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TRAFFIC IMPACT ANALYSIS

To: **John Culligan**
Cuningham Group Architecture, P.A.

From: Bill Grieve BG

Date: March 26, 2012

Subject: ***Potawatomi Bingo Casino Hotel***
Milwaukee, Wisconsin

PART I. PROJECT CONTEXT AND SUMMARY STATEMENT

GEWALT HAMILTON ASSOCIATES, INC. (GHA) has been working with the Potawatomi at their Bingo Casino in Milwaukee, Wisconsin since 1999. The next phase of expansion is construction of a 20-story luxury hotel with up to 385 rooms on the former Badger Railing site in the southwest corner of the Canal Street / Potawatomi Circle intersection (lower 16th Street). A four level, 480 parking deck will also be built directly east of the existing parking garages.

GHA has conducted a traffic impact analysis (TIA) for the Potawatomi Bingo Casino Hotel. The following summarizes our findings and provides various recommendations for your consideration. *Exhibits* and Appendices referenced are located at the end of this document. Briefly summarizing, we believe that the adjacent roadways and the site access drives can accommodate hotel traffic activity. Reasons include...

- The Potawatomi Bingo Casino is well served by the adjacent streets, which offer excellent route selection and site access flexibility.
- Potawatomi Circle functions as a loop traffic distributor for the Bingo Casino, directing traffic to/from the building entrances and parking garages and lots. This helps to minimize the traffic impact at any one location along Canal Street.
- It is expected that 50% of hotel trip will be made by gaming patrons of the Bingo Casino. However, this discount was not applied to ensure that the maximum hotel traffic impacts were tested.

PART II. BACKGROUND INFORMATION

Exhibits 1 and 2 - Site Location Map and Photo Inventory

Exhibit 1 provides aerial photos of the site vicinity and *Exhibit 2* provides a photo inventory of current traffic operations. Patrons of the hotel will be well served by the adjacent streets to the Bingo Casino, which includes...

- Canal Street serves the entire Menomonee Valley, linking 6th Street in Downtown Milwaukee on the east with Miller Park on the west.
- The traffic signal at the Canal Street / Potawatomi Circle (formerly 20th Street) intersection on the west side of the Casino.
- Potawatomi Circle (formerly Pittsburgh Avenue) on the south side of the Bingo Casino that also provides direct access to the parking garages and lots.
- The traffic signal at the Canal Street / Potawatomi Circle (formerly lower 16th Street) intersection on the east side of the Casino.
- The traffic signal that provides direct access to the parking decks from upper 16th Street.

Exhibit 3 - Existing Traffic

GHA conducted traffic counts on Thursday, March 1, 2012 at the Bingo Casino access intersections from 2 PM to 9 PM. The length of the counts helped us to understand the shifts in Bingo Casino traffic activity and travel patterns. *Exhibit 3* illustrates the existing weekday evening peak hour traffic volumes, which occurred from 5 PM to 6 PM.

Pertinent comments from the counts and our observations include...

- About 50% of the Bingo Casino trips are oriented to/from the west on Canal Street. This can be partially attributable to the convenience and close proximity of the 25th Street interchange with I-94.
- Traffic in and out of the Bingo Casino ranged from a low of 1525 vehicles from 2 PM to 3 PM to a high of 1825 vehicles during the 5 PM to 6 PM peak hour and 1800 vehicles from 6 PM to 7 PM. The traffic activity then gradually decreased with 1610 trips generated from 8 PM to 9 PM.

PART III. TRAFFIC CHARACTERISTICS

Exhibit 4 – Site Plan and Proposed Access

Exhibit 4 illustrates the proposed hotel site plan. Planned access includes...

- Hotel traffic will be able to use all of the patron garages.
- The drives on Canal Street and Potawatomi Circle that will be shifted slightly from their current location, and will provide valet service for the main hotel entrance.
- The existing valet service for the Bingo Casino will be shifted to the east-west portion of Potawatomi Circle, so as not to mix drop-off and pick-up functions.

Exhibit 5 – Project Traffic Characteristics

Traffic Generations

Traffic was generated for the hotel, based on rate information published by the Institute of Transportation Engineers (ITE). *Exhibit 5 – Part A* summarizes the calculated weekday morning and evening and daily traffic generations.

As can be seen from *Exhibit 5 – Part A*, and per information provided by the owner, it can be expected that about 50% of hotel guests will already be on-site gaming and enjoying the many entertainment opportunities offered at the Potawatomi Bingo Casino. However, this discount was not taken to ensure that the maximum potential hotel traffic impacts are tested.

Trip Distribution

As noted, the hotel will be served well by the several means of accessing the Potawatomi Bingo Casino. This will help minimize the traffic impacts by distributing the hotel trips over several locations. *Exhibit 5 – Part B* summarizes the trip distribution, which is based on the traffic volumes and travel patterns illustrated on *Exhibit 3.4* – Existing Traffic 5 PM to 6 PM.

PART IV. TRAFFIC EVALUATION

Exhibits 6 and 7 – Site and Total Traffic Assignments

Exhibit 6 illustrates the site traffic assignment, which is based on the project traffic characteristics summarized in *Exhibit 5* (e.g. traffic generations and trip distribution) and the site access drives. Site traffic and background volumes (see *Exhibits 3 and 6*) were combined to produce the Total Traffic Assignment, which is illustrated in *Exhibit 7*.

Pertinent comments on the traffic assignments include...

- About 65% of hotel traffic is anticipated to use the convenience of the valet service and/or to drop-off and pick-up passengers and luggage at the hotel porte cochere prior to parking in one of the garages.

- The remaining 35% of hotel guests would use the direct access to the garage on upper 16th Street. These trips would probably be made by hotel patrons who don't have much luggage and by Bingo Casino gamers who decide to check-in at a later time.

- The total traffic assignment (see *Exhibit 7*) reflects the change in the current Bingo Casino valet drop-off / pick-up operations. This will add westbound left turns and eastbound right turns on Canal Street at Potawatomi Circle (lower 16th Street) that now use the existing valet.

Exhibit 8 – Intersection Capacity Analyses

Intersection capacity analyses were conducted, per guidelines in the Highway Capacity Manual (HCM). At signalized intersections, Level of Service (LOS) reports operations using the letter designations "A" (best) through "F" (worst) and measures the average control delay per vehicle in seconds. At unsignalized intersections where the minor approaches have stop control, the HCM measurement is approach delay in seconds, with the results reported from LOS A to LOS F.

Exhibit 8 summarizes the intersection capacity analysis results for the weekday evening peak hour. The software printouts are also provided in the *Appendix* for reference. Pertinent comments include...

- All intersections tested will continue to operate better than the design LOS C. In fact, site traffic has less than a one second impact on the overall delay at all intersections during the weekday evening peak hour.

- The 95th percentile queue for eastbound Canal at Potawatomi Circle (lower 16th Street) is 102 feet for existing traffic and 122 feet for the total traffic.

Key Findings. Based on the results of the capacity analyses, no road improvements are needed to specifically accommodate hotel traffic. And the eastbound queue on Canal Street will not extend past the new valet entrance. Thus, our recommendations focus on the access operations and site plan elements.

PART V. SITE PLAN ELEMENTS

Hotel Access Recommendations

Canal Street Valet Entrance

1. The drive will be relocated a bit to the east from its current location, about 150 feet west of Potawatomi Circle. Access will be limited to inbound movements only with a one-way counterclockwise circulation pattern.
2. Two inbound lanes will be provided from Canal, then will widen in the porte cochere influence area for four lanes, including valet lanes, a through travel lane, and a bus staging area for luggage and passenger unloading.
3. The median on Canal Street should be modified to close the existing opening. A new opening and westbound left turn lane should be provided. The site plan shows that about three cars of stacking can be provided, which should be adequate to accommodate the anticipated volumes (see *Exhibits 6 and 7*).
4. The modified island should be designed so as to physically preclude a driver from attempting to exit via the entrance.

Potawatomi Circle (lower 16th Street) Valet Exit

5. The valet exit will also be relocated a bit to the north onto Potawatomi Circle. Two exit lanes will be provided and should be striped for separate left and right turns.
6. Exiting site traffic should have Stop control.

Hotel and Casino Valet and Drop-off / Pick-Up Operations

As discussed, car valet attendants and the public dropping off patrons and luggage will enter via Canal Street then exit onto Potawatomi Circle. Valet attendants will drive past the truck loading dock and drive down the existing ramp to the underground parking. Hotel guest self-parkers will exit onto Potawatomi Circle and park in one of the parking garages. The reverse will occur for hotel pick-up.

Hotel bus guests will be dropped off at the entrance porte cochere and the bus will then drive to the east end where luggage will be taken into the hotel by staff. It is currently planned that hotel patrons leaving by bus will be picked up on the south side of the Bingo Casino.

The Bingo Casino valet drop-off / pick-up will take place in the existing west parking garage.

Parking

A new 480 stall parking garage will be built immediately east of the adjacent decks. The new garage will be interconnected to the other two garages. A one-bay surface parking lot will also be built, perhaps to be reserved for staff.

PART VI. TECHNICAL ADDENDUM

The following *Exhibits and Appendices* were previously referenced. They provide technical support for our observations, findings, and recommendations discussed in the text.

Exhibits

1. Site Vicinity Aerials
2. Photo Inventory
3. Existing Traffic
4. Site Plan
5. Project Traffic Characteristics
6. Site Traffic
7. Total Traffic
8. Intersection Capacity Analyses

Appendices

A. Capacity Analysis Worksheets

* * * * * * * * * * * * *

This Traffic Impact Analysis (TIA) for the proposed Potawatomi Bingo Casino Hotel prepared by:

William C. Grieve, P.E., PTOE
Senior Transportation Engineer
GEWALT HAMILTON ASSOCIATES, INC.
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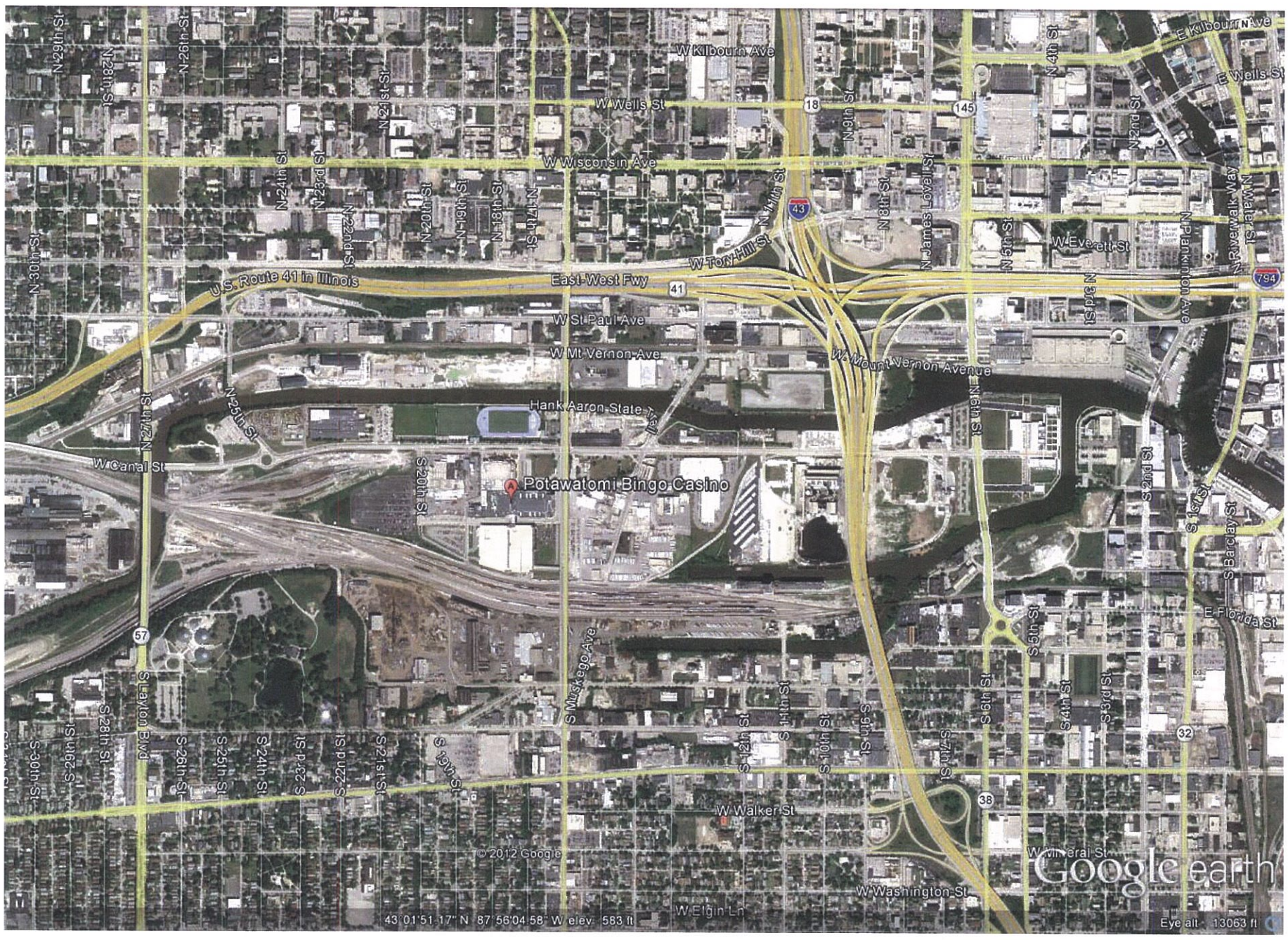
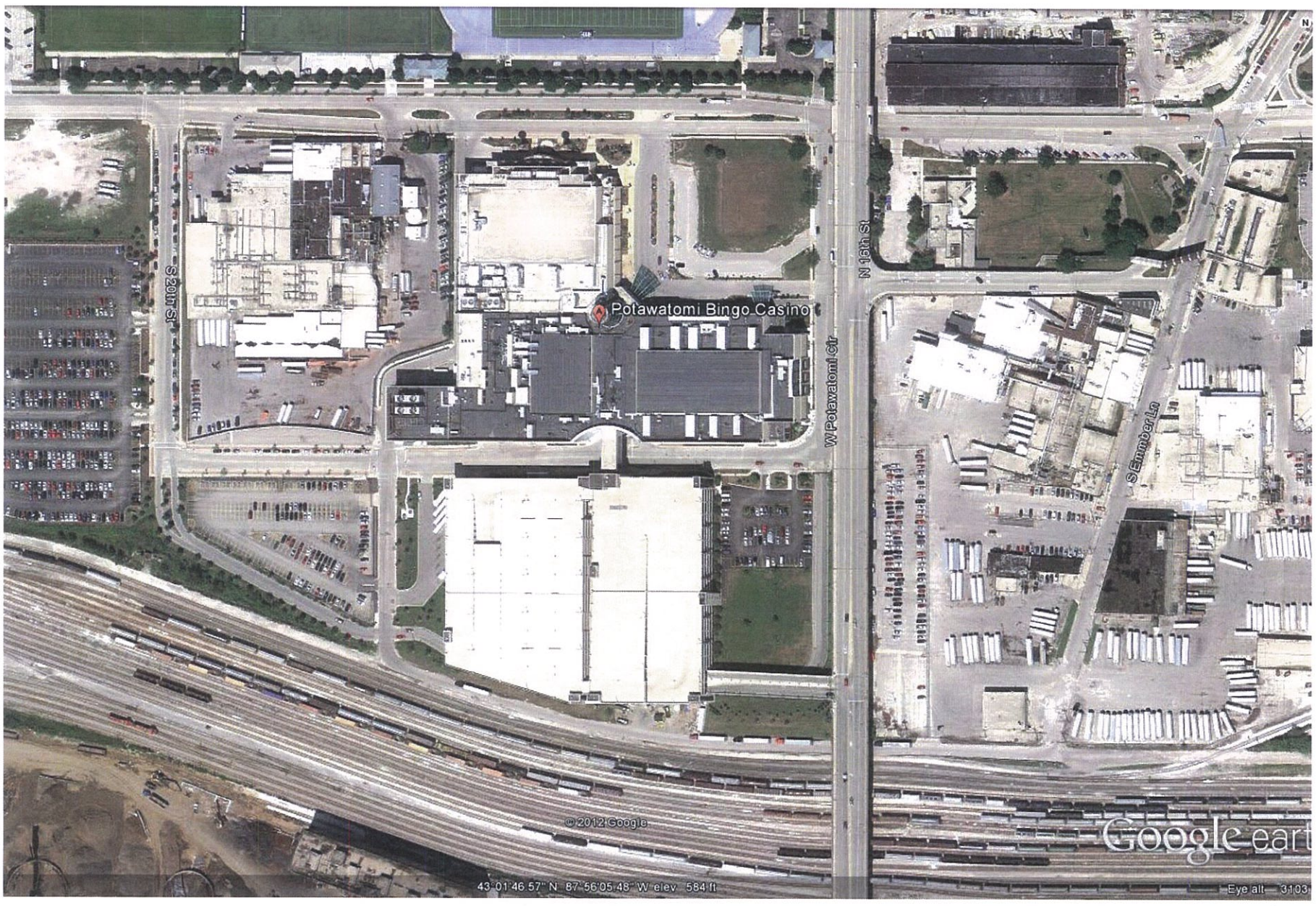
GEWALT HAMILTON ASSOCIATES, INC.

TECHNICAL ADDENDUM

Exhibit 1
SITE LOCATION AERIALS





Source: Google Earth

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Aerial photograph of Canal Street at 20th Street - west of Potawatomi Casino.

Looking eastbound along Canal Street across 20th Street.

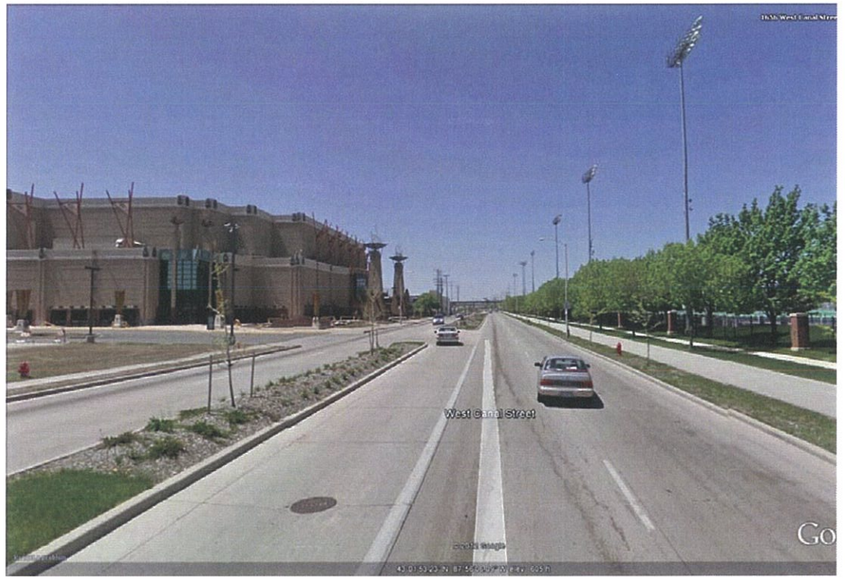
Looking north along 20th Street across Canal Street.

Looking westbound along Canal Street across 20th Street.

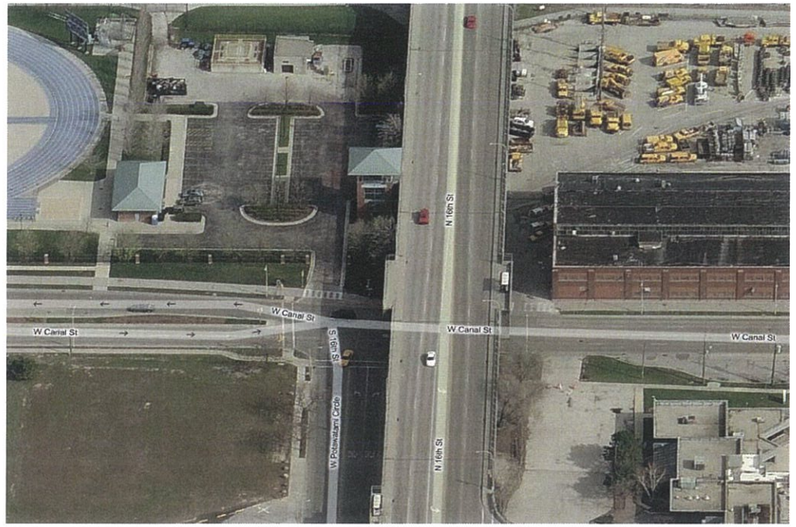
Aerial of Casino entrance off of Canal Street.

Looking south towards Potawatomi Casino across Canal Street.

Looking eastbound along Canal Street across Casino Entrance.

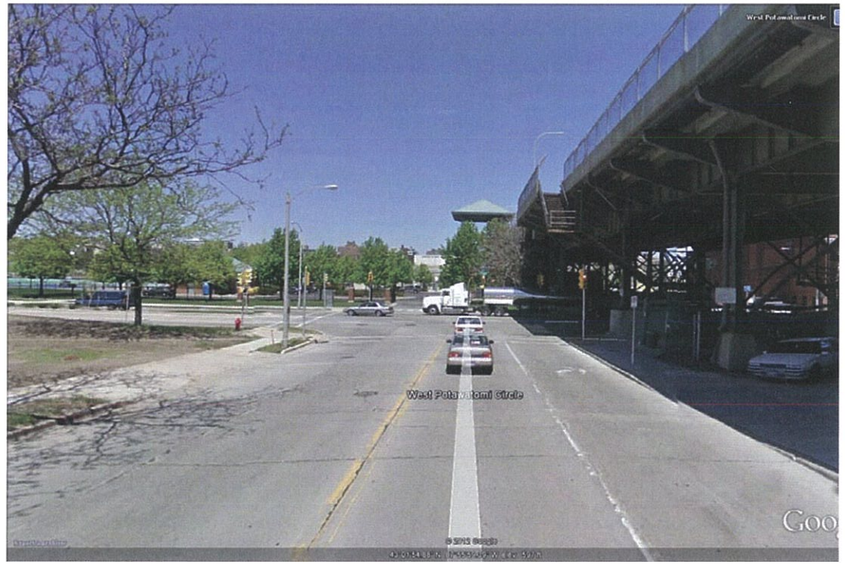


Looking westbound along Canal Street across Casino entrance drive.



Aerial view of Canal Street at Potawatomi Circle.

Looking eastbound along Canal Street at Potawatomi Circle.



Looking northbound along Potawatomi Circle toward Canal Street.

Looking westbound along Canal Street across Potawatomi Circle.

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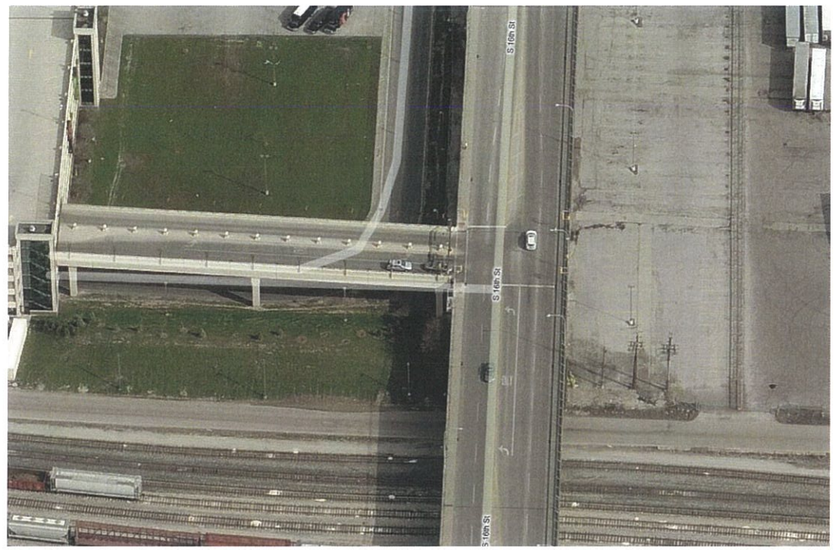
Exhibit 2.3
Photo Inventory



Aerial photograph of 16th Street at Potawatomi Casino parking deck entrance.

Looking northbound along 16th Street across parking deck entrance ramp.

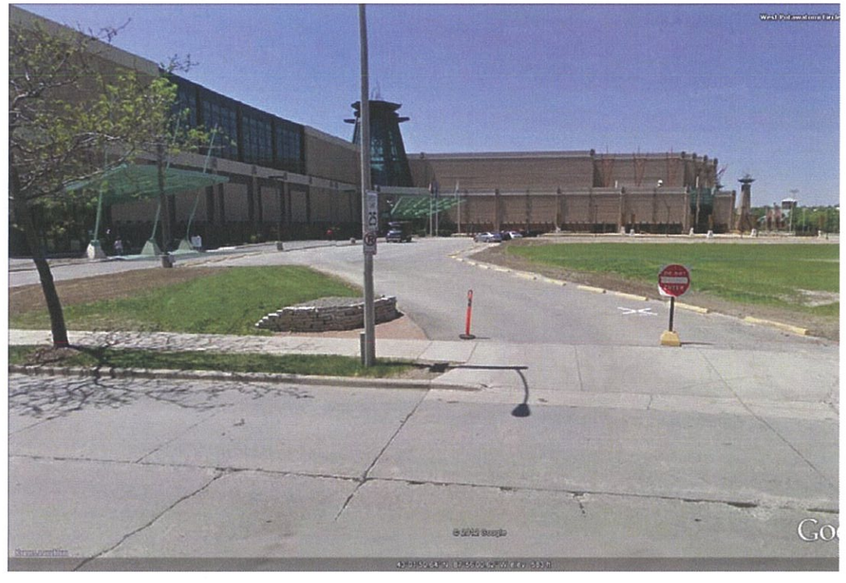
Looking westbound towards Potawatomi Casino Garage.

Looking southbound along 16th Street across parking deck entrance ramps.

Looking northbound along Potawatomi Circle across Casino exit driveway.

Looking westbound toward Casino at the main exit driveway.

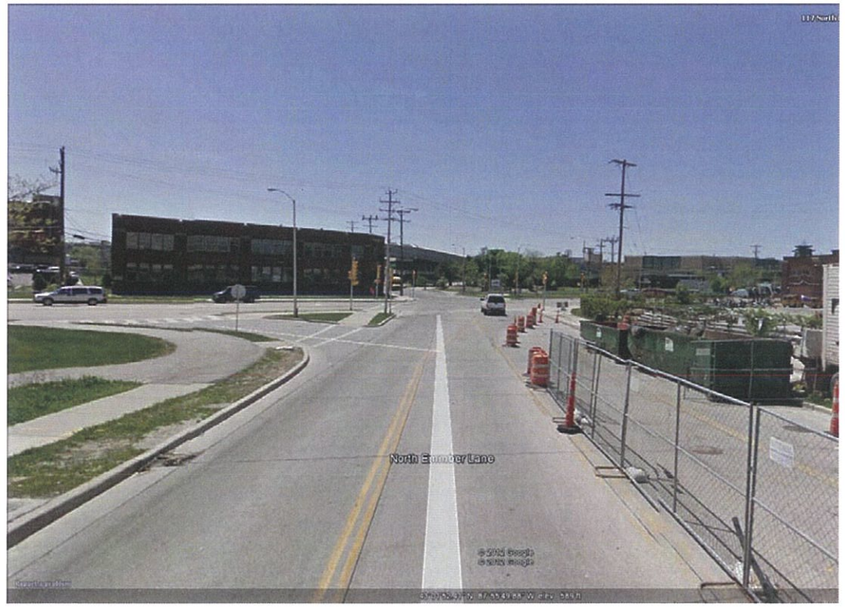
Looking southbound along Potawatomi Circle towards across Casino exit driveway.



Looking westbound toward Casino at auxiliary exit driveway.

Looking northbound along Emmber Lane across Canal Street.

Looking eastbound along Canal Street across Emmber Lane.



Looking southbound along Emmber Lane across Canal Street.

Looking westbound along Canal Street across Emmber Lane.

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Exhibit 2.6
Photo Inventory

N

Not to Scale

Canal St

Potawatomi Cir
20th Street

MPAC

One-Way

Potawatomi Casino

SITE

Potawatomi Cir

16th St

Cargill

Emmber Ln

IN	OUT	TOTAL
765	760	1525

Parking Lot

Bus Parking

Casino Garage

Parking Lot

Double Deck Entrance

Legend:

XX – Traffic Volumes

\- – Less Than 5 Vehicles

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Exhibit 3.1
Existing Traffic Volumes
2:00 - 3:00 PM

N

Not to Scale

Canal St

475
40

300
240

315
50

515
40

310
40

370
100

230
80

185
150

30
250
20

000
000
000

50
215
115

135
35
10

Potawatomi Cir
20th Street

MPAC

One-Way

Potawatomi Casino

SITE

35
180

Potawatomi Cir

16th St

Cargill

35
15

265

IN OUT TOTAL
765 865 1630

Emmber Ln

Parking Lot

Bus Parking

Casino Garage

Parking Lot

85
450

Double Deck
Entrance

55
110

140
450

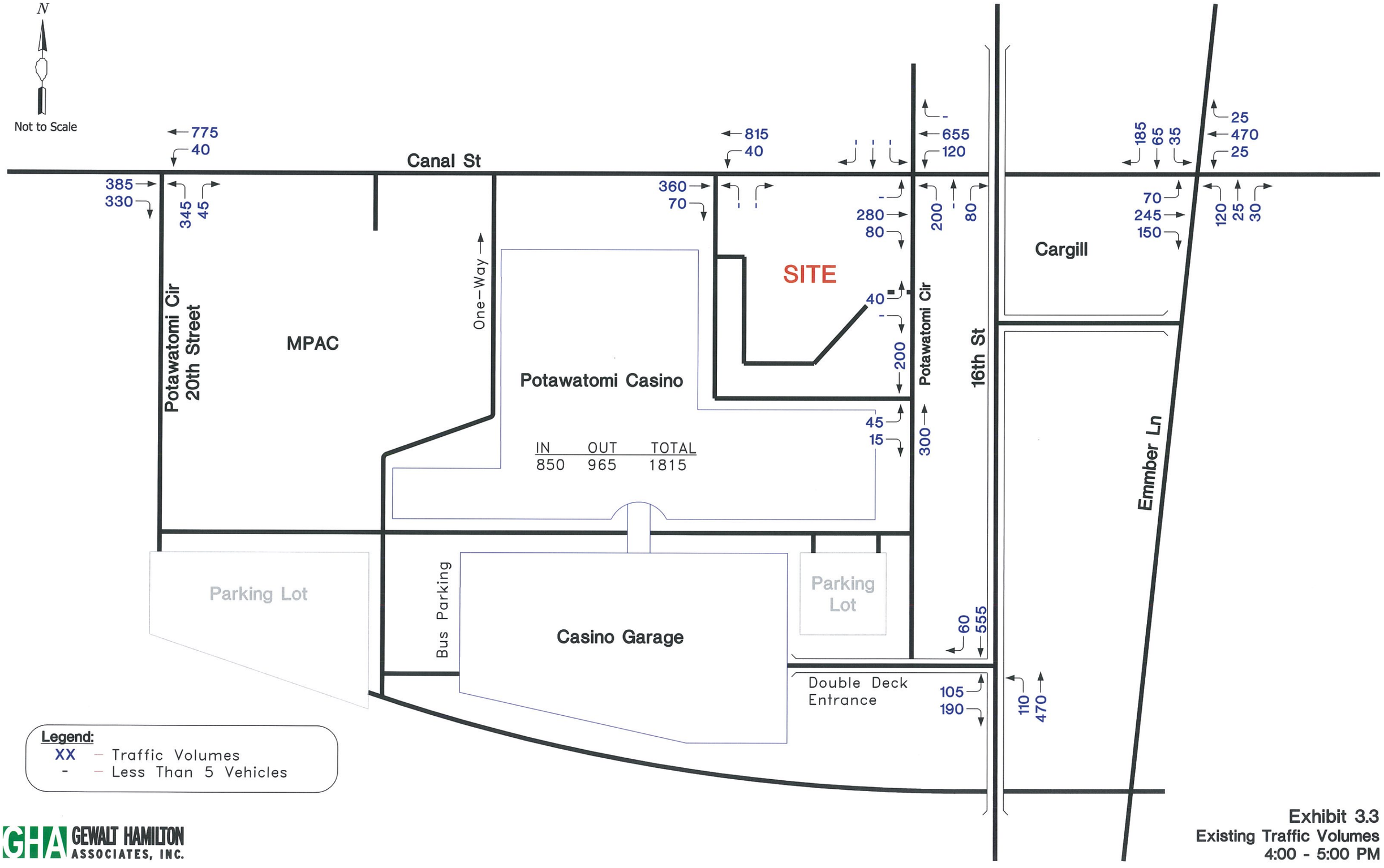
Legend:

XX – Traffic Volumes

\- – Less Than 5 Vehicles

GHA GEWALT HAMILTON ASSOCIATES, INC.

Exhibit 3.2
Existing Traffic Volumes
3:00 - 4:00 PM



GHA GEWALT HAMILTON ASSOCIATES, INC.

Exhibit 3.3
Existing Traffic Volumes
4:00 - 5:00 PM

N

Not to Scale

Canal St

Potawatomi Cir
20th Street

MPAC

One-Way

Potawatomi Casino

SITE

Potawatomi Cir

16th St

Cargill

Emmber Ln

IN	OUT	TOTAL
925	900	1825

Parking Lot

Bus Parking

Casino Garage

Parking Lot

Double Deck Entrance

760
25
405
280
310
30
785
55
360
75
670
115
270
90
170
150
40
205
55
20
225
15
530
20
190
40
20
45
255
120
65
20
10
90
515
100
140
195
335

Legend:

XX – Traffic Volumes

\- – Less Than 5 Vehicles

GHA GEWALT HAMILTON ASSOCIATES, INC.

Exhibit 3.4
Existing Traffic Volumes
5:00 - 6:00 PM

N

Not to Scale

Canal St

Potawatomi Cir
20th Street

MPAC

One-Way

Potawatomi Casino

SITE

Potawatomi Cir

16th St

Cargill

Emmber Ln

IN	OUT	TOTAL
950	850	1800

Parking Lot

Bus Parking

Casino Garage

Parking Lot

Double Deck Entrance

270
20
330
295
230
10
290
45
260
80
190
95
155
105
145
100
25
200
50
15
170
95
535
165
200
215
350
15
165
10
60
30
15
40
165
50
60
15
20

Legend:

XX – Traffic Volumes

\- – Less Than 5 Vehicles

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Exhibit 3.5
Existing Traffic Volumes
6:00 - 7:00 PM

N

Not to Scale

Canal St

Potawatomi Cir
20th Street

MPAC

One-Way

Potawatomi Casino

SITE

Potawatomi Cir

16th St

Cargill

Emmber Ln

IN	OUT	TOTAL
910	810	1720

Parking Lot

Bus Parking

Casino Garage

Parking Lot

Double Deck Entrance

Legend:

XX – Traffic Volumes

\- – Less Than 5 Vehicles

GHA GEWALT HAMILTON ASSOCIATES, INC.

Exhibit 3.6
Existing Traffic Volumes
7:00 - 8:00 PM

N

Not to Scale

Canal St

Potawatomi Cir
20th Street

MPAC

One-Way

Potawatomi Casino

SITE

Potawatomi Cir

16th St

Cargill

Emmber Ln

IN	OUT	TOTAL
685	925	1610

Parking Lot

Bus Parking

Casino Garage

Parking Lot

Double Deck Entrance

Legend:

XX – Traffic Volumes

\- – Less Than 5 Vehicles

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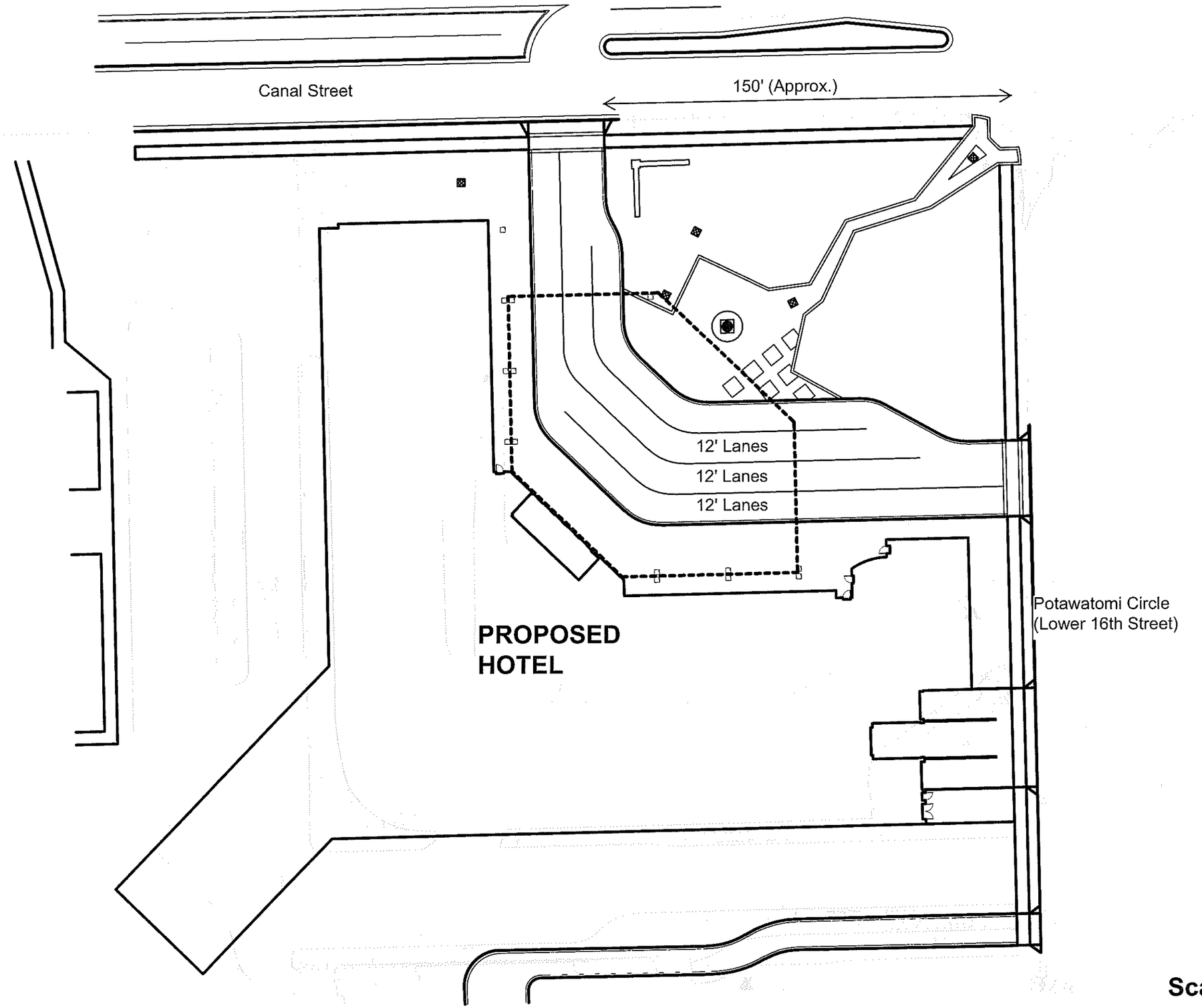
Exhibit 3.7
Existing Traffic Volumes
8:00 - 9:00 PM



NORTH

L:\Jobs2011\20110070-01\CAD\Site\dwg\resIC_00_prop070_DPD_GPD.dwg, 3/24/2012 7:25:20 AM, 1292, DWG To PDF.pc3

Exhibit 4
Site Plan
Scale: 1"=40' (Approx.)

Exhibit 5
Project Traffic Characteristics
Potawatomi Bingo Casino Hotel - Milwaukee, Wisconsin

Part A. Traffic Generation Calculations

		Peak Hours						Daily
	ITE	Weekday Morning			Weekday Evening			Weekday
	Code	In	Out	Sum	In	Out	Sum	Sum
Luxury Hotel	#310							
385 rooms		140	80	220	120	110	230	3,070
Less trips on-site @ 50% =		-70	-40	-110	-60	-55	-115	-1,535
	Totals =	**70**	**40**	**110**	**60**	**55**	**115**	**1,535**

Notes:

1) Source: Institute of Transportation Engineers (ITE) Trip Generation Manual; 8th Edition

2) Per owner information, about 50% of hotel traffic would be already at the Bingo Casino. This discount was NOT taken to ensure the maximum hotel traffic impacts were tested.

Part B. Trip Distribution

	Percent Use	
Route & Direction	Approach Site From	Depart Site To
16th Street (Upper)		
- North of Garage Access	10%	11%
- South of Garage Access	21%	16%
Emmber Lane		
- North of Canal Street	6%	5%
- South of Canal Street	5%	5%
Canal Street		
- East of Emmber Lane	10%	10%
- West of Casino	48%	53%
Totals =	100%	100%

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N

Not to Scale

Canal St

Potawatomi Cir
20th Street

MPAC

One-Way

Potawatomi Casino

SITE

16th St

Cargill

Potawatomi Cir
(Lower 16th St)

Emmber Ln

Parking Lot

Bus Parking

Casino Garage

Parking Lot

Double Deck
Entrance

Legend:

XX – Traffic Volumes

\- – Less Than 5 Vehicles

XX% – Directional Distribution

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Exhibit 6
Site Traffic

N

Not to Scale

Canal St

790
25
460
280
340
30
815
25
435
55
640
170
270
165
200
175
-
15
545
20
195
40
20
50
270
125
70
20
10

Potawatomi Cir
20th Street

MPAC

One-Way

Potawatomi Casino

SITE
25
55
390
30

16th St

Cargill

Emmber Ln

Potawatomi Cir320
(Lower 16th St)

Parking Lot

Bus Parking

Casino Garage

Parking
Lot

105
515

Double Deck
Entrance

110
155

220
335

Legend:

XX – Traffic Volumes

\- – Less Than 5 Vehicles

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Exhibit 7
Total Traffic

Exhibit 8
Intersection Capacity Analyses
Potawatomi Hotel; Milwaukee, Wisconsin

Part I. Parameters - Type of Traffic Control (Source: 2010 Highway Capacity Manual)

A. Traffic Signals

LOS	Delay (sec/veh)	Description
A	≤ 10	All signal phases clear waiting vehicles without delay
B	>10 and ≤ 20	Minimal delay experienced on select signal phases
C	>20 and ≤ 35	Some delay experienced on several phases; often used as design criteria
D	>35 and ≤ 55	Usually considered as the acceptable delay standard
E	>55 and ≤ 80	Very long delays experienced during the peak hours
F	>80	Unacceptable delays experienced throughout the peak hours

B. Stop Sign

LOS	Delay (sec/veh)
A	≤ 10
B	>10 and ≤ 15
C	>15 and ≤ 25
D	>25 and ≤ 35
E	>35 and ≤ 50
F	>50

Part II. Results

Intersection Operations		LOS Per Movement By Approach (Note: < > = shared lane; - = non-critical movement)												Intersection or Approach	
		Eastbound (EB)			Westbound (WB)			Northbound (NB)			Southbound (SB)			Delay	
		LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT	(sec / veh)	LOS
	Traffic Signal													**Intersection Delay**	
Emmber Lane @ Canal Street															
Existing Traffic (see *Exhibit 3*)	• Current	A	A	<	B	B	<	>	B	<	>	B	<	15.1	B
Total Traffic (see *Exhibit 7*)	• Current	A	A	<	B	B	<	>	B	<	>	B	<	15.2	B
16th Street (lower) @ Canal Street															
Existing Traffic	• Current	-	A	<	>	B	-	B	-	B	-	-	-	11.0	B
	102 ft. = 95th % Queue														
Total Traffic	• Current	-	A	<	>	B	-	B	-	B	-	-	-	11.4	B
	122 ft. = 95th % Queue														
20th Street @ Canal Street															
Existing Traffic	• Current	-	A	<	>	B	-	>	C	<	-	-	-	10.7	B
Total Traffic	• Current	-	A	<	>	B	-	>	C	<	-	-	-	11.3	B
16th Street (upper) @ Garage															
Existing Traffic	• Current	B	-	B	-	-	-	A	A	-	-	A	<	9.2	A
Total Traffic	• Current	B	-	B	-	-	-	A	A	-	-	A	<	9.7	A

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APPENDIX A

INTERSECTION CAPACITY ANALYSES PRINTOUTS

HCS+: Signalized Intersections Release 5.21

Analyst: Bg
Agency:
Date: 3/24/2012
Period: PM PEAK
Project ID:
E/W St: CANAL STREET

Inter.: CANAL ST. @ EMMBER LN.
Area Type: All other areas
Jurisd:
Year : EXISTING
N/S St:

SIGNALIZED INTERSECTION SUMMARY

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	2	0	1	2	0	0	1	0	0	1	0
LGConfig	L	TR		L	TR			LTR			LTR	
Volume	45	255	120	20	530	15	65	20	10	20	40	190
Lane Width	12.0	12.0		12.0	12.0			12.0			12.0	
RTOR Vol			0			0			0			0

Duration 0.25 Area Type: All other areas

Signal Operations

Phase Combination	1	2	3	4	5	6	7	8
EB Left	A	A			NB Left	A		
Thru	A	A			Thru	A		
Right	A	A			Right	A		
Peds					Peds			
WB Left		A			SB Left	A		
Thru		A			Thru	A		
Right		A			Right	A		
Peds					Peds			
NB Right					EB Right			
SB Right					WB Right			
Green	7.0	17.0				20.5		
Yellow	4.0	4.0				4.0		
All Red	0.0	1.5				2.0		

Cycle Length: 60.0 secs

Intersection Performance Summary

Appr/ Lane Grp	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound								
L	403	1805	0.12	0.49	8.8	A		
TR	1607	3444	0.25	0.47	9.7	A	9.6	A
Westbound								
L	280	988	0.08	0.28	15.9	B		
TR	1021	3602	0.56	0.28	19.0	B	18.9	B
Northbound								
LTR	454	1329	0.22	0.34	14.3	B	14.3	B
Southbound								
LTR	567	1660	0.46	0.34	16.1	B	16.1	B

Intersection Delay = 15.1 (sec/veh) Intersection LOS = B

HCS+: Signalized Intersections Release 5.21

Analyst: Bg
Agency:
Date: 3/24/2012
Period: PM PEAK
Project ID:
E/W St: CANAL STREET

Inter.: CANAL ST. @ EMMBER LN.
Area Type: All other areas
Jurisd:
Year : TOTAL

N/S St: 50

SIGNALIZED INTERSECTION SUMMARY

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	2	0	1	2	0	0	1	0	0	1	0
LGConfig	L	TR		L	TR			LTR			LTR	
Volume	50	265	125	20	545	15	70	20	10	20	40	195
Lane Width	12.0	12.0		12.0	12.0			12.0			12.0	
RTOR Vol			0			0			0			0

Duration 0.25 Area Type: All other areas

Signal Operations

Phase Combination	1	2	3	4		5	6	7	8
EB Left	A	A			NB Left	A			
Thru	A	A			Thru	A			
Right	A	A			Right	A			
Peds					Peds				
WB Left		A			SB Left	A			
Thru		A			Thru	A			
Right		A			Right	A			
Peds					Peds				
NB Right					EB Right				
SB Right					WB Right				
Green	7.0	17.0				20.5			
Yellow	4.0	4.0				4.0			
All Red	0.0	1.5				2.0			

Cycle Length: 60.0 secs

Intersection Performance Summary

Appr/ Lane Grp	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound								
L	396	1805	0.13	0.49	8.9	A		
TR	1607	3443	0.26	0.47	9.8	A	9.7	A
Westbound								
L	275	972	0.08	0.28	15.9	B		
TR	1021	3603	0.58	0.28	19.2	B	19.1	B
Northbound								
LTR	446	1306	0.24	0.34	14.4	B	14.4	B
Southbound								
LTR	567	1659	0.47	0.34	16.1	B	16.1	B

Intersection Delay = 15.2 (sec/veh) Intersection LOS = B

HCS+: Signalized Intersections Release 5.21

Analyst: Bg
Agency:
Date: 3/24/2012
Period: PM PEAK
Project ID:
E/W St: CANAL STREET

Inter.: CANAL ST. @ 16th ST. (lower)
Area Type: All other areas
Jurisd:
Year : EXISTING

N/S St: 16th STREET (lower)

SIGNALIZED INTERSECTION SUMMARY

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	2	0	0	2	0	1	0	1	0	0	0
LGConfig		TR			LT		L		R			
Volume		270	90	115	670		170		150			
Lane Width		12.0			12.0		12.0		12.0			
RTOR Vol			0						0			

Duration 0.25 Area Type: All other areas

Signal Operations

Phase Combination	1	2	3	4	5	6	7	8
EB Left					NB Left	A		
Thru		A			Thru			
Right		A			Right	A		
Peds					Peds			
WB Left		A			SB Left			
Thru		A			Thru			
Right					Right			
Peds					Peds			
NB Right					EB Right			
SB Right					WB Right			
Green		31.0				18.0		
Yellow		4.0				3.5		
All Red		1.5				2.0		

Cycle Length: 60.0 secs

Intersection Performance Summary

Appr/ Lane Grp	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound								
TR	1799	3482	0.21	0.52	7.9	A	7.9	A
Westbound								
LT	1532	2965	0.54	0.52	10.1	B	10.1	B
Northbound								
L	542	1805	0.33	0.30	16.7	B		
							16.7	B
R	485	1615	0.33	0.30	16.7	B		
Southbound								

Intersection Delay = 11.0 (sec/veh) Intersection LOS = B

HCS+: Signalized Intersections Release 5.21

Analyst: Bg
Agency:
Date: 3/24/2012
Period: PM PEAK
Project ID:
E/W St: CANAL STREET

Inter.: CANAL ST. @ 16th ST. (lower)
Area Type: All other areas
Jurisd:
Year : TOTAL

N/S St: 16th STREET (lower)

SIGNALIZED INTERSECTION SUMMARY

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	2	0	0	2	0	1	0	1	0	0	0
LGConfig		LTR			LTR		L		R			
Volume	0	270	165	170	640	0	170		150			
Lane Width		12.0			12.0		12.0		12.0			
RTOR Vol			0			0			0			

Duration 0.25 Area Type: All other areas

Signal Operations

Phase Combination	1	2	3	4		5	6	7	8
EB Left	A				NB Left	A			
Thru	A				Thru	A			
Right	A				Right	A			
Peds					Peds				
WB Left	A				SB Left	A			
Thru	A				Thru	A			
Right	A				Right	A			
Peds					Peds				
NB Right					EB Right				
SB Right					WB Right				
Green	31.0					18.0			
Yellow	4.0					3.5			
All Red	1.5					2.0			

Cycle Length: 60.0 secs

Intersection Performance Summary

Appr/ Lane Grp	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound								
LTR	1762	3411	0.26	0.52	8.2	A	8.2	A
Westbound								
LTR	1394	2699	0.61	0.52	11.0	B	11.0	B
Northbound								
L	542	1805	0.33	0.30	16.7	B		
							16.7	B
R	485	1615	0.33	0.30	16.7	B		
Southbound								

Intersection Delay = 11.4 (sec/veh) Intersection LOS = B

HCS+: Signalized Intersections Release 5.21

Analyst: Bg
Agency:
Date: 3/24/2012
Period: PM PEAK
Project ID:
E/W St: CANAL STREET

Inter.: CANAL ST. @ 20th ST.
Area Type: All other areas
Jurisd:
Year : EXISTING

N/S St: 20th STREET

SIGNALIZED INTERSECTION SUMMARY

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	2	0	0	2	0	1	0	0	0	0	0
LGConfig		TR			LT		L	LR				
Volume		405	280	25	760		310		30			
Lane Width		12.0			12.0		12.0	12.0				
RTOR Vol			0						0			

Duration 0.25 Area Type: All other areas

Signal Operations

Phase Combination	1	2	3	4		5	6	7	8
EB Left					NB Left	A			
Thru		A			Thru				
Right		A			Right	A			
Peds					Peds				
WB Left		A			SB Left				
Thru		A			Thru				
Right					Right				
Peds					Peds				
NB Right					EB Right				
SB Right					WB Right				
Green		32.5				17.0			
Yellow		4.0				3.5			
All Red		1.5				1.5			

Cycle Length: 60.0 secs

Intersection Performance Summary

Appr/ Lane Grp	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound								
TR	1840	3396	0.39	0.54	8.1	A	8.1	A
Westbound								
LT	1804	3330	0.46	0.54	8.6	A	8.6	A
Northbound								
L	511	1805	0.64	0.28	21.5	C		
LR	458	1615	0.07	0.28	15.8	B	21.0	C
Southbound								

Intersection Delay = 10.7 (sec/veh) Intersection LOS = B

HCS+: Signalized Intersections Release 5.21

Analyst: Bg
Agency:
Date: 3/24/2012
Period: PM PEAK
Project ID:
E/W St: CANAL STREET

Inter.: CANAL ST. @ 20th ST.
Area Type: All other areas
Jurisd:
Year : TOTAL

N/S St: 20th STREET

SIGNALIZED INTERSECTION SUMMARY

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	2	0	0	2	0	1	0	0	0	0	0
LGConfig		TR			LT		L	LR				
Volume		460	280	25	760		340		30			
Lane Width		12.0			12.0		12.0	12.0				
RTOR Vol			0						0			

Duration 0.25 Area Type: All other areas

Signal Operations

Phase Combination	1	2	3	4		5	6	7	8
EB Left					NB Left	A			
Thru		A			Thru				
Right		A			Right	A			
Peds					Peds				
WB Left		A			SB Left				
Thru		A			Thru				
Right					Right				
Peds					Peds				
NB Right					EB Right				
SB Right					WB Right				
Green		32.5				17.0			
Yellow		4.0				3.5			
All Red		1.5				1.5			

Cycle Length: 60.0 secs

Intersection Performance Summary

Appr/ Lane Grp	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound								
TR	1848	3412	0.42	0.54	8.3	A	8.3	A
Westbound								
LT	1798	3320	0.46	0.54	8.6	A	8.6	A
Northbound								
L	511	1805	0.70	0.28	23.5	C		
LR	458	1615	0.07	0.28	15.8	B	22.9	C
Southbound								

Intersection Delay = 11.3 (sec/veh) Intersection LOS = B

HCS+: Signalized Intersections Release 5.21

Analyst: Bg
Agency:
Date: 3/24/2012
Period: PM PEAK
Project ID:
E/W St: GARAGE

Inter.: 16th STREET (upper) @ GARAGE
Area Type: All other areas
Jurisd:
Year : EXISTING

N/S St: 16th STREET (upper)

SIGNALIZED INTERSECTION SUMMARY

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	0	1	0	0	0	1	2	0	0	2	0
LGConfig	L		R				L	T			TR	
Volume	100		140				195	335			515	90
Lane Width	12.0		12.0				12.0	12.0			12.0	
RTOR Vol			0									0

Duration 0.25 Area Type: All other areas

Signal Operations

Phase Combination	1	2	3	4	5	6	7	8
EB Left	A				NB Left	A		
Thru					Thru	A		
Right	A				Right	A		
Peds					Peds			
WB Left					SB Left			
Thru					Thru	A		
Right					Right	A		
Peds					Peds			
NB Right					EB Right			
SB Right					WB Right			
Green	17.0					33.0		
Yellow	3.5					3.5		
All Red	1.5					1.5		

Cycle Length: 60.0 secs

Intersection Performance Summary

Appr/ Lane Grp	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound								
L	511	1805	0.21	0.28	16.6	B		
							17.0	B
R	458	1615	0.32	0.28	17.4	B		
Westbound								
Northbound								
L	414	753	0.50	0.55	9.3	A		
T	1990	3618	0.18	0.55	6.8	A	7.7	A
Southbound								
TR	1945	3537	0.33	0.55	7.5	A	7.5	A

Intersection Delay = 9.2 (sec/veh) Intersection LOS = A

HCS+: Signalized Intersections Release 5.21

Analyst: Bg
Agency:
Date: 3/24/2012
Period: PM PEAK
Project ID:
E/W St: GARAGE

Inter.: 16th STREET (upper) @ GARAGE
Area Type: All other areas
Jurisd:
Year : TOTAL

N/S St: 16th STREET (upper)

SIGNALIZED INTERSECTION SUMMARY

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	0	1	0	0	0	1	2	0	0	2	0
LGConfig	L		R				L	T			TR	
Volume	110		155				220	335			515	105
Lane Width	12.0		12.0				12.0	12.0			12.0	
RTOR Vol			0									0

Duration 0.25 Area Type: All other areas

Signal Operations

Phase Combination	1	2	3	4	5	6	7	8
EB Left	A				NB Left	A		
Thru					Thru	A		
Right	A				Right	A		
Peds					Peds			
WB Left					SB Left			
Thru					Thru	A		
Right					Right	A		
Peds					Peds			
NB Right					EB Right			
SB Right					WB Right			
Green	17.0					33.0		
Yellow	3.5					3.5		
All Red	1.5					1.5		

Cycle Length: 60.0 secs

Intersection Performance Summary

Appr/ Lane Grp	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound								
L	511	1805	0.23	0.28	16.7	B		
							17.2	B
R	458	1615	0.36	0.28	17.6	B		
Westbound								
Northbound								
L	405	736	0.57	0.55	10.8	B		
T	1990	3618	0.18	0.55	6.8	A	8.4	A
Southbound								
TR	1939	3525	0.34	0.55	7.6	A	7.6	A

Intersection Delay = 9.7 (sec/veh) Intersection LOS = A