



Memorandum

To: Myra Patino, P.E., PMP
Miami-Dade County Department of Transportation and Public Works

From: Omar Kanaan, P.E. 
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Date: March 26, 2018

**Subject: Collins Park Garage
Entry Gate Analysis**

The purpose of this memorandum is to summarize the entry gate analysis conducted at the proposed Collins Park parking garage located in the southeast corner of the intersection of Park Avenue and 23rd Street in Miami Beach, Florida. The proposed parking garage provides one (1) entry lane, one (1) reversible entry/exit lane, and one (1) exit lane. The entry lanes provide approximately 66 feet of vehicle stacking distance including the service position or approximately three (3) vehicles per lane, for a total of six (6) vehicles. A site plan illustrating the proposed access configuration is included in Attachment A.

The proposed parking garage is expected to provide approximately 510 parking spaces. Based on major event parking, a peak parking garage turnover rate of 63.01 percent (63.01%) was used in the analysis. The major event parking demand was estimated for peak hour demand based on the Miami International Boat show & Strictly Sail event (Thursday, February 17, 2012 to Monday, February 20, 2012) and South Beach Wine & Food Festival (Friday February 24, 2014 to Sunday February 26, 2012). The major event parking demand was prepared for the highest entry demand based on peak hour demand from three (3) City of Miami Beach Parking Garages, including:

- G5: 17th Street and Pennsylvania Avenue Garage
- G7: City Hall Garage – 18th Street and Meridian
- G9: Pennsylvania Avenue – 17th Street

The peak parking garage turnover of 63.01 percent (63.01%) was observed at the G5 parking garage which has a capacity or 1,460 vehicles and a peak hour arrival rate of 920 vehicles per hour (920 vehicles enter/1,460 vehicle capacity). Therefore a 63.01% turnover rate was applied to the proposed garage resulting in an arrival rate of 321 vehicles per hour. Detailed parking demand data is included in Attachment B.

Vehicles entering the proposed parking garage will gain access via push-button ticket spitter. It was assumed that the average service rate is approximately 400 vehicles per hour per lane (or 9 seconds per vehicle) for each of the two (2) entry lanes based on information contained in *Parking Structures – Planning, Design, Construction, Maintenance, and Repair*, 2000 and 2011. However, to provide a conservative analysis, an additional service time of three (3) seconds per vehicle was added for a

service time of 12 seconds per vehicle per lane (or 0.2 minutes per vehicle per lane). Please note that these processing times are consistent with the processing times provided in the Institute of Transportation Engineer’s (ITE) *Traffic Engineering Handbook*.

The entry gate analysis used the multiple-channel waiting line model with Poisson arrivals and exponential service times. The analysis is based on the coefficient of utilization, ρ , which is the ratio of the average vehicle arrival rate over the average service rate multiplied by the number of channels.

If the coefficient of utilization (average service rate/valet attendant service capacity) is greater than one (>1), the calculation methodology does not yield a finite queue length. This result indicates overcapacity conditions for the entry gate area. The entry gate service capacity is the number of vehicles the entry gate can service in a one-hour period multiplied by the number of entry gates. Table 1 summarizes the expected 95th percentile vehicle queues. Detailed entry gate calculations are included in Attachment C.

Table 1: Entry Gate Queuing Analysis					
Access Point	Parking Control	Processing Time (secs/veh/lane)	Entering Volumes (vph)	95 th Percentile Queue (including service position)	Available Queue Storage (including service position)
Park Avenue	Push-Button Ticket-Spitter	12 ⁽¹⁾	321	4 vehicles	6 vehicles

Note: ⁽¹⁾ Based on processing time information provided in Parking Structures – Planning, Design, Construction, Maintenance, and Repair, 2000 and 2011 and ITE’s Traffic Engineering Handbook.

The 95th percentile queue length for the entry lanes is approximately one (1) vehicle behind each service position during the major event peak hour. Therefore, all anticipated queues are expected to be accommodated within the parking garage.

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Attachment A
Proposed Access Configuration

Attachment B
Major Event Parking Data

G5 - 17th Street & Pennsylvania Ave - Parking Garage February 2012 Data (Special Events)

Date	Day	Enter	Exit	Total	Peak Hour	Spaces	Entry Turnover	Exit Turnover
2/15/2012	Wednesday	248	229	477	14:00	1460	16.99%	15.68%
2/16/2012	Thursday	93	461	554	18:00	1460	6.37%	31.58%
2/17/2012	Friday	920	39	959	11:00	1460	63.01%	2.67%
2/18/2012	Saturday	224	343	567	19:00	1460	15.34%	23.49%
2/19/2012	Sunday	307	336	643	18:00	1460	21.03%	23.01%
2/20/2012	Monday	246	383	629	17:00	1460	16.85%	26.23%
2/21/2012	Tuesday	267	203	470	17:00	1460	18.29%	13.90%
2/22/2012	Wednesday	147	281	428	17:00	1460	10.07%	19.25%
2/23/2012	Thursday	235	258	493	18:00	1460	16.10%	17.67%
2/24/2012	Friday	254	335	589	17:00	1460	17.40%	22.95%
2/25/2012	Saturday	349	306	655	18:00	1460	23.90%	20.96%
2/26/2012	Sunday	415	352	767	16:00	1460	28.42%	24.11%
2/27/2012	Monday	116	242	358	18:00	1460	7.95%	16.58%

AVERAGE BOAT SHOW EVENT (2/16 - 2/20)	358	312	670	18:00		24.52%	21.40%
AVERAGE FOOD & WINE FEST. EVENT (2/24 - 2/26)	339	331	670	#N/A		23.24%	22.67%
BOAT SHOW PEAK DAY 2/17	920	39	959	11:00		63.01%	2.67%
FOOD & WINE FEST. PEAK DAY 2/26	415	352	767	16:00		28.42%	24.11%

G7 - 18th Street & Meridian - City Hall Garage - Parking Garage February 2012 Data (Special Events)

Date	Day	Enter	Exit	Total	Peak Hour	Spaces	Entry Turnover	Exit Turnover
2/15/2012	Wednesday	7	172	179	17:00	650	1.08%	26.46%
2/16/2012	Thursday	169	14	183	8:00	650	26.00%	2.15%
2/17/2012	Friday	7	166	173	17:00	650	1.08%	25.54%
2/18/2012	Saturday	68	93	161	16:00	650	10.46%	14.31%
2/19/2012	Sunday	115	80	195	14:00	650	17.69%	12.31%
2/20/2012	Monday	72	47	119	14:00	650	11.08%	7.23%
2/21/2012	Tuesday	160	27	187	8:00	650	24.62%	4.15%
2/22/2012	Wednesday	15	155	170	17:00	650	2.31%	23.85%
2/23/2012	Thursday	152	10	162	8:00	650	23.38%	1.54%
2/24/2012	Friday	157	15	172	8:00	650	24.15%	2.31%
2/25/2012	Saturday	24	32	56	19:00	650	3.69%	4.92%
2/26/2012	Sunday	14	15	29	15:00	650	2.15%	2.31%
2/27/2012	Monday	157	18	175	8:00	650	24.15%	2.77%

AVERAGE BOAT SHOW EVENT (2/16 - 2/20)	86	80	166	14:00	13.26%	12.31%
AVERAGE FOOD & WINE FEST. EVENT (2/24 - 2/26)	65	21	86	#N/A	10.00%	3.18%
BOAT SHOW PEAK DAY 2/16	169	14	183	8:00	26.00%	2.15%
FOOD & WINE FEST. PEAK DAY 2/24	157	15	172	8:00	24.15%	2.31%

G9 - Pennsylvania Ave (17th Street)- Parking Garage February 2012 Data (Special Events)

Date	Day	Enter	Exit	Total	Peak Hour	Spaces	Entry Turnover	Exit Turnover
2/15/2012	Wednesday	10	47	57	18:00	550	1.82%	8.55%
2/16/2012	Thursday	200	9	209	10:00	550	36.36%	1.64%
2/17/2012	Friday	249	1	250	9:00	550	45.27%	0.18%
2/18/2012	Saturday	239	9	248	10:00	550	43.45%	1.64%
2/19/2012	Sunday	248	1	249	10:00	550	45.09%	0.18%
2/20/2012	Monday	156	9	165	11:00	550	28.36%	1.64%
2/21/2012	Tuesday	28	52	80	17:00	550	5.09%	9.45%
2/22/2012	Wednesday	67	3	70	9:00	550	12.18%	0.55%
2/23/2012	Thursday	62	7	69	9:00	550	11.27%	1.27%
2/24/2012	Friday	43	29	72	15:00	550	7.82%	5.27%
2/25/2012	Saturday	116	11	127	20:00	550	21.09%	2.00%
2/26/2012	Sunday	98	17	115	15:00	550	17.82%	3.09%
2/27/2012	Monday	7	50	57	18:00	550	1.27%	9.09%

AVERAGE BOAT SHOW EVENT (2/16 - 2/20)	218	6	224	10:00	39.71%	1.05%
AVERAGE FOOD & WINE FEST. EVENT (2/24 - 2/26)	86	19	105	15:00	15.58%	3.45%
BOAT SHOW PEAK DAY 2/17	249	1	250	9:00	45.27%	0.18%
FOOD & WINE FEST. PEAK DAY 2/25	116	11	127	20:00	21.09%	2.00%

Attachment C
Entry Gate Analysis

Collins Park Garage Entry Gate Analysis

Arrival Rate

IN	OUT
321	

veh/hr

Service Rate

IN	OUT
0.20	

mins/veh

Control Delay = min
 Service Time = 0.20 mins/veh

Number of Entry Gates (N) = 2

Level of Confidence = 0.95

Queue Storage Provided On-Site = 50 vehicles

Total Entering Vehicles(q) = 321 veh/hr

Service Capacity per N (60 mins/Service Rate) (Q) = 300.00 veh/hr/pos

Average Service Rate (t) = 0.20 mins/veh

rho (t/Q) = 0.535

Expected (avg.) number of vehicles in the system	E(m)=	0.43	
Expected (avg.) number of vehicles waiting in queue	E(n)=	1.50	
Mean time in the queue	E(w)=	0.08	mins
Mean time in system	E(t)=	0.28	mins

Proportion of customers who wait (P) (E(w) > 0) = 37.29%

Probability of a queue exceeding a length (M) P(x > M) = 5.00%

Queue length which is exceeded 5.00% of the times is equal to 2.0 vehicles