

# Proposed Walgreens, Key Biscayne

## Traffic Generation, Distribution, Operation & Safety Study



### **Summary of Findings**

January 2014

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## 1. Introduction

This study was conducted to determine the impact of a proposed 24 hour Walgreens pharmacy and liquor store, to be built in the northern half of an already existing development, on the Northwest corner of Crandon Boulevard and Harbor Drive. The proposed development will consist of a Walgreens pharmacy occupying 10,000 square feet, a mezzanine occupying 2,628 square feet, and a liquor store occupying 1,930 square feet. **Exhibit 1** shows the location of the proposed development.

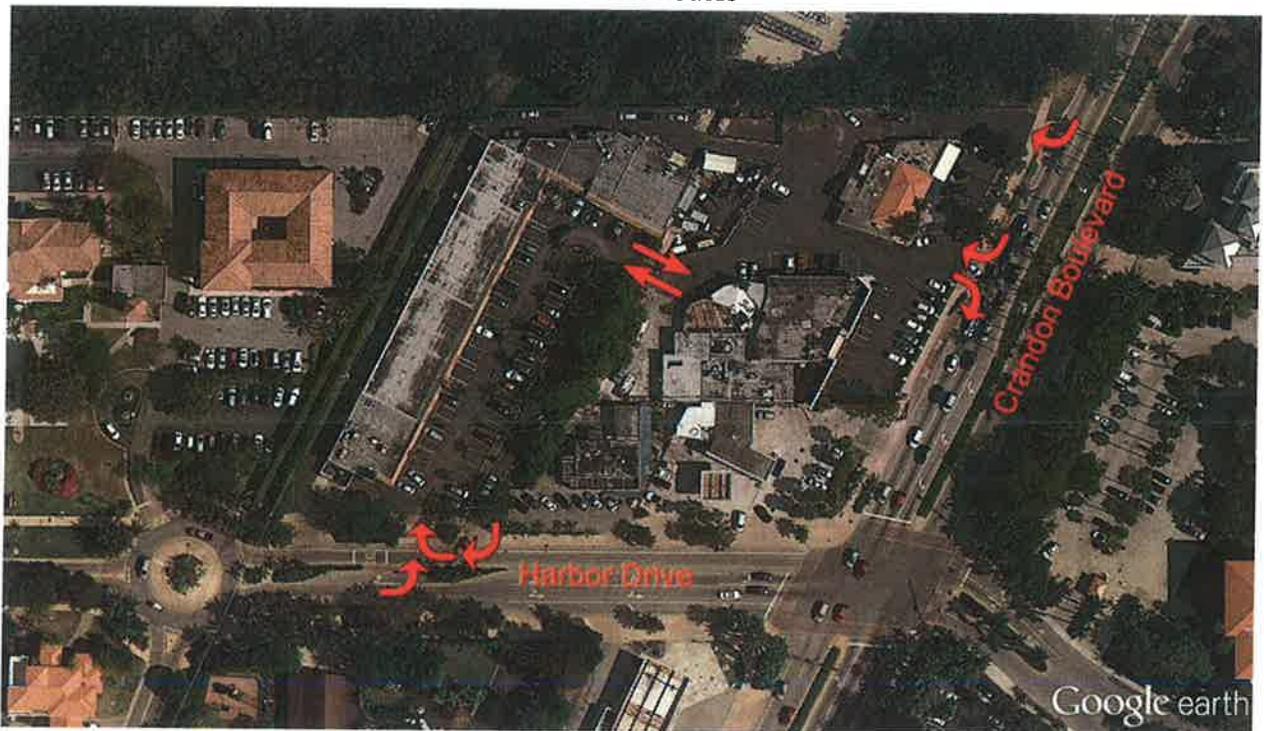
**Exhibit 1 - Site Plan**



## 2. Access Routes

There are three proposed access routes to the site: two driveways accessing Crandon Boulevard directly and the third a “cross-access” driveway to the adjacent facility leading to Harbor Drive. The northern Crandon Boulevard driveway will be one-way, allowing only entering traffic, accessible to Southbound Crandon Boulevard. The southern Crandon Boulevard driveway will be for inbound and outbound traffic accessible to and from southbound Crandon Boulevard. The traffic accessing the “cross-access” driveway will be entering or exiting through one-way driveways on Harbor Drive. The entrance driveway from Harbor drive is accessible to Eastbound and Westbound traffic. The exit driveway on Harbor drive exits to Westbound Harbor Drive only. **Exhibit 2** shows the access routes to and from the facility.

**Exhibit 2 – Access Routes**



## 3. Studies Reviewed

Two previous studies were reviewed regarding this proposed development. The first study was titled “**Walgreens / Liquor Store Key Biscayne Traffic Study**” and was performed by Traf Tech Engineering for Bohler Engineering. This report was dated November 27, 2013. The second study was titled “**Village of Key Biscayne 12-22-24 Crandon Boulevard and 51 Harbor Drive Traffic Study**” and was performed by Atkins for the Village of Key Biscayne. This report was dated November 25, 2013.

## **4. Traffic Generation and Distribution**

### **4.1. Traffic Generation**

A study of the number of additional vehicles that would be entering and exiting the access drives to the proposed facility was performed using two methods. The first method utilized the trip generation rates published by the Institute for Transportation Engineers (ITE). The second method examined the traffic generated at a similar facility in the area.

#### **4.1.1. ITE Trip Generation Rates for 24 Hour Pharmacy without Drive-Thru**

ITE trip generation rates are based on the proposed land use for a development. These rates have been determined through observations performed throughout the country. In the previous studies the assumed land-use was for that of a 24 hour pharmacy without drive-thru (ITE 880). The traffic generation rates were determined to be 3.20, 8.42, and 90.06 trips per 1,000 square feet for morning peak, evening peak, and daily respectively. This would mean a 10,000 square foot development would generate about 90 trips per day ( $90.06 \times 10 = 90.6$ )

#### **4.1.2. Trip Generation Rates for Exemplar Local Facility (CVS)**

The CVS pharmacy located at 726 Crandon Boulevard was determined to be the most appropriate exemplar facility due to its similar use and location. It occupies an 18,316.71 square foot facility with 519.29 square feet of mezzanine storage. A 24 hour mechanical traffic count was performed for all vehicles entering or exiting the location, as well as morning and evening peak hour observations were conducted. The traffic generation rates for this facility were determined to be 8.35, 15.50, and 190.91, morning peak, evening peak, and daily trips per 1,000 square feet, with 50 percent entering and exiting. This is substantially greater than the ITE rates.

Recently, for stores such as the proposed Walgreens, customer use for medical purposes has become only part of the attraction and use as a "convenience store" has become common. For that reason the trip generation is expected to be somewhere between that of a pharmacy (ITE 880) and that of a convenience store (ITE 851). The CVS pharmacy study has confirmed this.

### **4.1.3. Estimated Walgreens Generation**

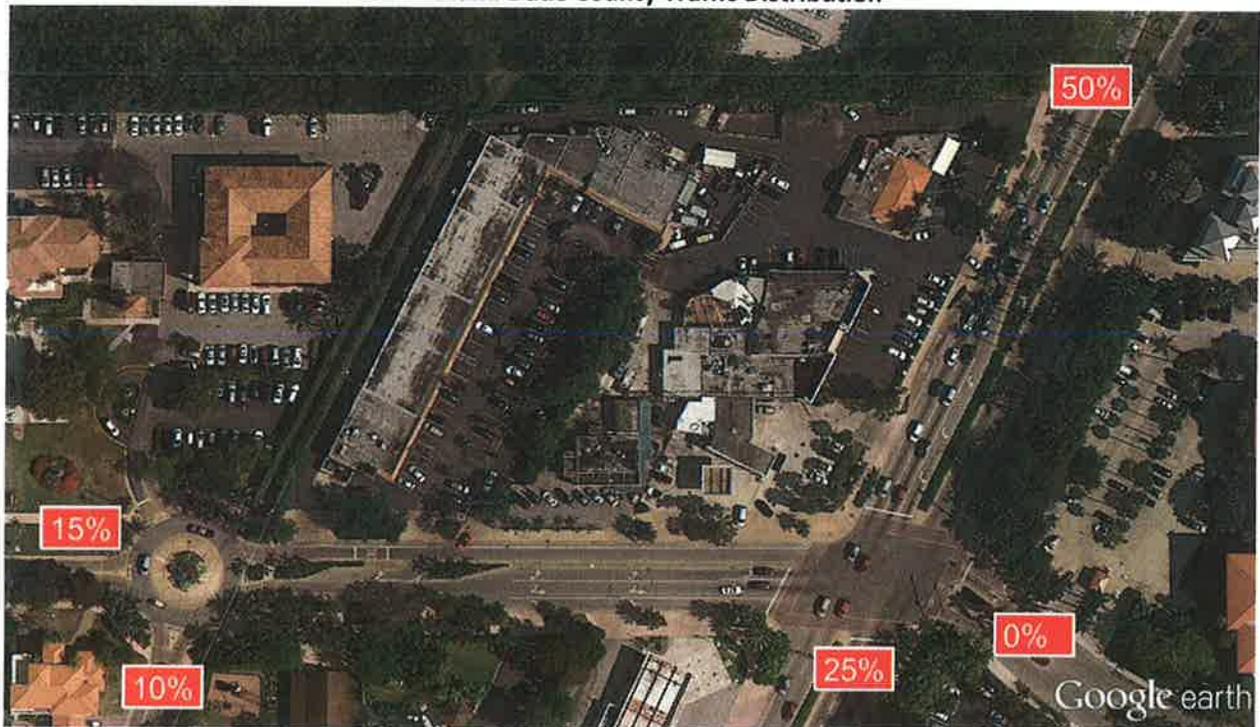
Since the exemplar generation rate was not similar to the 24 Hour Pharmacy generation rates, it was determined that the most accurate method for determining the number of expected additional vehicles using the facility was to use that exemplar rate. Since there is no trip generation rate for an attached liquor store, the square footage of the liquor store was added to the Walgreens totaling 11,930 square feet not including the mezzanine storage. Using the exemplar generation rates it was determined that there would be an additional 100 trips during the morning peak hour, 185 trips during the evening peak hour, and 2278 trips daily. These trips are half entering and half exiting. Although both previous studies considered the concept of “passer-by” (traffic not adding additional trips to the surrounding roadways), each additional trip will be using the access driveways and therefore was utilized in this study.

## 4.2. Traffic Distribution

### 4.2.1. Traffic Analysis Zones

Miami-Dade County publishes information regarding the expected travel directions to and from areas within its boundaries. This information is organized by Traffic Analysis Zones (TAZ), in this case the TAZ applicable is TAZ 647. This distribution is separated into 8 cardinal directions. The initial distribution was then examined with the immediate roadways to determine the distribution rates for traffic entering and exiting the proposed facility. **Exhibit 3** shows these distribution rates based the available roadways.

Exhibit 3 – Miami Dade County Traffic Distribution



#### **4.2.2. Local Observations**

The distribution of vehicles using the current facility was determined by observations during the morning and evening peak hours. It was concluded that utilizing these observations would more accurately predict future trips at the facility. **Exhibit 4** shows the observed distribution rates on the surrounding roadways.

**Exhibit 4 – Observed Traffic Distribution**



#### **4.3. Expected Traffic Generation and Distribution**

##### **4.3.1. Expected Generation Rates at Proposed Facility**

Using the exemplar traffic generation rates and the observed trip distribution, the number of vehicles entering or exiting via Crandon Boulevard and Harbor Drive was determined. **Exhibits 5, 6 and 7** show this data for the morning peak, evening peak, and daily.

Exhibit 5 – Expected Traffic – AM Peak

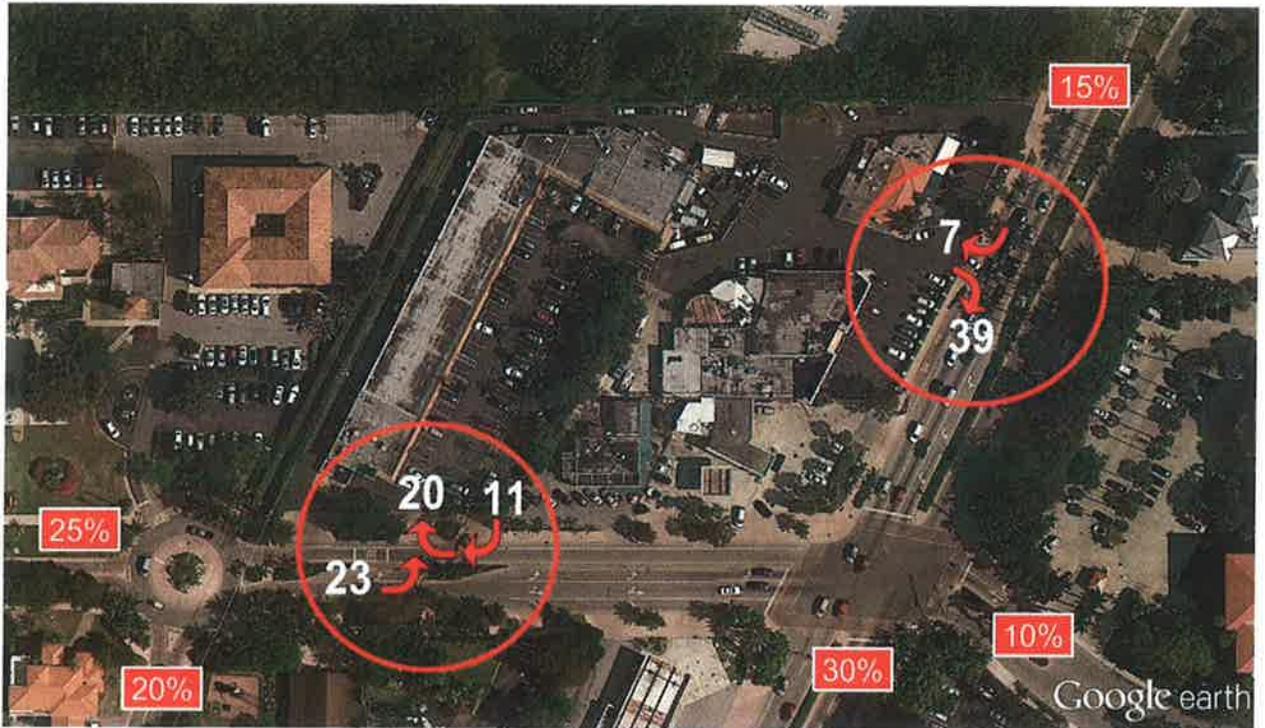
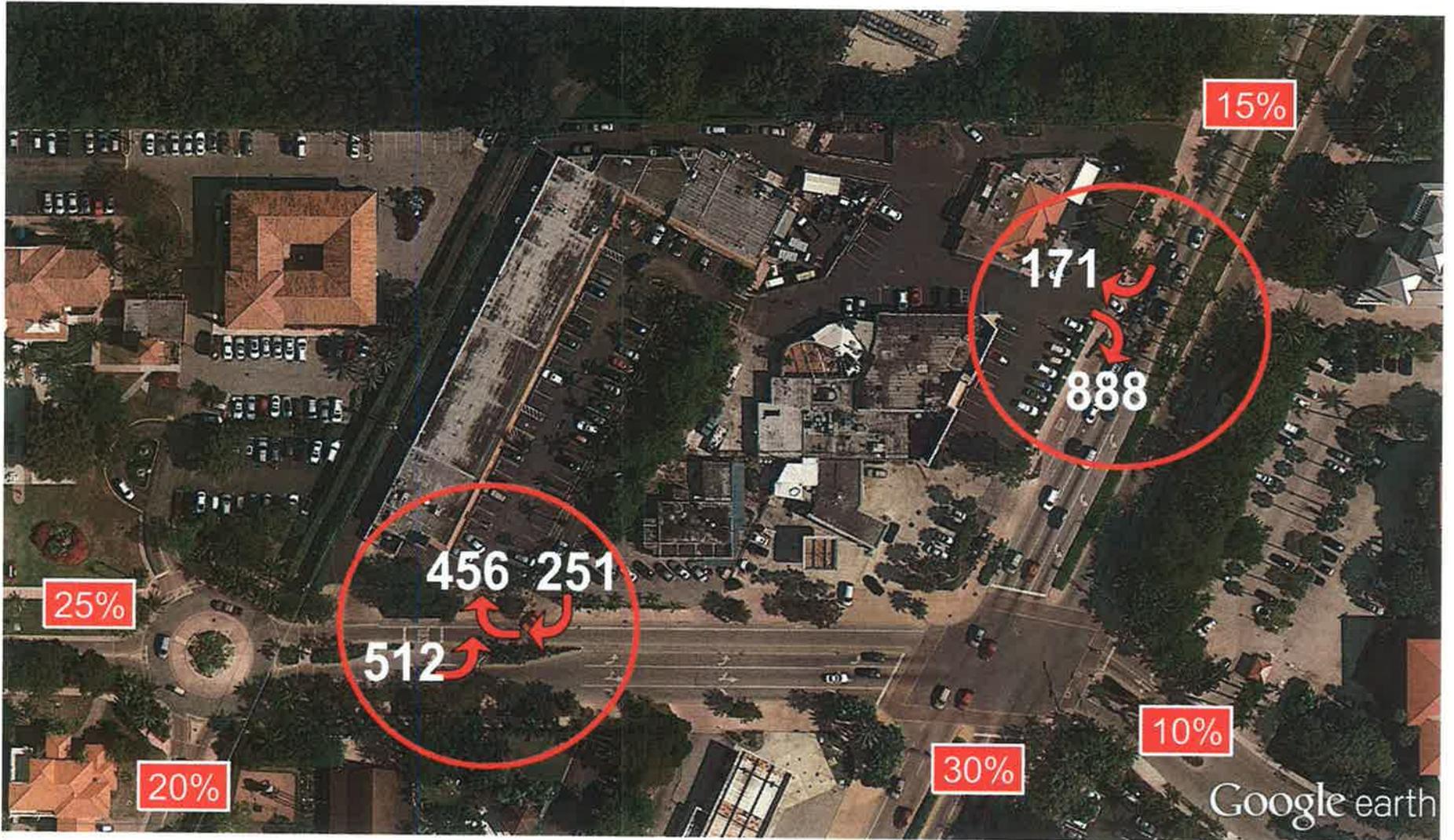


Exhibit 6 – Expected Traffic – PM Peak



Exhibit 7 – Expected Traffic – Daily



### 4.3.2. Expected Generation Rates at Convenience Store

An analysis of other potential developments under the existing zoning was performed to determine what usage would have the largest amount of traffic generated. The traffic generation rates for a convenience store were, respectively, 67.03, 52.41, and 737.99 trips per 1,000 square feet. This was used to determine the maximum impact of any development at this location under existing zoning. According to the ITE trip generation, a 24 hour convenience store (ITE 851) was determined to be the maximum traffic generating facility. Using the same 11,930 square footage as the proposed development, this would generate 800 trips during the morning peak, 625 during the evening peak, and 8804 trips daily. These trips were applied to the observed distribution patterns to determine the number of vehicles entering and exiting via Crandon Boulevard and Harbor Drive and which direction they would travel. **Exhibits 8, 9, and 10** show this data for the morning peak, evening peak, and daily.

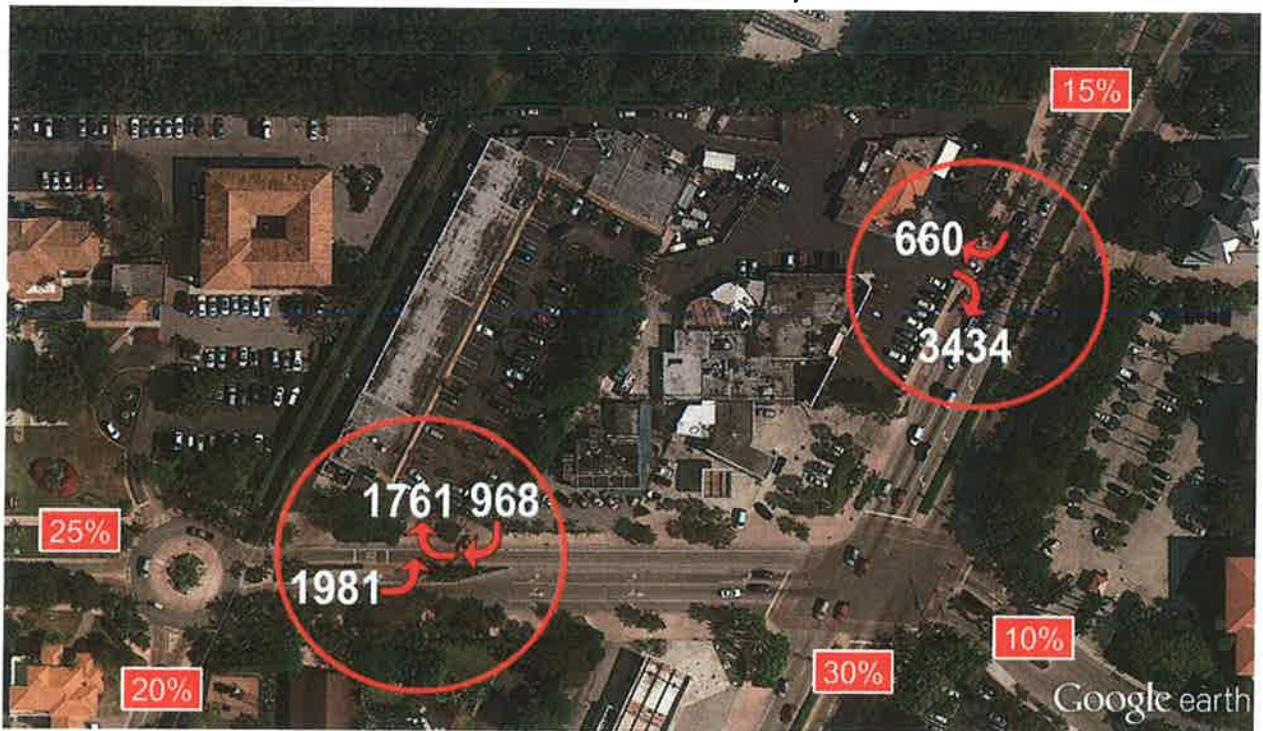
Exhibit 8 – Maximum Traffic – AM Peak



Exhibit 9 – Maximum Traffic – PM Peak



Exhibit 10 – Maximum Traffic – Daily



## 5. Operation and Safety Issues

During observations of the site and surrounding area various safety issues were observed regarding the existing driveways and confusing traffic flow patterns in and around the facility. **Exhibit 11** shows the seven (7) locations where safety issues were observed. In addition to site observations, all accidents which occurring within previous year, within the proposed access routes to and from the facility were researched. A total of 28 accidents occurred within this area of which eight (8) occurred inside the Harbor Plaza parking lot and account for about 36 percent of the total.

Exhibit 11



## 5.1. Location 1

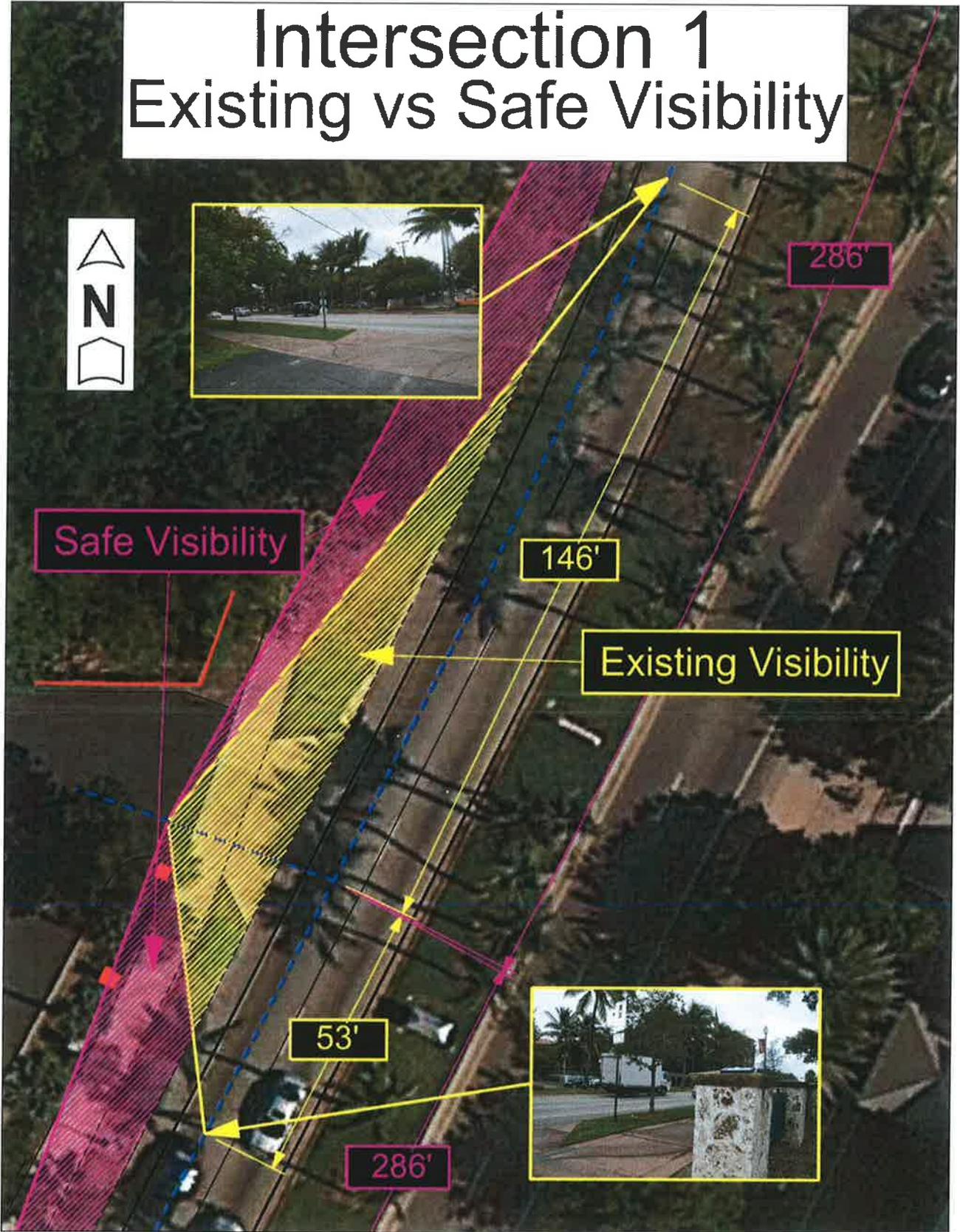
Location 1 is the northernmost driveway accessible from Crandon Boulevard. There were two main safety concerns observed at this location.

The first concern was limited visibility for vehicles exiting the driveway to see approaching motor vehicles, pedestrians, and bicycles with enough time to safely enter the roadway. The current visibility for a vehicle exiting this driveway of approaching vehicles is about 146 feet looking left and 53 feet looking right. A safe visibility distance requires at least 286 feet.

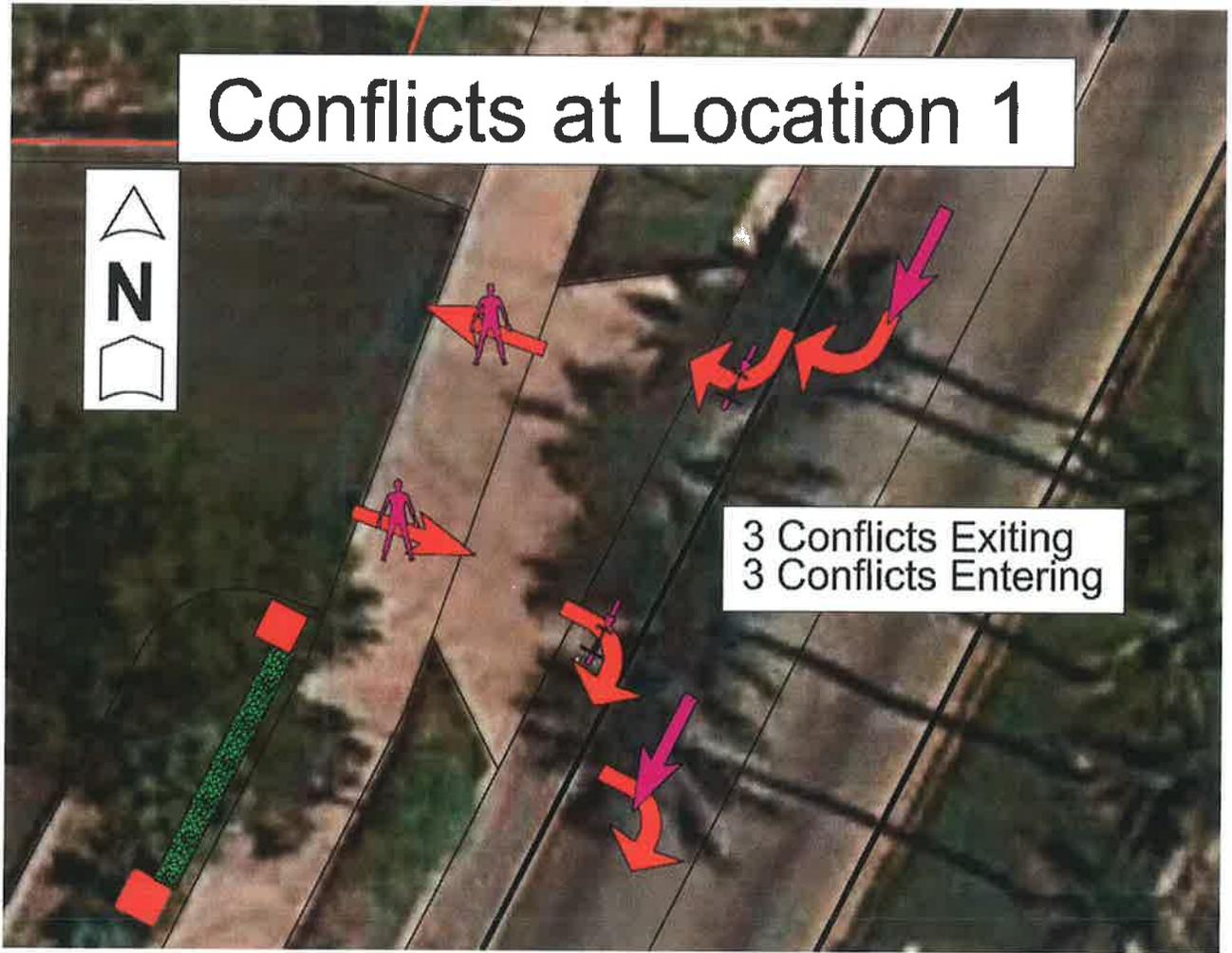
The second safety concern with this location is the number of potential collisions involving vehicles entering and exiting the driveway. Vehicles slowing to enter the driveway may lead to rear-end collisions, and in addition entering vehicles may collide with bicycles when crossing the bicycle lane and pedestrians when crossing the sidewalk. A vehicle exiting the driveway may collide with pedestrians when crossing the sidewalk, bicycles when crossing the bicycle lane, and vehicles approaching or within the path of the lane being entered. There are a total of three (3) potential types of collisions when entering or exiting this driveway.

**Exhibit 12** shows the visibility concerns with this location and **Exhibit 13** shows the various potential collisions at this location.

# Intersection 1 Existing vs Safe Visibility



# Conflicts at Location 1



## 5.2. Location 2

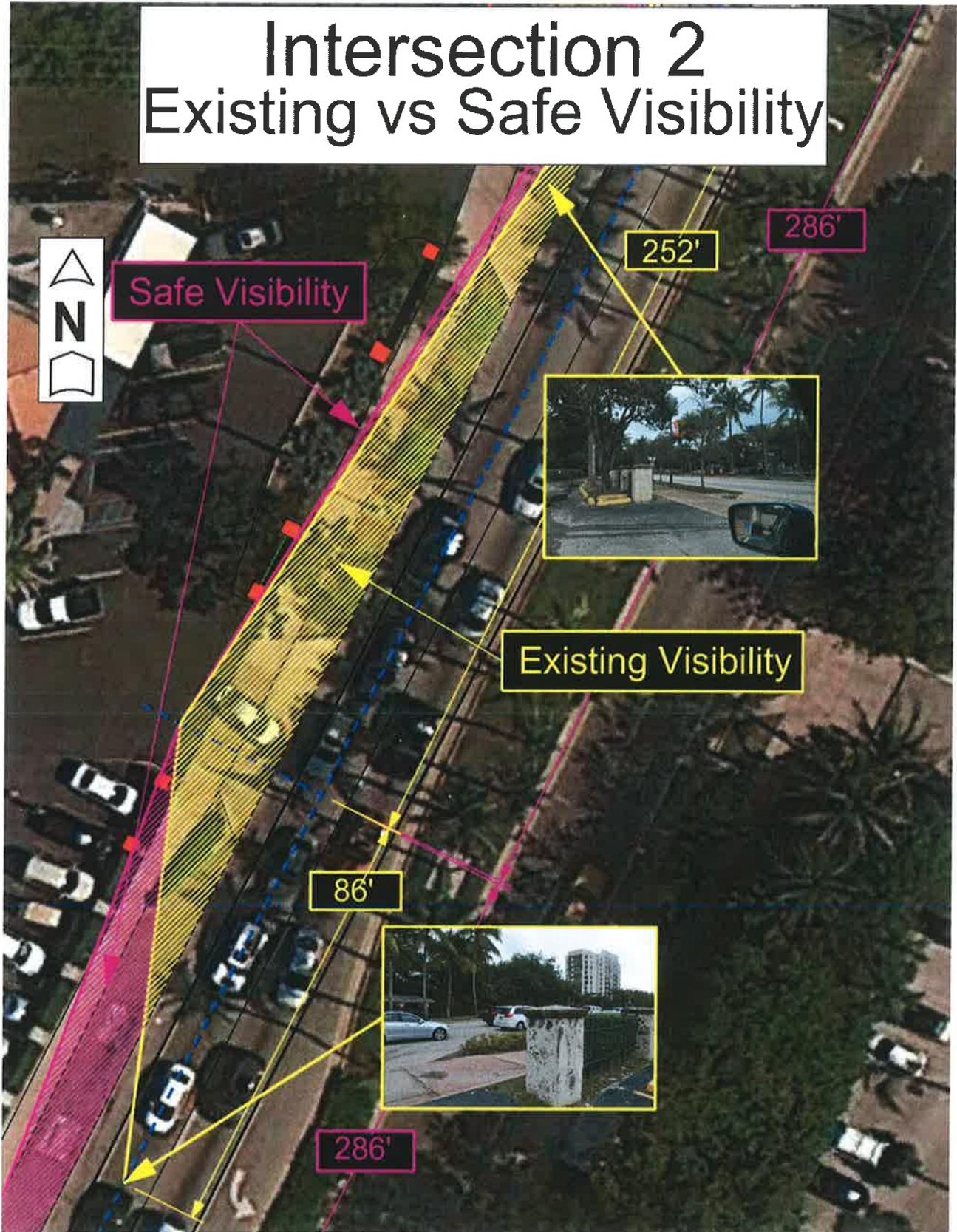
Location 2 is the southern driveway into the proposed facility, accessible from Crandon Boulevard. There were two main safety concerns observed at this location.

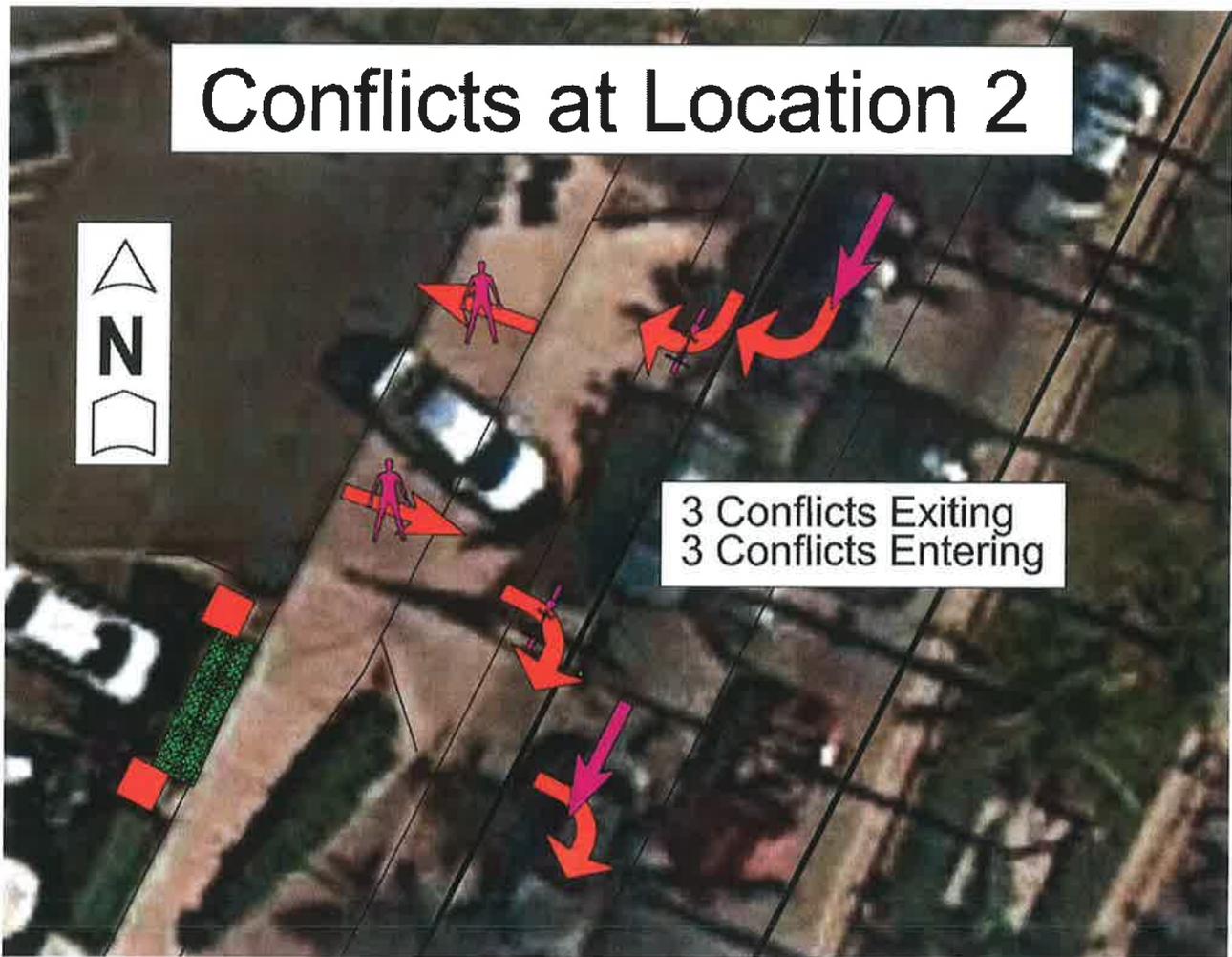
The first concern was limited visibility for vehicles exiting the driveway to see approaching motor vehicles, pedestrians, and bicycles with enough time to safely enter the roadway. The current visibility of this driveway of approaching vehicles is about 252 feet looking left and 86 feet looking right. A safe visibility distance requires at least 286 feet.

The second safety concern with this location is the number of potential collisions involving vehicles entering and exiting the driveway. Vehicles slowing to enter the driveway may lead to rear-end collisions, and in addition entering vehicles may collide with bicycles when crossing the bicycle lane and pedestrians when crossing the sidewalk. A vehicle exiting the driveway may collide with pedestrians when crossing the sidewalk, bicycles when crossing the bicycle lane, and vehicles approaching or within the path of the lane being entered. There are a total of three (3) potential types of collisions when entering or exiting this driveway.

**Exhibit 14** shows the visibility concerns with this location and **Exhibit 15** shows the various potential collisions at this location.

# Intersection 2 Existing vs Safe Visibility





### 5.3. Location 3

Location 3 is the driveway exiting onto Harbor Drive that would access the proposed facility via the cross-access driveway. There were three main safety concerns observed at this location.

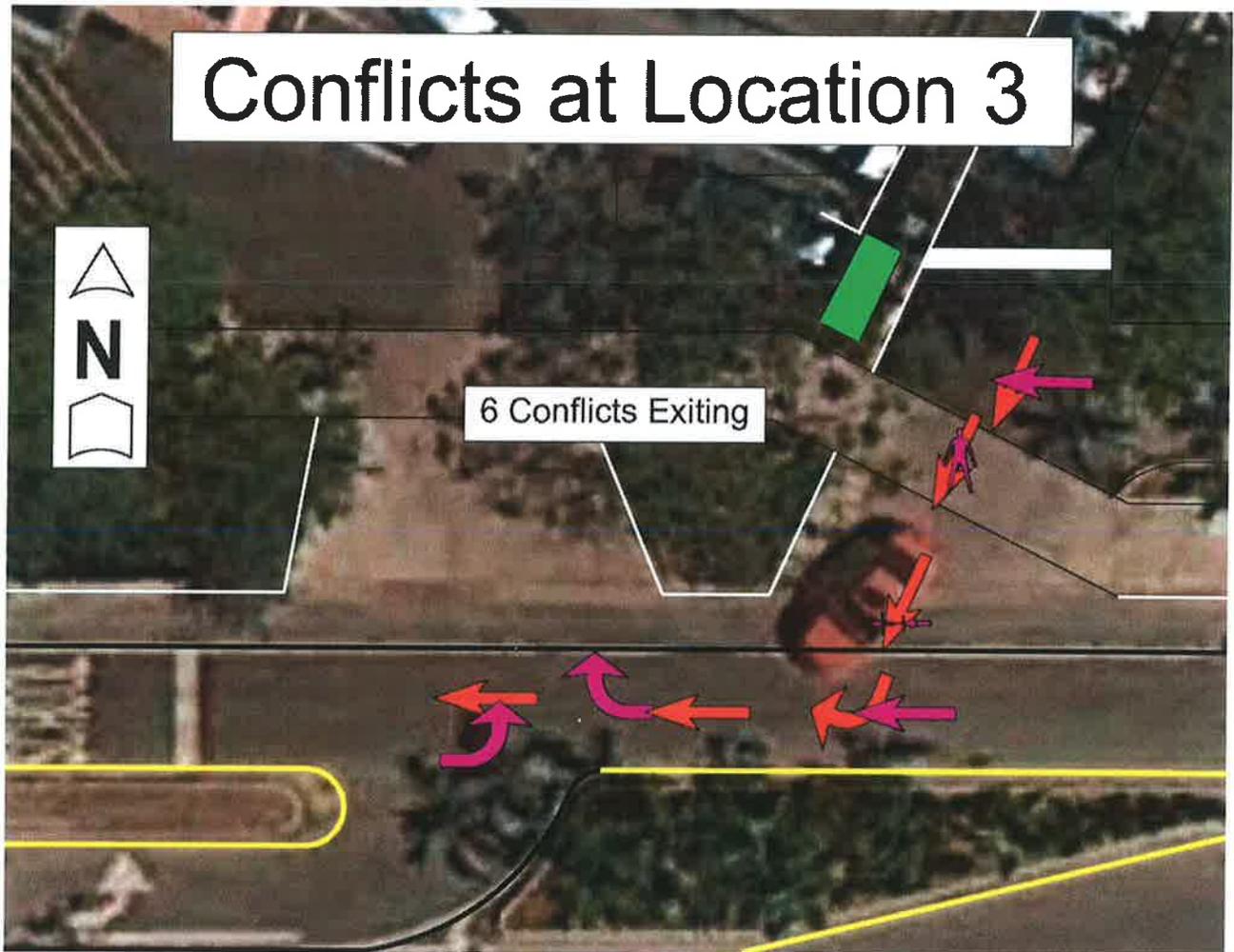
The first concern was limited visibility for vehicles exiting the driveway to see approaching motor vehicles, pedestrians, and bicycles with enough time to safely enter the roadway. The current visibility of this driveway of approaching vehicles is about 34 feet looking right. A safe visibility distance requires at least 286 feet. **Exhibit 16** shows the visibility concerns with this location.

# Intersection 3 Existing vs Safe Visibility



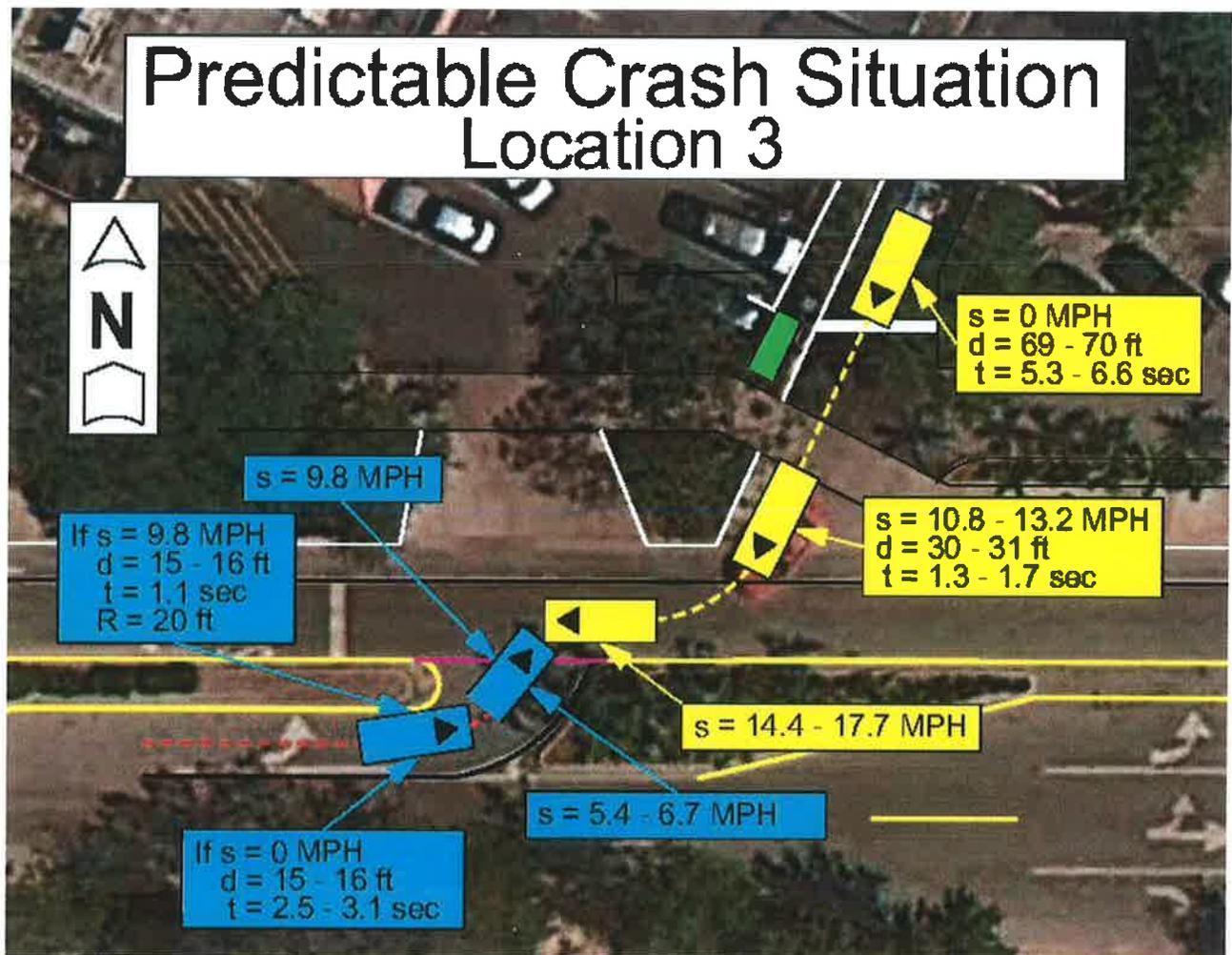
The second safety concern with this location is the number of potential collisions involving vehicles exiting the driveway. Vehicles exiting Oasis Café share the driveway with vehicles exiting via the cross-access ramp. Immediately after leaving the stop bar to exit onto Harbor drive there is a potential collision with vehicles exiting Oasis Café. Additionally vehicles exiting the driveway may collide with pedestrians when crossing the sidewalk, bicycles when crossing the bicycle lane, vehicles approaching or within the path of the lane being entered, vehicles slowing to turn right and vehicles turning left to enter the facility at the driveway immediately west of the exit. There are a total of six (6) potential collisions when exiting this driveway. **Exhibit 17** shows the various potential collisions at this location.

Exhibit 17



The third safety concern with this location is a predictable crash situation. Due to geometrics of this exit along with the eastbound left turn entrance into the facility, a collision between vehicles exiting and entering is possible where neither vehicle could have recognized the impending crash with enough notice to avoid a collision. A vehicle exiting the driveway from the stop bar would take about 5 – 7 seconds to reach the collision point. An eastbound entering vehicle stopped would take only about 2 – 3 second to reach impact, so it would still be stopped when the left turning vehicle begins its turn. The exiting vehicle would not enter Harbor Drive until it was 1 – 2 seconds from impact, meaning the entering vehicle would have already been accelerating for 1 – 2 seconds, therefore both vehicles are committed to their paths and neither has enough time to react and avoid the impact when the hazards are recognizable. If the left turning vehicle slowed to turn, but did not stop, then it would be less than 1 second from impact when it enters the roadway, and it would not have entered the turn bay when the exiting vehicle begins to accelerate. This would be an even less avoidable scenario. **Exhibit 18** shows the probable crash scenario at this location.

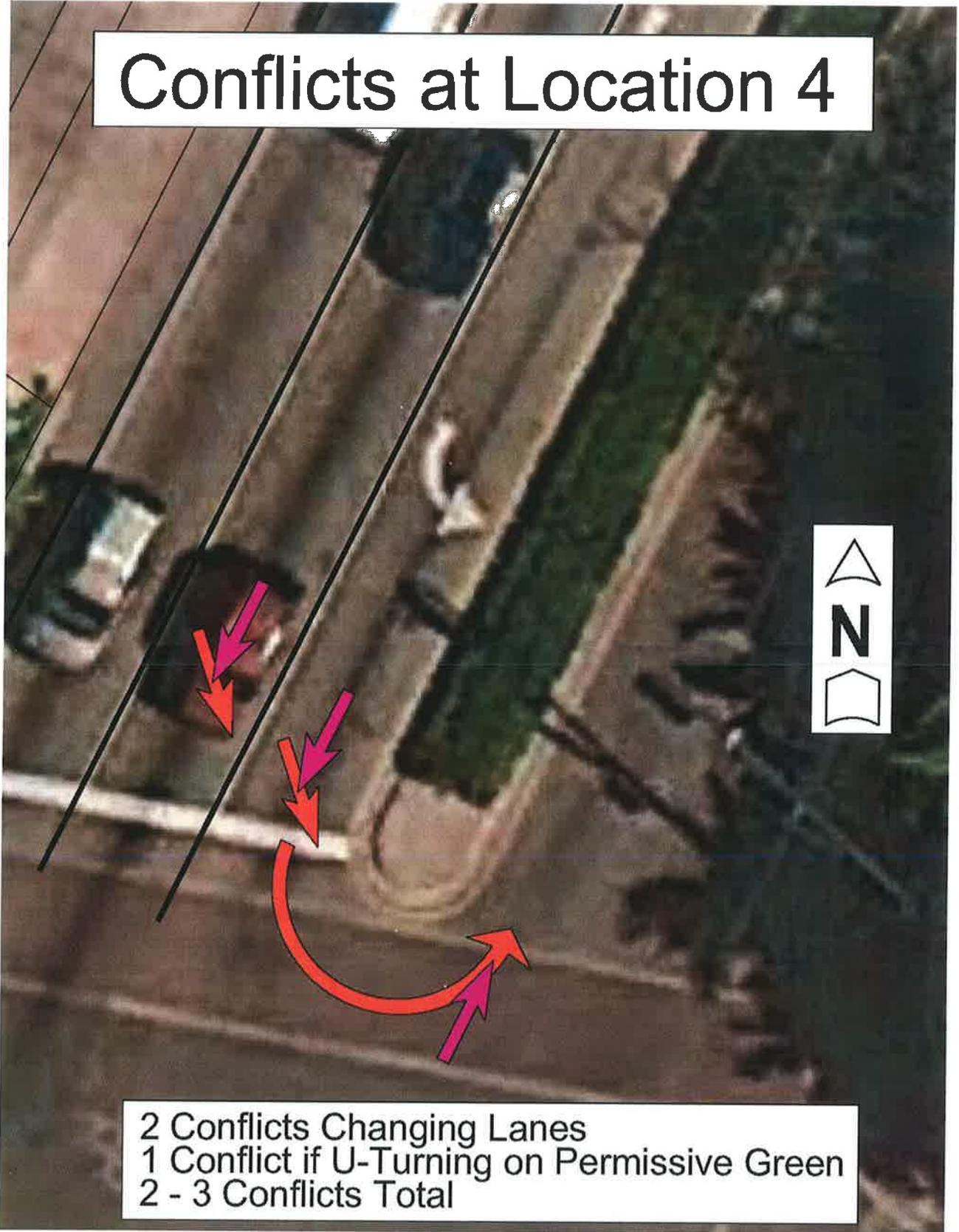
Exhibit 18



#### 5.4. Location 4

Location 4 is the U-turn that vehicles exiting the facility via Crandon Boulevard would be required to take in order to travel north. The traffic signal displays a green left turn arrow if vehicles arrive during a red signal, and also allows a left turn on a green “ball” signal. If arriving at other times, the main safety concern with this location is the number of potential collisions involving vehicles traveling this route. To reach the southbound left turn lane a vehicle must cross two lanes of traffic. At each lane crossing there is a potential collision with vehicles approaching the travel path or already within the travel path. In addition if making the maneuver on a green ball, there is a potential collision when completing the turn entering the northbound travel lane with approaching northbound vehicles. There are three (3) potential types of collisions at this location, in addition to the three potential collisions already experienced when exiting the facility onto Crandon Boulevard. **Exhibit 19** shows the various potential collisions at this location.

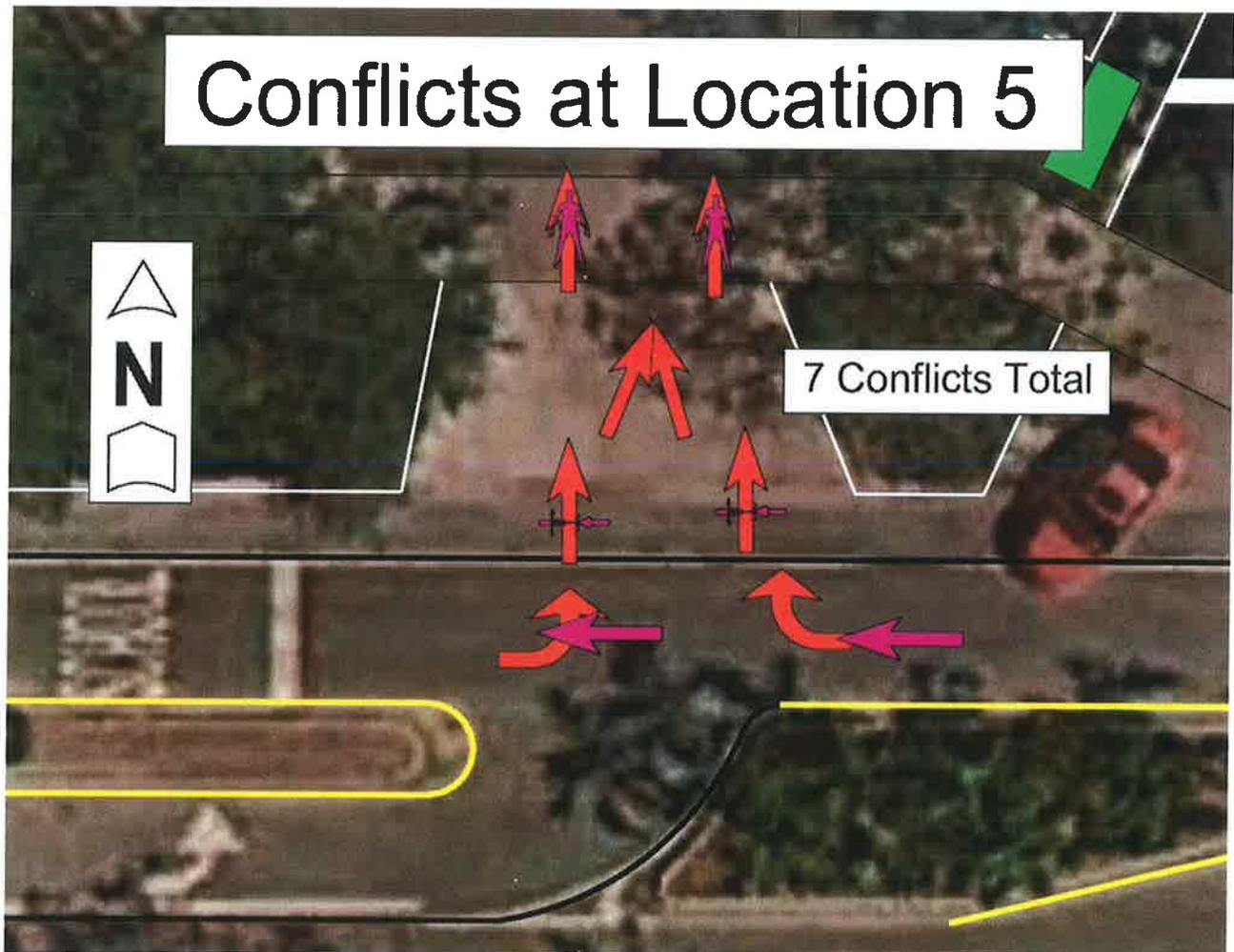
# Conflicts at Location 4



## 5.5. Location 5

Location 5 is the entrance driveway from Harbor Drive that would access the proposed facility via the cross-access driveway. The main safety concern with this location is the number of potential collisions involving vehicles entering the driveway. Vehicles slowing to enter the driveway from westbound Harbor Drive, turning right, may lead to rear-end collisions, and in addition entering vehicles may collide with bicycles when crossing the bicycle lane and pedestrians when crossing the sidewalk. Vehicles entering the driveway from eastbound Harbor Drive, turning left may collide with vehicles traveling westbound on Harbor Drive, bicycles when crossing the bicycle lane and pedestrians when crossing the sidewalk. In addition vehicles entering from westbound Harbor Drive may collide with vehicles entering from eastbound Harbor Drive. There are a total of seven (7) potential types of collisions when exiting this driveway location. **Exhibit 20** shows the various potential collisions at this location.

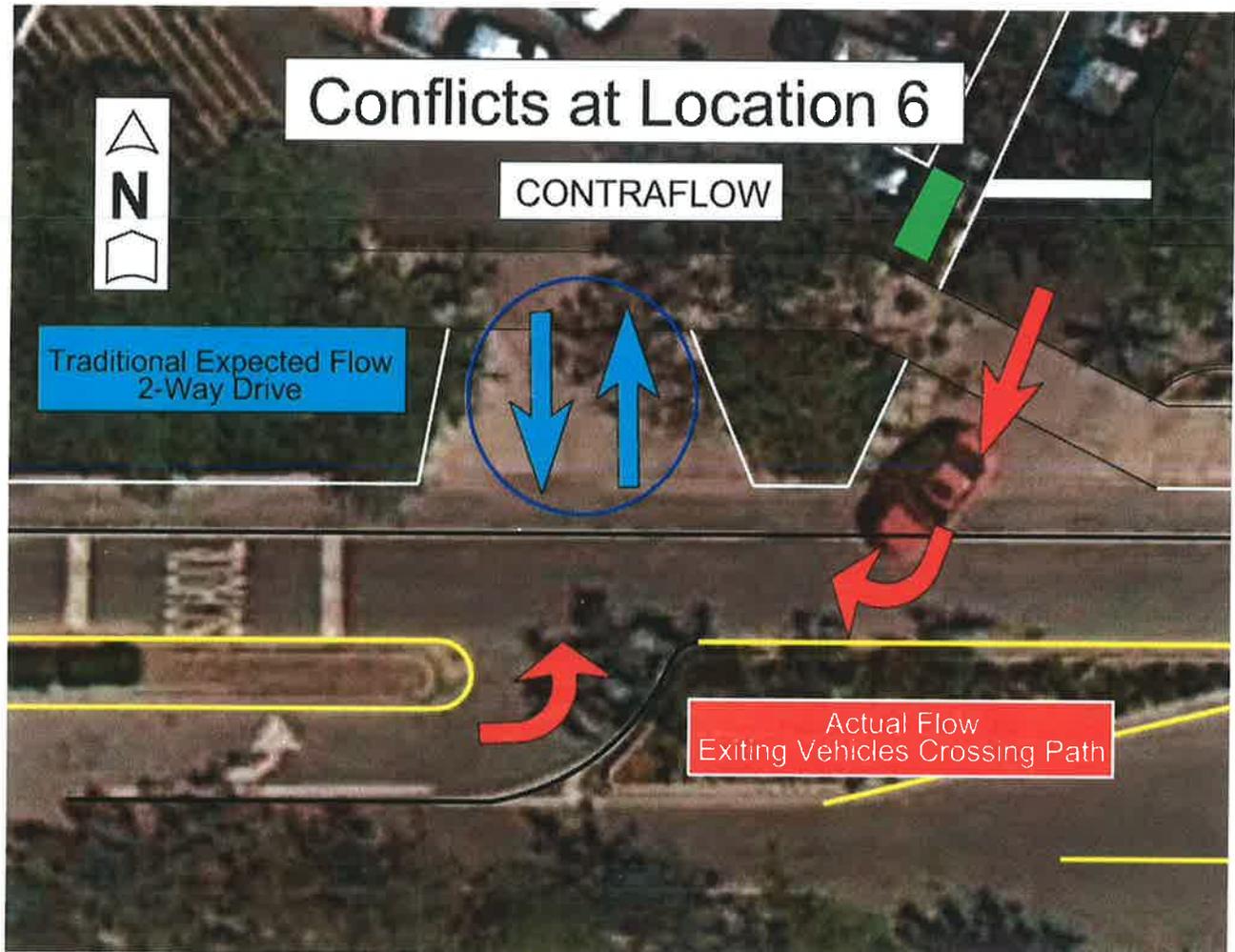
Exhibit 20



## 5.6. Location 6

Location 6 is a traffic flow safety issue occurring at the Harbor Drive exit and entrances. Vehicles enter the facility via eastbound and westbound Harbor Drive have no notice that the entrance is one-way, therefore there is an expectation of vehicles entering and exiting from the same driveway. Additionally there is no notification of vehicles exiting the facility via the one-way exit east of the entrance. Finally, the vehicles exiting the facility cross paths with the vehicles entering the facility. This traffic flow pattern is contrary to the logical and expected situation when entering or exiting a driveway, in this case exiting west of the entrance. Due to the unexpected flow pattern, vehicles entering the facility will not be looking towards the exit ramp for potential hazards. **Exhibit 21** shows the flow safety issue at this location.

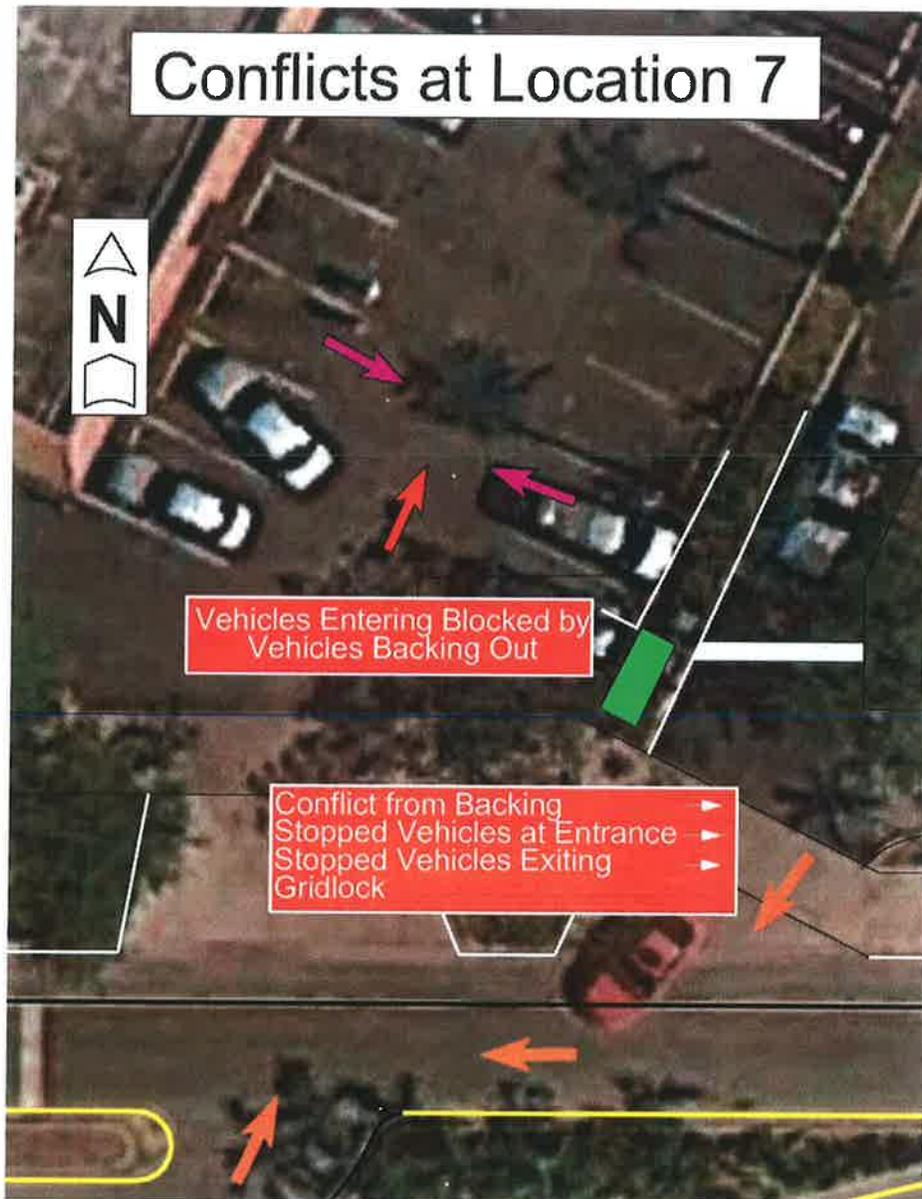
Exhibit 21



## 5.7. Location 7

Location 7 is the parking lot within the facility entered via Harbor Drive that would access the proposed facility via the cross-access driveway. Parking spaces begin immediately north of the entrance driveway from Harbor Drive. Because of the narrow travel path along the parking lot all vehicles exiting their parking spaces must block thru traffic. This condition causes entering vehicles, whether turning right or left, to obstruct the westbound traffic lanes, potentially leading to collisions. Since the exit from the facility is obstructed as well from this, with enough traffic the exiting vehicles could possibly obstruct the cross-access driveway. **Exhibit 22** shows the issue at this location.

Exhibit 22



## 6. Conclusions

The proposed Walgreens development is expected to generate more traffic than a traditional pharmacy and is expected to generate an additional 2278 daily trips, 100 trips during the morning peak hour and 185 trips during the evening peak hour. Within the past year about 36 percent of all accidents, within the routes used for the proposed facility occur within the Harbor Plaza parking lot, and over 50 percent of all traffic generated by the proposed facility will be using this parking lot for access. If access to this development is allowed via Harbor Drive, it is expected that the existing hazardous conditions will become substantially worse. It is predictable that this will lead to additional traffic accidents, injuries, or fatalities. It is therefore recommended that if this development is approved that it not be permitted to have access via the current driveways on Harbor Drive. In addition the access via Crandon Boulevard should have a safe access with unobstructed views of potential hazards.



Miles E Moss, P.E.  
President, Miles Moss & Associates, Inc.

County: 99  
 Station: 0040  
 Description: DRIVE 1 ON WEST OF CRANDON BLVD  
 Start Date: 01/14/2014  
 Start Time: 0000

Time	Direction: E					Direction: W					Combined Total
	1st	2nd	3rd	4th	Total	1st	2nd	3rd	4th	Total	
0000	5	2	3	3	13	0	1	1	0	2	15
0100	1	0	1	0	2	0	0	0	0	0	2
0200	0	0	0	0	0	0	0	0	0	0	0
0300	0	0	3	0	3	0	0	0	0	0	3
0400	0	2	0	0	2	0	0	0	0	0	2
0500	0	2	1	1	4	0	0	0	0	0	4
0600	0	6	0	2	8	0	1	1	3	5	13
0700	8	10	7	12	37	0	1	6	3	10	47
0800	10	10	15	23	58	5	6	10	9	30	88
0900	15	10	19	18	62	7	10	12	9	38	100
1000	26	16	20	26	88	17	12	7	4	40	128
1100	20	20	23	18	81	18	17	21	8	64	145
1200	24	42	23	54	143	19	24	24	17	84	227
1300	22	29	26	29	106	20	18	29	12	79	185
1400	25	27	33	34	119	13	18	12	19	62	181
1500	24	34	33	20	111	11	15	25	16	67	178
1600	32	22	16	17	87	12	10	7	10	39	126
1700	26	35	17	22	100	29	21	20	36	106	206
1800	16	31	25	32	104	22	18	13	16	69	173
1900	27	24	22	18	91	28	19	17	20	84	175
2000	15	27	28	13	83	10	11	8	2	31	114
2100	23	25	17	17	82	7	9	5	8	29	111
2200	14	16	7	3	40	4	3	3	5	15	55
2300	13	10	3	6	32	6	0	1	0	7	39
24-Hour Totals:	1456					861					2317

	Peak Volume Information					
	Direction: E		Direction: W		Combined Directions	
	Hour	Volume	Hour	Volume	Hour	Volume
A.M.	845	67	845	38	845	105
P.M.	1200	143	1700	106	1200	227
Daily	1200	143	1700	106	1200	227

County: 99  
 Station: 0041  
 Description: DRIVE 2 EAST DRIVE ON WESTWOOD DR. S OF WESTW  
 Start Date: 01/14/2014  
 Start Time: 0000

Time	Direction: N					Direction: S					Combined Total	
	1st	2nd	3rd	4th	Total	1st	2nd	3rd	4th	Total		
0000	1	0	1	1	3	0	0	1	0	1	4	
0100	0	1	0	0	1	2	1	0	0	3	4	
0200	0	0	0	0	0	0	0	0	0	0	0	
0300	0	0	0	0	0	0	0	0	0	0	0	
0400	0	0	0	0	0	0	0	0	0	0	0	
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0600	0	1	1	1	3	0	0	1	0	1	4	
0700	1	1	0	8	10	0	1	1	3	5	15	
0800	5	8	9	7	29	1	2	5	1	9	38	
0900	3	9	16	12	40	2	1	4	3	10	50	
1000	8	12	14	16	50	2	5	1	5	13	63	
1100	7	9	11	16	43	4	3	6	2	15	58	
1200	16	25	20	25	86	3	0	1	3	7	93	
1300	21	9	29	32	91	0	0	0	1	1	92	
1400	23	27	15	23	88	2	2	4	3	11	99	
1500	14	19	12	22	67	2	4	7	0	13	80	
1600	15	13	13	13	54	5	6	2	1	14	68	
1700	16	28	10	17	71	1	0	3	4	8	79	
1800	16	15	4	13	48	1	2	1	0	4	52	
1900	17	13	10	9	49	2	1	4	4	11	60	
2000	6	12	9	9	36	4	6	3	1	14	50	
2100	10	14	15	7	46	1	0	0	1	2	48	
2200	7	4	2	1	14	3	0	0	0	3	17	
2300	2	4	2	2	10	1	0	0	0	1	11	
24-Hour Totals:					840						146	986

	Peak Volume Information					
	Direction: N		Direction: S		Combined Directions	
	Hour	Volume	Hour	Volume	Hour	Volume
A.M.	845	35	745	11	845	43
P.M.	1330	111	1530	18	1330	116
Daily	1330	111	1045	18	1330	116

County: 99  
 Station: 0042  
 Description: DRIVE 3 WEST DRIVE ON WESTWOOD DR. S OF WESTW  
 Start Date: 01/14/2014  
 Start Time: 0000

Time	Direction: N					Direction: S					Combined Total	
	1st	2nd	3rd	4th	Total	1st	2nd	3rd	4th	Total		
0000	0	0	0	0	0	0	0	0	0	0	0	
0100	0	0	0	0	0	0	0	0	0	0	0	
0200	0	0	0	0	0	0	0	0	0	0	0	
0300	0	0	0	0	0	0	0	0	0	0	0	
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0500	0	0	0	0	0	0	0	0	0	0	0	
0600	0	0	0	0	0	0	0	0	0	0	0	
0700	0	0	1	0	1	0	0	0	0	0	1	
0800	0	0	1	0	1	0	0	0	1	1	2	
0900	0	1	3	0	4	0	0	6	0	6	10	
1000	4	10	2	7	23	7	5	8	0	20	43	
1100	6	4	2	1	13	0	1	7	1	9	22	
1200	2	3	0	0	5	4	3	4	1	12	17	
1300	7	0	0	3	10	0	3	0	1	4	14	
1400	2	4	4	2	12	2	2	2	2	8	20	
1500	5	0	3	2	10	6	2	3	0	11	21	
1600	2	2	0	6	10	2	4	3	2	11	21	
1700	4	0	0	1	5	1	2	0	1	4	9	
1800	3	8	0	1	12	0	0	0	0	0	12	
1900	1	1	1	1	4	0	4	0	1	5	9	
2000	6	1	1	6	14	1	0	2	0	3	17	
2100	0	0	1	0	1	0	0	0	0	0	1	
2200	0	1	0	1	2	0	0	0	0	0	2	
2300	0	0	2	0	2	1	0	0	0	1	3	
24-Hour Totals:					129						95	224

	Peak Volume Information					
	Direction: N		Direction: S		Combined Directions	
	Hour	Volume	Hour	Volume	Hour	Volume
A.M.	845	4	845	7	845	11
P.M.	1415	15	1445	13	1415	27
Daily	1015	25	945	20	1000	43