	**1,175**	**1,170**	**1,225**	**1,198**
	February - Apr are actual data							
	May - September is forecast data							

Massachusetts Port Authority
One Harborside Drive
East Boston, MA 02128-2909
Telephone (617) 568-5000
www.massport.com

June 5, 2019

Boston Airline Committee (BAC)
c/o Kevin Costello
Director Infrastructure, Properties & Development
jetBlue Airways Corporation
27-01 Queens Plaza North
Long Island City, New York 11101

Re: Boston-Logan International Airport Peak Period Surcharge Regulation Monitoring Report

Dear Mr. Costello:

The Massachusetts Port Authority (Massport) has completed the Peak Period Pricing Monitoring Report for 2019, in compliance with Massport's Peak Period Surcharge Regulation (740 CMR 27.03) ("Regulation"). The Regulation requires that Massport monitor published scheduled and expected non-scheduled aircraft activity at Logan and report to airfield-users the implication of the total projected aircraft activity on Logan's good weather delays. I have attached a copy of the Monitoring Report.

The Monitoring Report includes historical and projected activity data for the 2019 spring and summer season. The report concludes that current and projected near-term flight levels at Boston-Logan are well below Logan's good weather (VFR) throughput of approximately 120 flights per hour. As a result, average VFR (good weather) delays based on the expected demand are projected to be minimal through the analysis period and well below the 15 minutes threshold of the Peak Period Surcharge Regulation.

Please forward a copy of this Monitoring Report to the BAC membership. If you have any questions please feel free to contact Flavio Leo at 617-568-3528 or Greg Zanni at 617-561-3372.

Sincerely,

Edward C. Freni
Director of Aviation

cc: Todd Smith, Daniel Gallagher, Greg Zanni, Flavio Leo

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Reduced/Single Engine Taxiing at Logan Airport Memoranda

This Appendix provides detailed information in support of Chapter 7, *Air Quality/ Emissions Reduction:*

- Memorandum from Edward C. Freni, Massport Director of Aviation, to the Boston Logan Airline Committee, Regarding Single/Reduced-Engine Taxiing and Other Strategies to Reduce Aircraft-Generated Emissions and Noise at Boston Logan. Dated May 30, 2017.
- Memorandum from Edward C. Freni, Massport Director of Aviation, to the Boston Logan Airline Committee, Regarding Single/Reduced-Engine Taxiing and Other Strategies to Reduce Aircraft-Generated Emissions and Noise at Boston Logan. Dated May 22, 2018.
- Memorandum from Edward C. Freni, Massport Director of Aviation, to the Boston Logan Airline Committee, Regarding Update on Single/Reduced-Engine Taxiing and Other Strategies to Reduce Aircraft-Generated Emissions and Noise at Boston Logan. Dated June 12, 2019.

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Massachusetts Port Authority
One Harborside Drive
East Boston, MA 02128-2909
Telephone (617) 568-5000
www.massport.com

TO: Boston Logan Air Carriers, Chief Pilots

FROM: Edward C. Freni
Director of Aviation

DATE: May 30, 2017

RE: Single/Reduced-Engine Taxiing and Other Strategies to Reduce Aircraft-Generated Emissions and Noise at Boston Logan

As an important user of Boston-Logan International Airport ("Boston Logan"), you are an essential partner in our efforts to ensure that Boston Logan operates in the safest, most dependable and environmentally responsible manner feasible. Our success in implementing physical and technological improvements and piloting cutting-edge safety enhancements at Boston Logan is based, in part, on continuing to evaluate and promote operational measures with the potential to reduce environmental impacts from various landside and airside operations.

Important measures that have been identified are:

1.) Single/reduced-engine taxiing,
2.) Use of idle-reverse thrust, and
3.) Retrofitting older A320 aircraft with "vortex generators" to reduce aircraft noise.

Based on outreach to the Logan air carrier community, it is clear that single- or reduced-engine taxiing is being voluntarily implemented by the vast majority of air carriers at Boston Logan. I write to you again to encourage your continued use of this fuel-saving emissions reduction strategy, subject to pilot discretion and to the extent consistent with your established operating safety procedures.

I also encourage your use of idle reverse thrust (or minimize the use of reverse thrust) on landing, as a second operational measure, again, only at the discretion of the pilot and only to the extent consistent with your established operational safety procedures. This measure provides noise relief to our nearest neighbors and, at the same time, provides companion benefits to you, such as reducing fuel burn and engine wear. Clearly, the use of this procedure must be consistent with operational conditions at Boston Logan, including runway surface conditions and whether LAHSO is in use.

Finally, I again want to share with you information regarding recent industry efforts to retrofit A320 aircraft with "vortex generators" to reduce airframe noise. Although the A320 is a fully noise-compliant/modern aircraft, this is an excellent example of additional, incremental actions we can take as an industry to reduce operational impacts on the environment. Attached please find more information related to this technology.

I encourage you to share this letter with your flight crews and thank you for your continued work to enhance Boston Logan's operational safety and efficiency, while improving its environmental footprint. If you have any questions or would like to discuss any aspect of this letter, please feel free to contact me or Mr. Flavio Leo, Director of Planning and Strategy, at 617-568-3528.

Edward C. Freni
Director of Aviation

Attachment

An even quieter approach: Airbus introduces air flow deflectors on the A320 Family

10 JULY 2014 NEWS IN BRIEF

Building on the A320 Family's established reputation for quiet operations, Airbus is reducing noise levels even further for its popular single-aisle product line with the introduction of small underwing air flow deflectors. Positioned just ahead of underwing cavities for the fuel over-pressure protection system, these devices prevent the cavities from generating a "whistling" sound which can sometimes be heard on the ground when the engines are at idle during final approach. Air flow deflectors were implemented in production A320 jetliners this spring and are also available as a retrofit modification.

Tags : INNOVATION A320 FAMILY NOISE

Massachusetts Port Authority
One Harborside Drive
East Boston, MA 02128-2909
Telephone (617) 568-5000
www.massport.com

To: Boston Airline Committee

From: Edward C. Freni
Director of Aviation

Date: May 22, 2018

RE: Single/Reduced-Engine Taxiing and Other Strategies to Reduce Aircraft-Generated Emissions and Noise at Boston Logan

As an important user of Boston-Logan International Airport ("Boston Logan"), you are an essential partner in our efforts to ensure that Boston Logan operates in the safest, most dependable and environmentally responsible manner. Although the aviation industry has been highly successful in reducing noise and emissions, there are additional opportunities to further reduce aircraft noise and emissions including: 1. Single/reduced-engine taxiing, 2. Use of idle-reverse thrust, and 3. Retrofitting older A320 aircraft with "vortex generators" to reduce aircraft noise.

We understand that single or reduced-engine taxiing is being voluntarily implemented by the vast majority of air carriers at Boston Logan. I write to you to encourage your continued use of this fuel-saving emissions reduction strategy, subject to pilot discretion and to the extent consistent with your established operating safety procedures.

I also encourage your use of idle reverse thrust (or to minimize the use of reverse thrust) on landing, as a second operational measure, again, only at the discretion of the pilot and consistent with your established operational safety procedures. This measure provides noise relief to our nearest neighbors and, at the same time, provides companion benefits to you, such as reducing fuel burn and engine wear. Clearly, the use of this procedure must be consistent with operational conditions at Boston Logan, including runway surface conditions and whether LAHSO is in use.

Finally, I urge you to continue recent industry efforts to retrofit A320 family aircraft with "vortex generators" to reduce airframe noise unique to this aicraft. Although the A320 is a fully noise-compliant/modern aircraft, this is an excellent example of additional, incremental actions we can take as an industry to reduce impacts on the environment. Attached please find more information related to this technology.

Thank you for your continued work to enhance Boston Logan's operational safety and efficiency, while improving its environmental footprint. If you have any questions or would like to discuss any aspect of this letter, please feel free to contact me or Mr. Flavio Leo, Director of Planning and Strategy, at 617-568-3528.

Edward C. Freni
Director of Aviation

Attachment

An even quieter approach: Airbus introduces air flow deflectors on the A320 Family

Building on the A320 Family's established reputation for quiet operations, Airbus is reducing noise levels even further for its popular single-aisle product line with the introduction of small underwing air flow deflectors. Positioned just ahead of underwing cavities for the fuel over-pressure protection system, these devices prevent the cavities from generating a "whistling" sound which can sometimes be heard on the ground when the engines are at idle during final approach. Air flow deflectors were implemented in production A320 jetliners this spring and are also available as a retrofit modification.

massport
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To: Boston Airline Committee

From: Edward C. Freni
Director of Aviation

Date: June 12, 2019

RE: Update on Single/Reduced-Engine Taxiing and Other Strategies to Reduce Aircraft-Generated Emissions and Noise at Boston Logan

As an important user of Boston-Logan International Airport ("Boston Logan"), you are an essential partner in our efforts to ensure that Boston Logan operates in the safest, most dependable and environmentally responsible manner. Although the aviation industry has been highly successful in reducing noise and emissions, there are additional opportunities to further reduce our environmental footprint.

One action air carriers are taking to reduce noise is the retrofitting of the A320 family of aircraft to reduce airframe noise. I want to congratulate jetBlue in their announcement to retrofit their A320s aircraft with "vortex generators" to reduce airframe noise unique to this airplane type (see attachment). This initiative will provide meaningful reductions in noise that generates community complaints. If your airline is also working towards this retrofit please let us know. I strongly urge you to consider this important improvement to the noise emissions of this family of aircraft.

I understand that single or reduced-engine taxiing is being voluntarily implemented by the vast majority of air carriers at Boston Logan. I write to you to encourage your continued use of this fuel-saving emissions reduction strategy, subject to pilot discretion and to the extent consistent with your established operating safety procedures.

Finally, I encourage your use of idle reverse thrust (or to minimize the use of reverse thrust) on landing, as a second operational measure, again, only at the discretion of the pilot and consistent with your established operational safety procedures. This measure provides noise relief to our nearest neighbors and, at the same time, provides companion benefits to you, such as reducing fuel burn and engine wear. The use of this procedure must be consistent with operational conditions at Boston Logan, including runway surface conditions and whether LAHSO is in use.

Thank you for your continued work to enhance Boston Logan's operational safety and efficiency, while improving its environmental footprint. If you have any questions or would like to discuss any aspect of this letter, please feel free to contact me or Mr. Flavio Leo, Director of Planning and Strategy, at 617-568-3528.

Attachment

JetBlue has committed to add vortex generators to its 138 remaining Airbus A320 family aircraft through 2021

East Boston
Times-Free Press

Massport and community applaud JetBlue's plans to retrofit airbus fleet with noise reducing generators

Special to the Times

Last week, JetBlue announced plans to retrofit their entire Airbus fleet with noise-reducing vortex generators. JetBlue is the largest operator at Logan International Airport and this move reflects the partnership between Massport and the airline to reduce aircraft noise to benefit surrounding communities. Massport understands concerns about aircraft noise and has continuously been involved in community discussions with residents and elected officials regarding overflights.

"While the airline industry has benefited from advances in technology and efficiency leading to quieter planes and engines, the work is never done," said Joe Bertapelle, Director Strategic Airspace Programs, JetBlue. "We're pleased to incorporate this advancement across our Airbus fleet and contribute to our communities in a meaningful way as good corporate citizens."

Beginning in 2015, the airline began taking delivery of new aircraft with vortex generators already installed as standard equipped Airbus family aircraft. JetBlue is committing to add the devices to its 138 remaining Airbus A320 family aircraft through 2021. The small devices disrupt wind over ports on the wing, which can produce a "whistling" tone during approach into an airport.

Vortex generators will be installed on 130 existing JetBlue A320 aircraft and 8 JetBlue A321 aircraft during their existing scheduled heavy checks with the full fleet wide install expected to be complete in 2021. All future Airbus orders will be delivered with vortex generators already installed.

This extraordinary commitment is a testament to years of advocacy by local elected officials, and JetBlue's ongoing support for the communities where its customers and crewmembers live and work, paralleled JetBlue's own research on the effectiveness of vortex generators.

"Thank you to JetBlue for its leadership in implementing noise-reduction technologies to its entire Airbus fleet," said House Speaker Robert DeLeo. "I'm encouraged that the airline is taking this important step on this issue- one I have advocated for since I was a municipal official. I encourage the other airlines that fly in and out of Logan Airport to follow JetBlue's example."

Working with the community and elected officials, Massport has made efforts over the years in various areas to mitigate the effects of aircraft noise. Currently, Massport and the FAA are working on a groundbreaking RNAV Study led by technical experts at MIT to develop test projects to determine the possibility of noise reducing procedures at Logan. Working with the public and the statutorily created Massport Community Advisory Committee (Massport CAC), Massport has completed an initial phase called Block 1 and are in Block 2. Block 1 resulted in recommendations, which were technically less complex and did not result in shifting of noise from one community to another. Block 2 is looking at ideas that are more complex and that may shift noise.

"JetBlue's new technology to reduce airplane noise will have a positive impact on the communities impacted by flights arriving at Logan," said Senator Joseph Boncore. "This is a great move for the airline and a win for those who have advocated on this issue over the years."

"I'm pleased with JetBlue's efforts to implement noise-reduction technology across its Airbus fleet," Rep. Adrian Madaro said. "Noise pollution has long been a top quality of life concern for residents of East Boston. This investment is a step in the right direction and I implore other airlines to make noise reduction a priority as well."

The Massport CAC spearheaded that Massport prioritize this noise reduction implementation.

In December of 2015, East Boston resident John Nucci was named by Boston Mayor Marty Walsh as a representative of the City of Boston to the Massport CAC. That committee unanimously elected him as their appointment to the Massport Board of Directors.

"As a lifelong resident of East Boston, I know how important it is that Massport push the airlines to develop noise reducing benefits for the surrounding communities," said Massport CAC member and Board member John Nucci. "After hearing from the membership of the Massport CAC, as their appointment to the Massport Board, I was pleased to advocate for the retrofit of fleets to include noise-reducing vortex generators. JetBlue's actions are a positive outcome for all."

"At Massport, we are continuously engaged with the surrounding communities of Logan Airport and appreciate their feedback regarding airplane noise," said Massport CEO Thomas P. Glynn. "We think this is a great step JetBlue is taking toward reducing airplane noise and we are thankful to the airline for making this a priority."

"After hearing from the membership of the Massport CAC, as their appointment to the Massport Board, I was pleased to advocate for the retrofit of fleets to include noise-reducing vortex generators. JetBlue's actions are a positive outcome for all."

jetBlue

JetBlue to Retrofit Airbus Fleet with Vortex Generators

Oct 10, 2018

NEW YORK--(BUSINESS WIRE)-- JetBlue (NASDAQ: JBLU), New York's Hometown Airline™, today announces plans to retrofit its entire Airbus fleet with noise-reducing vortex generators. This move reflects JetBlue's continued commitment to the communities where its customers and crewmembers live and work. Beginning in 2015, JetBlue began taking delivery of new aircraft with vortex generators already installed. JetBlue is committing to add the devices to its 138 remaining Airbus A320 family aircraft through 2021. The small devices disrupt wind over ports on the wing which can produce a "whistling" tone during approach into an airport.

"While the airline industry has benefited from advances in technology and efficiency leading to quieter planes and engines, the work is never done," said Joe Bertapelle, Director Strategic Airspace Programs, JetBlue. "We're pleased to incorporate this advancement across our Airbus fleet and contribute to our communities in a meaningful way as good corporate citizens."

Vortex generators will be installed on 130 existing JetBlue A320 aircraft and eight JetBlue A321 aircraft during their existing scheduled heavy checks with the full fleet wide install expected to be complete in 2021. All future Airbus orders will be delivered with vortex generators already installed. The cost to retrofit the full Airbus fleet is less than $1 million.

About JetBlue

JetBlue is New York's Hometown Airline®, and a leading carrier in Boston, Fort Lauderdale - Hollywood, Los Angeles (Long Beach), Orlando, and San Juan. JetBlue carries more than 40 million customers a year to 103 cities in the U.S., Caribbean, and Latin America with an average of 1,000 daily flights. For more information please visit www.jetblue.com.

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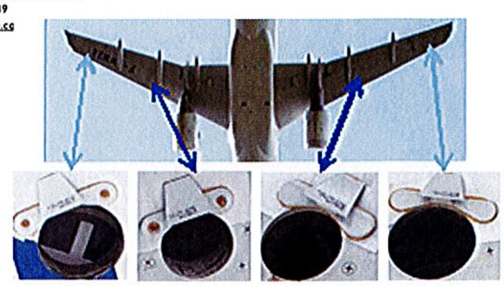

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