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TRAFFIC MANAGEMENT PLAN

MAR-A-LAGO
PALM BEACH, FLORIDA

Prepared for:

Mar-a-Lago Beach Club
1100 S. Ocean Boulevard
Palm Beach, Florida 33480

Job No. 23-050

Date: April 27, 2023

Bryan Kelley
Digitally signed by Bryan Kelley
Date: 2023.04.27 14:39:52 -04'00'

Bryan G. Kelley, P.E.
FL Reg. No. 74006

Bryan G. Kelley, P.E., State of Florida, Professional Engineer, License No. 74006

This item has been digitally signed and sealed by Bryan G. Kelley, P.E. on 04/27/2023 .

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The Traffic Management Plan (TMP) documented herein is provided to serve as an update to the 1999 Traffic Management Plan. The Mar-a-Lago Club (The Club) is requesting approval for a security guardhouse at the main entry gate on S. Ocean Boulevard. The guardhouse is proposed to be located 31 feet west of the existing gate and approximately 60 feet from S. County Road. At the request of the Town Council, the Traffic Management Plan has been updated to document the existing and proposed traffic operations of The Club. For consistency purposes, the format and methodology of the updated TMP is similar to the previous 1999 TMP. The 1999 TMP included a list of objectives to evaluate that were agreed upon between the Town Staff and traffic consultants. The list included the following:

1. Address external impacts on the adjacent roadways. All efforts should be made not to interfere with traffic already on Southern Boulevard and South Ocean Boulevard.
2. Provide appropriate access for emergency vehicles.
3. Provide a routing plan for limousines.
4. Discuss access plan for Southern Boulevard gate.
5. Demonstrate how The Club's planning for events can alleviate traffic congestion (i.e., "spreading out the peak").
6. Explain valet parking operations and any problems related to its efficient operation.
7. Describe operations, including valet parking, during special events.
8. Discuss other traffic considerations, including drop-offs.

The 1999 TMP never contemplated a Donald Trump becoming President of the United States. The 2016 election of Mr. Trump to President created additional security measures including the increased presence of United States Secret Service during presidency and a modified presence as a former president. The above items will be readdressed as part of this updated TMP. A total of three scenarios (3) will be presented that will show various levels of Club operations and uses. The first scenario includes mostly daily Club operations and smaller events with less than 200 guests. The second scenario will describe the traffic operations for events with between 200 and 399 guests. The final scenario will include larger events with 400 to 740 guests. The existing traffic management and operations are designed to minimize traffic congestion on the surrounding roadway network. It should be noted the frequency of events decreases as the number of guests increase.

Scenario #1 – Events up to 199 Guests

This scenario represents the majority of Mar-a-Lago activity. During daily operations, Club members can use the Southern Boulevard gate or main gate on S. Ocean Boulevard. Members tend to use the gate closest to their destination. Members going to the beach club or tennis area generally use the Southern Boulevard entrance and members going to the spa or main house generally use the S. Ocean Boulevard entrance. Club members have the option to self-park or use the valet service. When leaving the site, Club members are strongly encouraged to use the exit only gate on S. Ocean Boulevard.

Events up to 199 people can represent dinner parties, birthday parties, weddings, and other celebrations. Daily regular activity at The Club includes dining, spa, and tennis activities and can be easily accommodated when events of less than 200 guests are on going.

All guests are emailed guidance instructions for arriving at site, security requirements, and Club policies. The guidance includes the arrival locations and informs guests to have ID's and QR codes ready upon arrival in order to expedite the check in process.

Guest traffic enters at the main driveway from S. Ocean Boulevard. The Southern Boulevard access is restricted to members, vendors, and staff. Staff arrive earlier than guest traffic. Guest traffic is restricted to left turn only on S. Ocean Boulevard at the main entrance. For smaller events and when traffic is minimal, right turns into the main entrance may be permittable. When right turns are restricted, all guests arriving from the north are directed to travel around the corner and then make a U-turn at the roundabout on Southern Boulevard on the south side of The Club. The purpose of this restriction is to eliminate or minimize vehicular spillover and queuing on S. Ocean Boulevard. South Ocean Boulevard along the site frontage is a two-lane undivided roadway with an exclusive northbound left turn lane. Any vehicle stacking on southbound S. Ocean Boulevard would block through traffic not traveling to Mar-a-Lago. The northbound left turn lane is approximately 200 feet in length and can accommodate approximately 8 vehicles. Additionally, the chevron striping prior to the turn lane can accommodate approximately another 6 vehicles for a total of 14 vehicles. United States Secret Service is staged immediately inside the gate. Once motorists are cleared through security, they continue to the front of The Club to turn their vehicle over to valet. Valet then parks their vehicle starting at the parking lots to the east and moving west. Once the parking lots are filled, the grass lot is used for valet parking.

The Mar-a-Lago security team has implemented measures to improve vehicle operational efficiency and reduce traffic impact to S. Ocean Boulevard. First, off-duty police officers are hired to assist with traffic flow for all events 150 guests or larger. The police officers assist with traffic flow before events. At times, the security team and with police assistance position themselves on S. Ocean Boulevard to verify proper clearance onto the site. They will then inform the inside security/United States Secret Service team which vehicles have been cleared for quicker entry. Mar-a-Lago has recently implemented a QR code system check in for guests. The QR code has allowed for a much quicker processing time in identifying reservations and getting vehicles off of S. Ocean Boulevard.

Once through security, motorists will continue to the front of The Club to the designated valet drop off area. Approximately 10 vehicles can stack (20 if double stacked) between the valet drop off area and S. Ocean Boulevard. The vehicles are then parked by valet staff in available parking spaces on the north side of The Club. The vehicles are generally parked east to west and begin at the parking lot closest to S. Ocean Boulevard. The grass field parking is the last parking area to be utilized.

At the conclusion of the event, guests pick up their vehicles at the same valet location as drop off if event is held in the main house area. Motorists utilize the exit only gate to S. Ocean Boulevard to exit the property. If the event is located in the Grand Ballroom, guests will generally pick up their vehicle behind the Grand Ballroom and exit onto Southern Boulevard.

Emergency vehicles can access any of the three driveways as needed. A paramedic is always onsite for events with 150 guests or more. Limousines, Uber, Lyft, and other ridesharing services are not permitted on the property per United States Secret Service security requirements. This procedure has not caused traffic issues. Personnel drivers (employed by a family) and shuttle buses are allowed on property.

Staffing for valet personnel varies pending event size. Valet staff is present at The Club during all days The Club is open even during non-events to allow for regular Club use valet services.

The plan described above for events of less than 200 guests is the majority of the events at the Mar-a-Lago. The number and size of events is detailed later in the report. The procedures described above unless otherwise noted carry over and are the same for larger events. A Traffic Circulation Exhibit documenting the ingress and egress circulation is provided in Appendix “A” of this report.

Scenario #2 – Events from 200 to 399 Guests

Events between 200 to 399 guests can include charitable functions, luncheons, cocktail parties, weddings, or other forms of celebrations. The Club schedules events of this size to take place when minimal other activity is happening on the property. The Club does not schedule two or more events of this size or larger at the same time. One or two police officers are always used for events of this size. The Club notifies the police department well in advance of any event and informs them of the number of attendees expected and the duration of the event. The Club pays for the off-duty police officers. The arrival and departure procedure are nearly identical to Scenario #1.

The previous TMP stated staffing for valet personnel typically started at 7 people for an event of 200 guests and increased by two additional valet staff for every 100 guests. Therefore, a 400-guest event would generally have 11 valet staff members. Currently, The Club utilizes approximately 5 to 6 valet personnel for every 50 vehicles which exceeds the previous TMP assumptions. For purposes of this updated TMP, the traffic and queuing analysis will assume the previous valet staffing assumptions to be conservative.

Scenario # 3 – Events from 400 to 740 Guests

Events between 400 to 740 guests represent a small percentage of the overall events held at the Mar-a-Lago Club. A minimum of two police officers are used for all events with 400 or more anticipated guests. The police officers also generally assist with vehicle departure in addition to arrival for large events. The traffic management procedures are similar to the first two scenarios with a couple of additional options as further detailed below. The valet personnel will typically range from 11 staff members for a 400-guest event up to 18 staff members for a 740-guest event.

Optional Traffic Management Measures

For large events, The Club will generally utilize the Bath and Tennis Club's west parking lot across from The Club on the south side of Southern Boulevard to pre-screen guests. Guests are notified prior to the event they must arrive at the Bath and Tennis Club. The Club security team is staged at both the entrance to Mar-a-Lago and within the Bath and Tennis Club parking lot. All vehicles arrive at the Bath and Tennis Club's west parking lot via the driveway on S. Ocean Boulevard. Once guests have arrived at the parking lot, a pre-screen queuing line is formed that can accommodate approximately 17 vehicles single stacked and additional lanes can be created to allow for additional vehicles. The security team gives vehicles an entrance pass once they have been pre-screened. Once several vehicles have been pre-screened, the police officer will stop eastbound and westbound Southern Boulevard traffic and allow vehicles to the enter Mar-a-Lago using the south gate. This procedure dramatically reduces vehicle congestion on S. Ocean Boulevard and Southern Boulevard since all queuing is occurring within the Bath and Tennis Club. The Bath and Tennis Club is used for large events and when available. However, the Bath and Tennis Club is not always available due to other planned events.

Once inside the Southern Boulevard gate, guests proceed to the valet drop off area which is approximately 250 feet inside the gate near the Grand Ballroom driveway. The valet stacking can accommodate approximately 10 vehicles single stacked or 20 vehicles double stacked. For red carpet events, the valet drop off is approximately 450 feet north (18 vehicles single stacked capacity) of the Southern Boulevard gate just south of the parking lot on the north side of the property. Numerous valet attendants are ready as soon as vehicles arrive so queueing is typically not an issue. Further, security can hold vehicles at the Bath and Tennis Club if needed to allow the vehicles at the valet to clear.

For these events, guests will pick up their vehicles behind the ballroom and exit onto Southern Boulevard when the event is over. A police officer is always present for these events at the entrance for arrival and for departure of large events. Guests are notified prior to the event if the Southern Boulevard gate is to be used.

To help reduce traffic congestion for larger events (approaching 740 guests), at times The Club will stagger arrival times for guests. Guests will be notified the arrival times on the guest guidance sheet that is sent out prior to all events. A Traffic Circulation Exhibit documenting the ingress and egress circulation for large events and using the Bath and Tennis Club parking lot is provided in Appendix “A” of this report.

Event Summary (October 31, 2022 – April 20, 2023)

The number and types of events documented below were provided by Mar-a-Lago Catering & Events and Dining Services for the time period from October 31, 2022 through April 20, 2023. There is a small discrepancy in the event threshold used in the reporting below was for 500 guests instead of 400 guests. However, the data provides insight to the frequency and size of events.

- Number of days in 2022-2023 season as noted above: 171 days
- Number of banquet events: 95 (56% of seasonal days)
- Number of banquet events with less than 200 total guests: 59 (62% of total events/ 35% of seasonal days)
- Number of banquet events with 200-499 guests: 22 (23% of events/ 13% of seasonal days)
- Number of banquet events with 500 or more guests: 14 (15% of events/ 8% of seasonal days)
- Average number of guests per event: 172

Queuing Calculations

The queuing calculations were prepared based on the methodology outlined within the ITE Transportation and Land Development, Application of Queueing Analysis. Separate queuing calculations were provided for both the security checkpoint and valet operations since both have different procedures. A valet and security queue calculations were also provided for a 200-guest event, a 400-guest event, and a 740-guest event. It should be noted the number of valet personnel used in the calculations is lower than the typical procedure in order to be conservative. The detailed queuing calculations for each of the scenarios are provided in Appendix "B" attached to this report.

The queue calculations had the following assumptions:

- All traffic would arrive within a one-hour span for a given event.
- The average vehicle occupancy rate is 2.5 guests per vehicle.
- The valet would consist of the following staff members:
    1. 200-guest event: 7 valet staff with minimum 6 valet runners (2 valet runners available at all times)
    2. 400-guest event: 11 valet staff with minimum 9 valet runners (3 valet runners available at all times)
    3. 740-guest event: 18 valet staff with minimum 16 valet runners (4 valet runners available at all times)
- It would take on average 2.5 minutes from when the vehicle arrives at the service point until the valet attendant parks the vehicle and is back at the service point for the next vehicle.
- The security team would have the following minimum staffing dedicated to confirming credentials (QR code, ID, etc.):
    1. 200-guest event: 1 security team member
    2. 400-guest event: 2 security team members
    3. 740-guest event: 3 security team members

    Note the security team members dedicated to credentials is understated for queuing calculations to be conservative. The Club typically has 2 security members for a 200 guest event, 3 security members for a 400 guest event, and 6 security members for a 740 guest event.
- It would take on average 30 seconds to scan QR code and check ID per vehicle.

  Additional assumptions related to the queuing operations and the calculations for all six scenarios are attached to this report. The calculations shown below document the 740-guest valet and security queuing calculations.

The queuing analysis was based on the following ratio:

Coefficient of utilization (ρ) = Average Demand Rate / Average Service Rate

The required queue storage (M) is determined based on the following equation:

$$M = \left[\frac{\ln P(x > M) - \ln Q_M}{\ln \rho}\right] - 1$$

A 95% confidence rate was used for this analysis. Therefore, the P(x > M) was set to 5%. Demand is approximately 296 vehicles/hour during a 740-guest event based on a vehicle occupancy of 2.5 guests per vehicle.

<u>Valet Queue – 740-Guest Event</u>

Q = Processing rate = 96 processes per hour
q = Demand rate = 296 vehicles per hour
N = 4 valet attendants (processing simultaneously)
ρ = Utilization factor = q/(NQ) = 296/(4*96) = 0.771
Q_m = Table value = 0.547
M = (ln(0.05) - ln(0.547))/ ln(0.771) - 1 = 8.19, or 8 vehicles.

The queue for the valet stand is conservatively estimated at 8 vehicles. At the valet service point at the Southern Boulevard and S. Ocean Boulevard gates, approximately 10 vehicles can be accommodated in the queuing area single stacked prior to reaching the gate. Stacking capacity can increase to 20 vehicles at each gate if double stacked but generally is not needed. FThus, the valet queueing capacity at this site is adequate. Note the number of valet attendants will fluctuate based on anticipated demand. The valet area will be monitored and additional valet attendants will be utilized if needed to ensure efficient queuing operations. Note The Club currently uses approximately 5 to 6 valet staff for every 50 vehicles which exceeds the 18 valet staff used in the calculations to be conservative.

<u>Security Queue – 740-Guest Event</u>

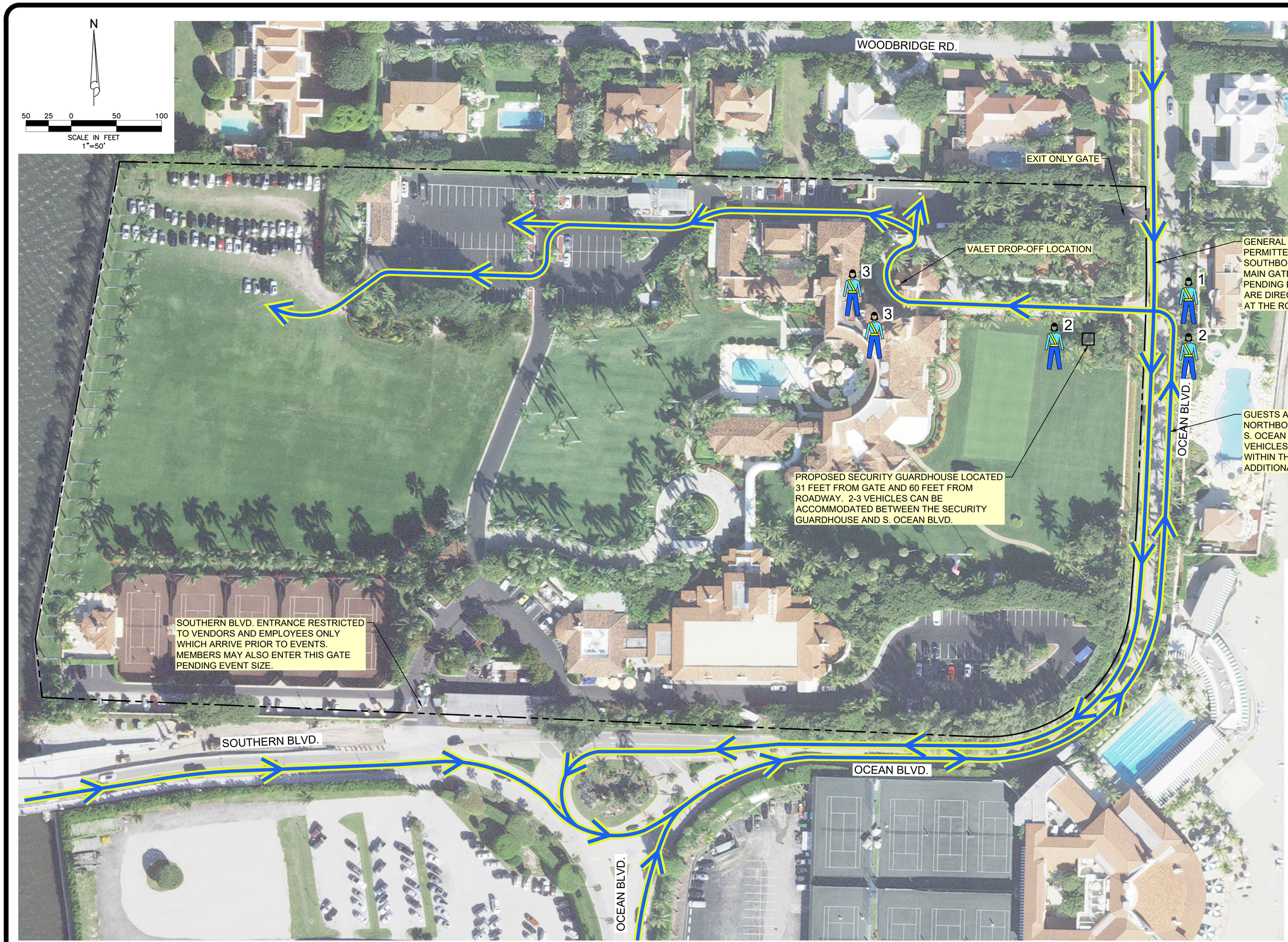
Q = Processing rate = 120 processes per hour
q = Demand rate = 296 vehicles per hour
N = 3 security attendants (processing simultaneously)
ρ = Utilization factor = q/(NQ) = 296/(3*120) = 0.822
Q_m = Table value = 0.685
M = (ln(0.05) - ln(0.685))/ ln(0.822) - 1 = 12.37, or 12 vehicles.

The queue for the security check in is conservatively estimated at 12 vehicles. At the Bath and Tennis Club's west parking lot, approximately 17 vehicles can be single stacked and more if needed. At the security service point at the S. Ocean Boulevard main gate, approximately 2 vehicles can be accommodated onsite and an additional 14 vehicles can be accommodated within the northbound left turn lane and chevron striped area on S. Ocean Boulevard. Therefore, the security queueing capacity at this site is adequate. Note the number of security staff dedicated to credential check-in will fluctuate based on anticipated demand. The area will be monitored and additional security staff will be utilized if needed to ensure efficient queuing operations.

As previously stated, the queuing calculations for the 200-guest and 400-guest events are attached to this report. The 200-guest event is anticipated to have a 95th percentile queue of 3 vehicles for the valet and 5 vehicles for the security check in. The 400-guest event is anticipated to have a 95th percentile queue of 7 vehicles for the valet and 5 vehicles for security check in. These calculations are based on the assumptions documented including the processing time of vehicles and the number of staff members present to assist with traffic management operations. The Club will continuously monitor operations and adjust staffing levels if necessary to ensure a safe and efficient process that minimizes disruptions to the surrounding roadway network.

APPENDIX “A”

TRAFFIC CIRCULATION EXHIBITS



LOCATION MAP
NOT TO SCALE

TRAFFIC MANAGEMENT STAFF:

1 **POLICE OFFICER:**
A POLICE OFFICER IS USED FOR ALL EVENTS WITH A MINIMUM OF 150 GUESTS. 2 POLICE OFFICERS ARE USED FOR EVENTS WITH A MINIMUM OF 400 GUESTS. POLICE OFFICER DIRECTS TRAFFIC ON S. OCEAN BLVD. AND THE MAIN GATE. AS NEEDED, THE POLICE OFFICER WILL STOP SOUTHBOUND TRAFFIC TO ALLOW GUEST TO ENTER THE SITE FROM THE SOUTH.

2 **SECURITY STAFF:**
SECURITY STAFF IS LOCATED INTERNAL TO THE GATE AND AT TIMES WILL BE LOCATED WITHIN THE EXISTING S. OCEAN BLVD. TURN LANE TO VERIFY RESERVATIONS. THE NUMBER OF SECURITY STAFF IS DEPENDENT ON EVENT SIZE.

3 **VALET STAFF:**
VALET VEHICLE DROP-OFF IS LOCATED APPROXIMATELY 200 FEET WEST OF THE GATE. VALET PARKS VEHICLES FROM THE EAST TO THE WEST ON THE NORTH SIDE OF THE CLUB. THE GRASS PARKING IS USED LAST. THE NUMBER OF VALET STAFF IS DEPENDENT ON EVENT SIZE.

4/27/2023

EVENT INGRESS CIRCULATION PLAN STANDARD PROCEDURE

REVISIONS

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DESIGN	DRAWN	CHECKED	APPROVED	DATE
B.K.	D.B.			

MAR-A-LAGO
SECTION 35, TOWNSHIP 43S., RANGE 43E.
TOWN OF PALM BEACH, FLORIDA
TRAFFIC CIRCULATION EXHIBIT

JOB NO.	DRAWING NO.	SHEET	OF
23-050	23050Z01	1	4

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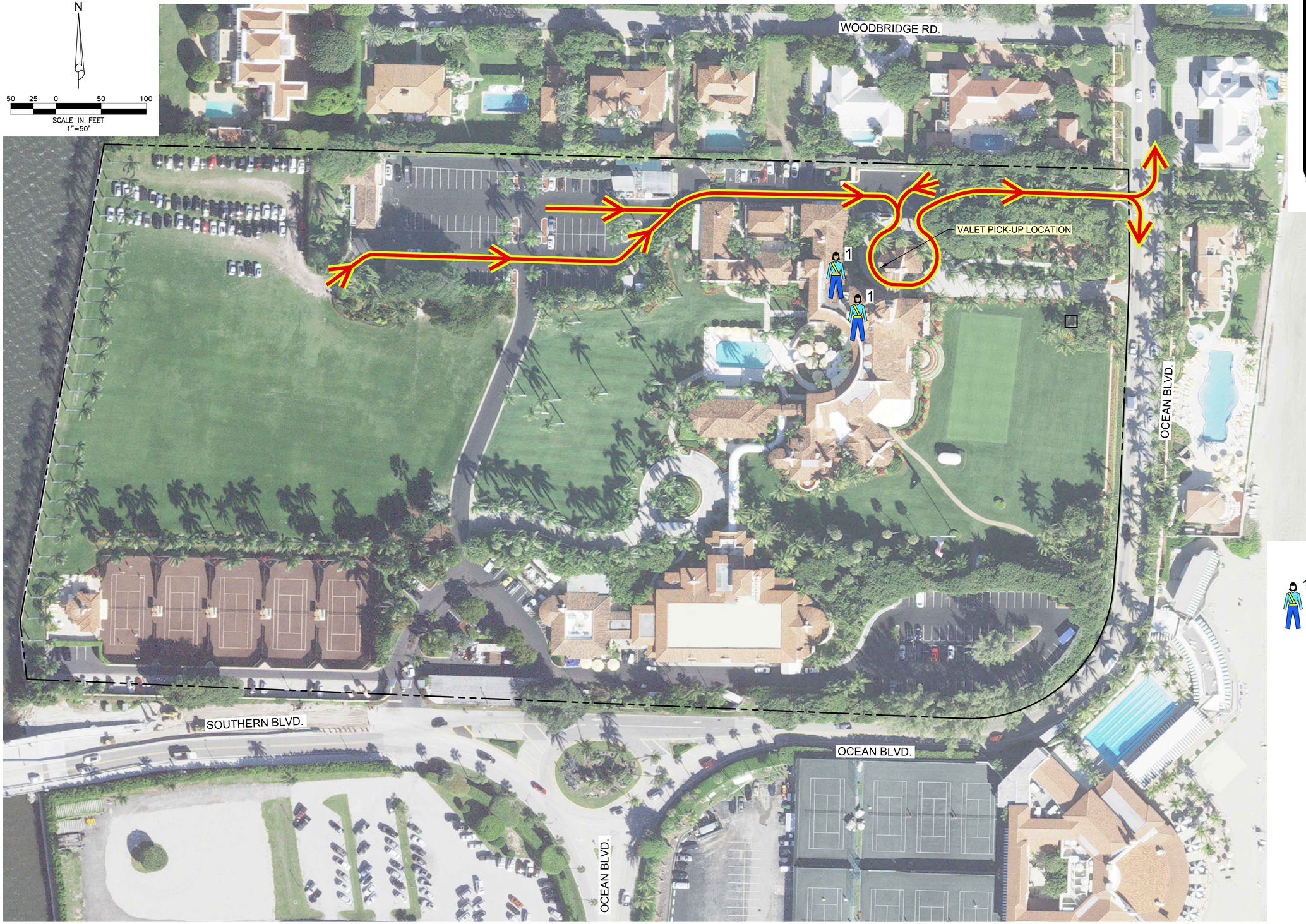

LOCATION MAP
NOT TO SCALE

TRAFFIC MANAGEMENT STAFF:

1 VALET STAFF:
VALET STAFF RETRIEVE VEHICLES AND ARRIVE BACK TO VALET PICK-UP LOCATION. ALL VEHICLES WILL EXIT ONTO SOUTHERN BLVD. THE NUMBER OF VALET STAFF MEMBERS IS DEPENDENT ON EVENT SIZE.

4/27/2023

EVENT EGRESS CIRCULATION PLAN
STANDARD PROCEDURE

REVISIONS	SIMMONS & WHITE ENGINEERING I PLANNING I CONSULTING I SINCE 1982 Authorization No. 3452 2581 Metrocentre Blvd West • Suite 3 • West Palm Beach, Florida 33407 • (561) 478-7848					MAR-A-LAGO SECTION 35, TOWNSHIP 43S., RANGE 43E. TOWN OF PALM BEACH, FLORIDA TRAFFIC CIRCULATION EXHIBIT		
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LOCATION MAP
NOT TO SCALE

N

50 25 0 50 100
SCALE IN FEET
1"=50'

TRAFFIC MANAGEMENT STAFF:

1 **POLICE OFFICER:**
A POLICE OFFICER IS USED FOR ALL EVENTS WITH A MINIMUM OF 150 GUESTS. 2 POLICE OFFICERS ARE USED FOR EVENTS WITH A MINIMUM OF 400 GUESTS. POLICE OFFICER STOPS TRAFFIC ON SOUTHERN BLVD. AS NECESSARY TO ALLOW GUESTS TO ENTER SITE.

2 **SECURITY STAFF:**
SECURITY STAFF IS LOCATED INTERNAL TO THE GATE AND AT BATH AND TENNIS CLUB. SECURITY CHECKS CREDENTIALS AND RESERVATIONS USING QR CODE AT BATH AND TENNIS CLUB BEFORE SENDING VEHICLES TO MAR-A-LAGO.

3 **VALET STAFF:**
VALET VEHICLE DROP-OFF IS LOCATED APPROXIMATELY 450 FEET NORTH OF THE SOUTHERN BLVD. VALET PARKS VEHICLES FROM THE EAST TO THE WEST ON THE NORTH SIDE OF THE CLUB. THE GRASS PARKING IS USED LAST. THE NUMBER OF VALET STAFF IS DEPENDENT ON EVENT SIZE.

4/27/2023

LARGE EVENT INGRESS CIRCULATION PLAN STANDARD PROCEDURE

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MAR-A-LAGO
SECTION 35, TOWNSHIP 43S., RANGE 43E.
TOWN OF PALM BEACH, FLORIDA
TRAFFIC CIRCULATION EXHIBIT

REVISIONS	DESIGN	DRAWN	CHECKED	APPROVED	DATE	JOB NO.	DRAWING NO.	SHEET	OF
	B.K.	D.B.				23-050	23050Z01	3	4

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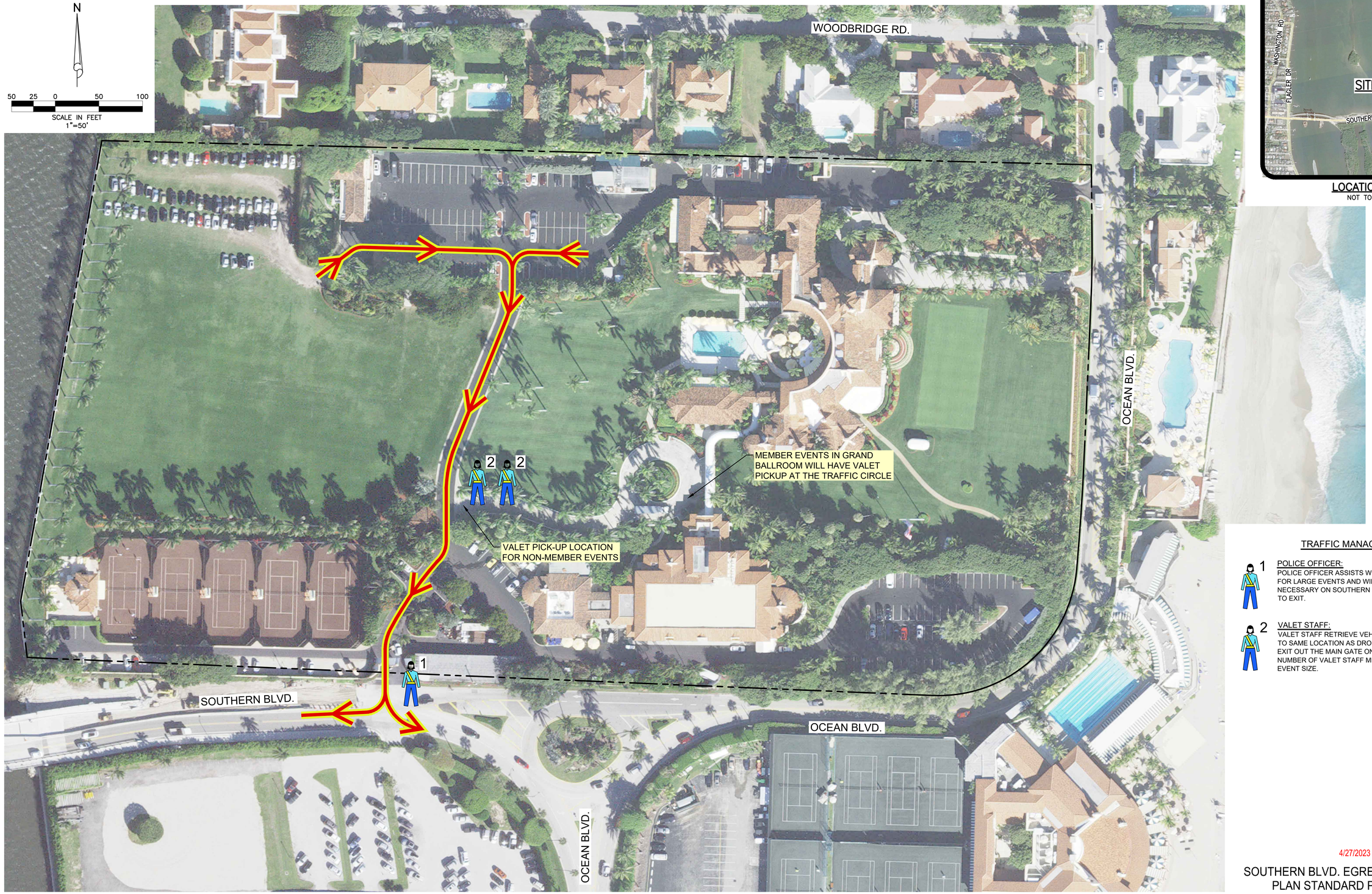

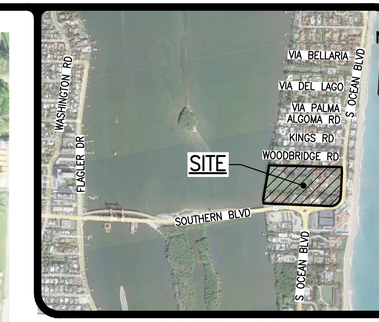

LOCATION MAP
NOT TO SCALE

TRAFFIC MANAGEMENT STAFF:

1 **POLICE OFFICER:**
POLICE OFFICER ASSISTS WITH EVENT DEPARTURE FOR LARGE EVENTS AND WILL STOP VEHICLES AS NECESSARY ON SOUTHERN BLVD. TO ALLOW GUESTS TO EXIT.

2 **VALET STAFF:**
VALET STAFF RETRIEVE VEHICLES AND ARRIVE BACK TO SAME LOCATION AS DROP-OFF. ALL VEHICLES WILL EXIT OUT THE MAIN GATE ONTO S. OCEAN BLVD. THE NUMBER OF VALET STAFF MEMBERS IS DEPENDENT ON EVENT SIZE.

4/27/2023

SOUTHERN BLVD. EGRESS CIRCULATION PLAN STANDARD PROCEDURE

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23-050	23050Z01	4	4

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APPENDIX "B"

95TH PERCENTILE QUEUING CALCULATIONS

200-GUEST EVENT

Valet Queuing Calculations - 200 Guest Event

$$M = \left[\frac{\ln P(x > M) - \ln Q_M}{\ln \rho}\right] - 1$$

Q =	72	Processing rate (processes per hour)
q =	80	Demand rate (vehicles per hour)
N =	2	Service positions (attendants)
ρ =	0.556	Utilization factor (q/(NQ))
Q_m =	0.398	Table Value
M =	2.53	

	N = 1	2	3	4	6	8	10
0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.1	0.1000	0.1820	0.0037	0.0080	0.0000	0.0000	0.0000
0.2	0.2000	0.0666	0.0247	0.0096	0.0015	0.0002	0.0000
0.3	0.3000	0.1385	0.0700	0.0370	0.0111	0.0036	0.0011
0.4	0.4000	0.2286	0.1411	0.0907	0.0400	0.0185	0.0088
0.5	0.5000	0.3333	0.2368	0.1739	0.0991	0.0591	0.0360
0.6	0.6000	0.4501	0.3548	0.2870	0.1965	0.1395	0.1013
0.7	0.7000	0.5766	0.4923	0.4286	0.3359	0.2706	0.2218
0.8	0.8000	0.7111	0.6472	0.5964	0.5178	0.4576	0.4093
0.9	0.9000	0.8526	0.8172	0.7878	0.7401	0.7014	0.6687
1	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

Interpolate	X	Y
Low Number =	0.5000	0.3333
High Number =	0.6000	0.4501

Assumptions:

1. 200 guests with average vehicle occupancy of 2.5 guests per vehicle
2. 7 valet staff members with 6 runners
3. A minimum of 2 runners would be available at all times to take cars at valet stand.
4. A total processing time of 2.5 minutes for each valet runner to pick up vehicle and return to stand
5. Processing rate = 2.5 minutes / 3 groups of runners times) = 50 seconds or 72 processes p
6. 3 groups of runners = 6 runners / 2 available at all times

Security Queuing Calculations - 200 Guest Event

$$M = \left[\frac{\ln P(x > M) - \ln Q_M}{\ln \rho}\right] - 1$$

Q =	120	Processing rate (processes per hour)
q =	80	Demand rate (vehicles per hour)
N =	1	Service positions (attendants)
ρ =	0.667	Utilization factor (q/(NQ))
Q_m =	0.534	Table Value
M =	4.84	

	N = 1	2	3	4	6	8	10
0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.1	0.1000	0.1820	0.0037	0.0080	0.0000	0.0000	0.0000
0.2	0.2000	0.0666	0.0247	0.0096	0.0015	0.0002	0.0000
0.3	0.3000	0.1385	0.0700	0.0370	0.0111	0.0036	0.0011
0.4	0.4000	0.2286	0.1411	0.0907	0.0400	0.0185	0.0088
0.5	0.5000	0.3333	0.2368	0.1739	0.0991	0.0591	0.0360
0.6	0.6000	0.4501	0.3548	0.2870	0.1965	0.1395	0.1013
0.7	0.7000	0.5766	0.4923	0.4286	0.3359	0.2706	0.2218
0.8	0.8000	0.7111	0.6472	0.5964	0.5178	0.4576	0.4093
0.9	0.9000	0.8526	0.8172	0.7878	0.7401	0.7014	0.6687
1	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

Interpolate	X	Y
Low Number =	0.6000	0.4501
High Number =	0.7000	0.5766

Assumptions:

1. 200 guests with average vehicle occupancy of 2.5 guests per vehicle
2. 1 security guard checking clearance credentials.
3. A total processing time of 30 seconds per vehicle to scan QR code and check ID

400-GUEST EVENT

Valet Queuing Calculations - 400 Guest Event

$$M = \left[\frac{\ln P(x > M) - \ln Q_M}{\ln \rho}\right] - 1$$

Q =	72	Processing rate (processes per hour)
q =	160	Demand rate (vehicles per hour)
N =	3	Service positions (attendants)
ρ =	0.741	Utilization factor (q/(NQ))
Q_m =	0.555	Table Value
M =	7.02	

	N = 1	2	3	4	6	8	10
0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.1	0.1000	0.1820	0.0037	0.0080	0.0000	0.0000	0.0000
0.2	0.2000	0.0666	0.0247	0.0096	0.0015	0.0002	0.0000
0.3	0.3000	0.1385	0.0700	0.0370	0.0111	0.0036	0.0011
0.4	0.4000	0.2286	0.1411	0.0907	0.0400	0.0185	0.0088
0.5	0.5000	0.3333	0.2368	0.1739	0.0991	0.0591	0.0360
0.6	0.6000	0.4501	0.3548	0.2870	0.1965	0.1395	0.1013
0.7	0.7000	0.5766	0.4923	0.4286	0.3359	0.2706	0.2218
0.8	0.8000	0.7111	0.6472	0.5964	0.5178	0.4576	0.4093
0.9	0.9000	0.8526	0.8172	0.7878	0.7401	0.7014	0.6687
1	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

Interpolate	X	Y
Low Number =	0.7000	0.4923
High Number =	0.8000	0.6472

Assumptions:

1. 400 guests with average vehicle occupancy of 2.5 guests per vehicle
2. 11 valet staff members with 9 runners
3. A minimum of 3 runners would be available at all times to take cars at valet stand.
4. A total processing time of 2.5 minutes for each valet runner to pick up vehicle and return to stand
5. Processing rate = 2.5 minutes / 3 groups of runners times) = 50 seconds or 72 processes p
6. 3 groups of runners = 9 runners / 3 available at all times

Security Queuing Calculations - 400 Guest Event

$$M = \left[\frac{\ln P(x > M) - \ln Q_M}{\ln \rho}\right] - 1$$

Q =	120	Processing rate (processes per hour)
q =	160	Demand rate (vehicles per hour)
N =	2	Service positions (attendants)
ρ =	0.667	Utilization factor (q/(NQ))
Q_m =	0.534	Table Value
M =	4.84	

	N = 1	2	3	4	6	8	10
0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.1	0.1000	0.1820	0.0037	0.0080	0.0000	0.0000	0.0000
0.2	0.2000	0.0666	0.0247	0.0096	0.0015	0.0002	0.0000
0.3	0.3000	0.1385	0.0700	0.0370	0.0111	0.0036	0.0011
0.4	0.4000	0.2286	0.1411	0.0907	0.0400	0.0185	0.0088
0.5	0.5000	0.3333	0.2368	0.1739	0.0991	0.0591	0.0360
0.6	0.6000	0.4501	0.3548	0.2870	0.1965	0.1395	0.1013
0.7	0.7000	0.5766	0.4923	0.4286	0.3359	0.2706	0.2218
0.8	0.8000	0.7111	0.6472	0.5964	0.5178	0.4576	0.4093
0.9	0.9000	0.8526	0.8172	0.7878	0.7401	0.7014	0.6687
1	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

Interpolate	X	Y
Low Number =	0.6000	0.4501
High Number =	0.7000	0.5766

Assumptions:

1. 400 guests with average vehicle occupancy of 2.5 guests per vehicle
2. 2 security guards simultaneously checking clearance credentials.
3. A total processing time of 30 seconds per vehicle to scan QR code and check ID

740-GUEST EVENT

Valet Queuing Calculations - 740 Guest Event

$$M = \left[\frac{\ln P(x > M) - \ln Q_M}{\ln \rho}\right] - 1$$

Q =	96	Processing rate (processes per hour)
q =	296	Demand rate (vehicles per hour)
N =	4	Service positions (attendants)
ρ =	0.771	Utilization factor (q/(NQ))
Q_m =	0.547	Table Value
M =	8.19	

	N = 1	2	3	4	6	8	10
0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.1	0.1000	0.1820	0.0037	0.0080	0.0000	0.0000	0.0000
0.2	0.2000	0.0666	0.0247	0.0096	0.0015	0.0002	0.0000
0.3	0.3000	0.1385	0.0700	0.0370	0.0111	0.0036	0.0011
0.4	0.4000	0.2286	0.1411	0.0907	0.0400	0.0185	0.0088
0.5	0.5000	0.3333	0.2368	0.1739	0.0991	0.0591	0.0360
0.6	0.6000	0.4501	0.3548	0.2870	0.1965	0.1395	0.1013
0.7	0.7000	0.5766	0.4923	0.4286	0.3359	0.2706	0.2218
0.8	0.8000	0.7111	0.6472	0.5964	0.5178	0.4576	0.4093
0.9	0.9000	0.8526	0.8172	0.7878	0.7401	0.7014	0.6687
1	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

Interpolate	X	Y
Low Number =	0.7000	0.4286
High Number =	0.8000	0.5964

Assumptions:

1. 740 guests with average vehicle occupancy of 2.5 guests per vehicle
2. 18 valet staff members with 16 runners
3. A minimum of 4 runners would be available at all times to take cars at valet stand.
4. A total processing time of 2.5 minutes for each valet runner to pick up vehicle and return to stand
5. Processing rate = 2.5 minutes / 4 groups of runners times) = 37.5 seconds or 96 processes
6. 4 groups of runners = 16 runners / 4 available at all times

Security Queuing Calculations - 740 Guest Event

$$M = \left[\frac{\ln P(x > M) - \ln Q_M}{\ln \rho}\right] - 1$$

Q =	120	Processing rate (processes per hour)
q =	296	Demand rate (vehicles per hour)
N =	3	Service positions (attendants)
ρ =	0.822	Utilization factor (q/(NQ))
Q_m =	0.685	Table Value
M =	12.37	

	N = 1	2	3	4	6	8	10
0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.1	0.1000	0.1820	0.0037	0.0080	0.0000	0.0000	0.0000
0.2	0.2000	0.0666	0.0247	0.0096	0.0015	0.0002	0.0000
0.3	0.3000	0.1385	0.0700	0.0370	0.0111	0.0036	0.0011
0.4	0.4000	0.2286	0.1411	0.0907	0.0400	0.0185	0.0088
0.5	0.5000	0.3333	0.2368	0.1739	0.0991	0.0591	0.0360
0.6	0.6000	0.4501	0.3548	0.2870	0.1965	0.1395	0.1013
0.7	0.7000	0.5766	0.4923	0.4286	0.3359	0.2706	0.2218
0.8	0.8000	0.7111	0.6472	0.5964	0.5178	0.4576	0.4093
0.9	0.9000	0.8526	0.8172	0.7878	0.7401	0.7014	0.6687
1	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

Interpolate	X	Y
Low Number =	0.8000	0.6472
High Number =	0.9000	0.8172

Assumptions:

1. 740 guests with average vehicle occupancy of 2.5 guests per vehicle
2. 3 security guards simultaneously checking clearance credentials.
3. A total processing time of 30 seconds per vehicle to scan QR code and check ID