3030 ST. JOSEPH BOULEVARD RESIDENTIAL/COMMERCIAL BUILDING

TRANSPORTATION BRIEF

Submitted to: Orleans Heights Developments Madison Centre 4950 Younge Street Toronto, Ontario M2N 6K1

Submitted by:



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> September 18, 2017 476166 01000

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Transportation Brief

1. INTRODUCTION

From the information provided it is our understanding that the proposed mixed-use development project, located on a vacant lot at the southwest corner of the St. Joseph Blvd. /Duford Dr. intersection in Orleans, (3030 St. Joseph Boulevard), will be an approximate 12 storey building comprised of below grade parking (172 spaces), lower floor commercial (6,897 ft²), and 12 floors of residential apartments/condominiums (144 units). Vehicle access to the proposed parking garage will be via a right-in/right-out driveway connection to St. Joseph Blvd. The site in its local context is shown in Figure 1 and the proposed Site Plan is depicted in Figure 2.

As the project requires a minor Zoning By-Law Amendment and as approximately only 40 vph to 60 vph net new vehicle trips will be generated by the development during peak hours, and as its only vehicular driveway connection will be a right-in/right-out to St. Joseph Boulevard, a Transportation Brief is considered the appropriate type and level of transportation assessment.



Figure 1: Site Context



PARSONS 2. EXISTING CONDITIONS



2.1. AREA ROAD NETWORK

As shown in Figures 1 and 2, the triangular shaped site is bounded by St. Joseph Boulevard on the north and Duford Drive on the east and south. Commercial land uses and open space are on its western boundary.

St. Joseph Boulevard is a four-lane arterial road with auxiliary turn lanes at all adjacent signalized intersections. It extends east-west throughout Orleans and becomes Montreal Road west of its interchange with OR 174. Its intersection with Duford Drive is traffic signal controlled with auxiliary turn lanes and channelization in the southwest corner adjacent to the site. Along the length of the site's St. Joseph Boulevard frontage is an eastbound left-turn lane and raised median (plus a short length of painted median). It is for this reason that the development's proposed garage connection to St. Joseph Boulevard is a right-in/right-out only. Sidewalks are provided on both sides, but there are no delineated bicycle facilities. Its posted speed is 50 km/h and its right-of-way protection policy is for 37.5 m adjacent to the subject site. Within the City's Official Plan it is also designed as a cycling Spine Route and a Cross-Town Bikeway.

Duford Drive is a curvilinear two-lane collector road extending from St. Joseph Boulevard south to Hoylake Crescent internal to Orleans. Adjacent to the site, it has sidewalks on both sides but no delineated cycling facilities. Within the City's Official Plan it is designed as a cycling Local Route. Its posted speed is 40 km/h.

2.2. EXISTING INTERSECTION OPERATIONS

Illustrated in Figure 3 and included as Appendix A, are the most recent weekday morning and afternoon peak hour traffic volumes obtained from the City of Ottawa for the study area intersections. The Figure 3 volumes have been balanced somewhat.





The following Table 1 provides a summary of existing traffic operations at study area intersection based on the Synchro (V9) traffic analysis software. The subject intersections were assessed in terms of the volume-to-capacity (v/c) ratio and the corresponding Level of Service (LoS) for the critical movement(s). The subject intersections 'as a whole' were assessed based on a weighted v/c ratio and the Synchro model output of existing conditions is provided within Appendix B.





Table 1: Existing Performance of Study Area Intersections

	Weekday AM Peak (PM Peak)								
Intersection		Critical Mover	nent	Intersection					
	LoS	max. v/c or avg. delay (s)	Movement	Delay (s)	LoS	v/c			
St. Joseph/Place d'Orleans	A(D)	0.52(0.81)	SBL(SBL)	10.1(14.7)	A(A)	0.36(0.51)			
St. Joseph/Napoleon	A(A)	0.20(0.38)	WBT(EBT)	2.3(6.3)	A(A)	0.19(0.37)			
St. Joseph/Duford	A(D)	0.48(0.87)	NBL(SBL)	23.0(29.4)	A(B)	0.37(0.61)			
Note: Analysis of signalized intersections assumes a PHF of 0.95 and a saturation flow rate of 1800 veh/h/lane.									

As shown is Table 1, study area intersections 'as a whole' are currently operating at an acceptable LoS 'B' or better during both the weekday morning and afternoon peak hours. With regard to the 'critical movements' at study area intersections, they are operating at an acceptable LoS 'A' during the morning peak hour. During the afternoon peak hour, the southbound left-turn movements at the St. Joseph/Place d'Orleans and at the St. Joseph/Duford intersections are operating close to capacity (LoS 'D'). All movements at the St. Joseph/Napoleon intersection are operating at LoS 'A' during both peak hours.

3. PLANNED TRANSPOTATION NETWORK MODIFICATION

There are only two significant planned transportation network modifications planned for the general area. They are as follows along with their current construction schedules from the recent Transportation Master Plan.

- OR 174 widening to six lanes from the Hwy 417 split to Trim Road ______post 2031
- LRT extension to Place d'Orleans ______2023 (subject to funding)

4. BACKGROUND TRAFFIC GROWTH

A review of 2014 traffic counts at the St. Joseph/Place d'Orleans West intersection and a 2010 traffic count at the adjacent St. Joseph/Shopping Centre intersection was used to identify current background traffic growth. These counts were quite comparable with only a marginal increase over four years. Accordingly, a conservative 1% annual growth rate will be used up to the horizon year (assumed to be 2018/2019).

5. PROJECTED TRAFFIC CONDITIONS

5.1. SITE-GENERATED PEAK HOUR TRAFFIC

Appropriate trip generation rates for the proposed development consisting of approximately 6,897 ft² of specialty retail and 144 mid-rise apartments were obtained from the 9th Edition of the Institute of Transportation Engineers (ITE) Trip Generation Manual, which are summarized in Table 2.





Table	2:	ITE	Trip	Generation	Rates
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	Data Sourco	Trip Rates						
Lanu USe	Data Source	AM Peak	PM Peak					
Specialty Retail	ITE 826	T = 1.36 (X); T = 1.20(X) + 10.74	T = 2.71 (X); T = 2.40(X) + 21.48					
Mid-Rise Apartments	ITE 223	T = 0.30(du); T = 0.41(du) - 13.06	T = 0.51(du); T = 0.48(du) - 11.07					
Notes: T = Average Vehicle Trip Ends X = 1,000 ft ² Gross Floor Area du = Dwelling units Specialty Retail AM Peak is assumed to be 50% of the PM Peak								

As ITE trip generation surveys only record vehicle trips and typically reflect highly suburban locations (with little to no access by travel modes other than private automobiles), adjustment factors appropriate to the more urban study area context were applied to attain estimates of person trips for the proposed development.

To convert ITE vehicle trip rates to person trips, an auto occupancy factor and a non-auto trip factor were applied to the ITE vehicle trip rates. Our review of available literature suggests that a combined factor of approximately 1.3 is considered reasonable to account for typical North American auto occupancy values of approximately 1.15 and combined transit and non-motorized modal shares of less than 10%. As such, the person trip generation for the proposed site is summarized in Table 3.

Land Lico	Area	AM Pe	eak (Person Trips/h)		PM Peak (Person Trips/h)			
Lanu USe	Area	In	Out	Total	In	Out	Total	
Specialty Retail	6,897 ft ²	18	93	111	87	44	131	
Mid-Rise Apartments	144 units	82	246	328	262	155	417	
Total	Person Trips	100	339	439	349	199	548	
Note: 1.3 factor to account for typical North American auto occupancy values of approximately 1.15 and combined transit and non-motorized modal shares of less than 10%								

Table 3: Modified Person Trip Generation

The person trips shown in Table 3 for the proposed site were then reduced by modal share and pass-by values based on the site's location and proximity to adjacent communities, employment, and other shopping uses. Modal share and passby values for the proposed retail and apartments are summarized in Tables 4 and 5, respectively, with the total site vehicle trip generation summarized in Table 6.

Travel Mode	Mode Share	AM Peak (Person Trips/h) PM Peak (Perso				eak (Person Ti	Trips/h)	
	Noue Share	In	Out	Total	In	Out	Total	
Auto Driver	50%	7	6	13	11	14	25	
Auto Passenger	15%	3	2	5	3	5	8	
Transit	25%	3	2	5	5	7	12	
Non-motorized	10%	1	1	2	2	2	4	
Total Person Trips 1000		14	11	25	21	28	49	
Less Pa	-2	-2	-4	-3	-3	-6		
Total 'New	5	4	9	8	11	19		

Table 4: Specialty Retail Trip Generation



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Table 5: Mid-Rise Apartment Trip Generation

Travel Mede	Modo Shara	AM Pe	eak (Person Tr	ips/h)	PM Peak (Person Trips/h)		
	NOUE Share	In	Out	Total	In	Out	Total
Auto Driver	50%	9	21	30	22	16	38
Auto Passenger	15%	3	7	10	7	5	12
Transit	25%	5	10	15	10	8	18
Non-motorized	10%	1	4	5	4	3	7
Total Person Trips	100%	18	42	60	43	32	75
Total 'New	9	21	30	22	16	38	

Table 6: Total Site Vehicle Trip Generation

	AM Peak (veh/h)			PM Peak (veh/h)		
	In	Out	Total	In	Out	Total
Specialty Retail	7	6	13	11	14	25
Mid-Rise Apartments	9	21	30	22	16	38
Less Retail Pass-by (25%)	-2	-2	-4	-3	-3	-6
Total Site-Generated Auto Trips	14	25	39	30	27	57

As shown in Table 6, the resulting number of potential 'new' two-way vehicle trips for the proposed development is approximately 40 and 60 veh/h during the weekday morning and afternoon peak hours, respectively.

5.2. ASSIGNMENT OF SITE-GENERATED TRAFFIC

As the only vehicular connection to the proposed development and its garage is via the proposed right-in/right-out driveway to St. Joseph Boulevard, the assignment of peak hour site-generated traffic is very straight forward, as depicted in Figure 4. At the two Place d'Orleans intersections east and west of the site driveway, site-generated traffic was distributed based on a combination of the current distribution proportions and OR174 access.



PARSONS envision more 5.3. TOTAL PROJECTED PEAK HOUR TRAFFIC CONDITIONS AND RELATED INTERSECTION OPERATIONS

Full site build-out is assumed to be late 2018/early 2019. As the adjacent volumes on St. Joseph Boulevard were from 2014 counts, five years (5%) of background traffic growth was added to the relevant through/turn movements at the study area intersections to derive a 2019 background traffic base condition. The Figure 4 site-generated traffic was then added to the 2019 background volumes to derive total projected peak hour volumes for the 2019 horizon year. These volumes are depicted in Figure 5.

Figure 5: Total Projected Peak Hour Traffic Volumes

Place d'Orleans i Pl_{ace} d'Orle_{ans} Napoleon ←6(23) € 106(248) 207(315) 77(289) 28(138 10(30) 110(80) 80(133) 0(33) 547(450) 5(14) St. Joseph - 521(613) **₽**⁵⁽¹⁴⁾ 15(25) 12(13) 634(675) 16(33) t 20(90) 🕈 192(296) • 4 4 118(141) 27(30) 76(54) 89(87) 7(7) 467(766) → (19) 7(6) 4 559(1082) -368(837) 13(23) 51(129) Duford **AM Peak Hour Volumes** xx (уу) **PM Peak Hour Volumes**

The following Table 7 provides a projected performance summary for study area intersections, based on total projected traffic volumes. The detailed SYNCHRO model output of projected conditions is provided within Appendix D.

	Weekday AM Peak (PM Peak)								
Intersection		Critical Mover	nent	Intersection					
	LoS max. v/c or avg. delay (s)		Movement	rement Delay (s)		v/c			
St. Joseph/Place d'Orleans	A(D)	0.50(0.90)	SBL(SBL)	9.2(16.4)	A(A)	0.36(0.56)			
St. Joseph/Napoleon	A(A)	0.21(0.41)	WBT(EBT)	2.1(6.4)	A(A)	0.20(0.40)			
St. Joseph/Duford	A(D)	0.42(0.90)	SBL(SBL)	21.1(30.4)	A(B)	0.37(0.64)			
Note: Analysis of signalized intersections assumes a PHF of 0.95 and a saturation flow rate of 1800 veh/h/lane.									

As shown, for the total projected 2019 traffic volumes, the signalized study area intersections 'as a whole' are projected to continue to operate at an acceptable LoS 'B' or better during the weekday morning and afternoon peak hours. The critical southbound left-turn movements at the St. Joseph/Place d'Orleans and St. Joseph/Duford intersections are projected to operate at LoS 'D', similar to existing conditions. All movements at the St. Joseph/Napoleon intersection are projected to operate at LoS 'A'.

In overview, as all projected (year 2019) levels of service indicators and v/c rates are the same or very similar to existing conditions, it can be said that site-generated traffic will have negligible impact on the operation of adjacent streets and intersections.

PARSONS 6. SITE PLAN REVIEW



6.1. SITE ACCESS/EGRESS

The ramp to the proposed 172 space parking garage is 6.7 m wide and located approximately 5.7 m from the west property line and approximately 89 m form the adjacent St. Joseph/Duford intersection. These offset dimensions meet the City's By-Law requirements.

6.2. GARAGE LAYOUT

We are advised by the project architect that the proposed 172 parking spaces and 75 bicycle parking spaces meet By-Law requirements. With regard to dimensions, drive aisles are shown as 6.7 m wide and the parking space dimensions are 5.2 m long and 2.6 m wide, all of which meet By-Law requirements.

With regard to the driveway connection to St. Joseph Boulevard at the west end of the site, it is 6.7m wide. There is approximately 10m from the road curb to the start of the garage ramp. This 10m includes a 2.4m wide sidewalk, and a combination of 2% to 3% grade in the 7.6m from the back of the sidewalk to the top of the ramp. This distance and grades will result in good sight lines of and for vehicles exiting the garage.

With regard to ramp grades, the garage ramp internal to the building has a primary grade of 11%, for a length of 9.3m. At the bottom of this ramp, vehicles can then proceed up a 9% grade ramp to the upper parking level or down a 15.5m long ramp to the lower parking levels that has a 15% grade, and 3m long 8% transition grade at the top and bottom of this ramp. These grades and transition lengths are considered acceptable.

Car turn templates have been applied to the garage layout to check operation. All movements can be made in an acceptable/typical manner with the exception of:

- At the easterly pointed end of the garage, due to the acute angle, mirrors are required to warn vehicles approaching from both the inbound and outbound directions, as the angle does not permit one vehicle to pass another on this corner.
- At the entry to the ground level garage, due to the back to back 'S' turn that connects the entry ramp to the ground floor parking, only one vehicle can pass through this area at a time. As such, appropriate measures are required to warn vehicles entering this area that only one vehicle can pass through at a time. Priority should always be given to the inbound vehicle.

7. MULTI-MODAL OVERVIEW

On site, the proposed Site Plan meets or exceeds the By-Law bicycle parking requirements and there are residential building pedestrian connections to both St. Joseph Boulevard and Duford Drive. As well, the ground floor commercial also has its doors on the St Joseph Boulevard frontage. As previously noted, sidewalks exist on both sides of St. Joseph Boulevard and Duford Street.

Transit services within the vicinity of the site is currently provided by OC Transpo Regular Routes #131 and 137, which provide frequent all-day service, Connexion Routes #232, 234 which provide peak hour service and School Route #632. Bus stops for Routes #131, 137, 234, and 632 are located at the Duford/Chartrand intersection approximately 100 m southeast of the site. The bus stop for Route #232 is located along St. Joseph Boulevard approximately 150 m from Duford Drive.

Rapid transit service (in the form of BRT) is also provided via the Place d'Orleans BRT Station, located approximately 600 metres walking distance northwest of the proposed development, which provides convenient access to multiple locations and routes along the Transitway.

PARSONS 8. FINDINGS, CONCLUSIONS AND RECOMMENDATIONS



8.1. FINDINGS AND CONCLUSIONS

Based on the foregoing analysis, the findings and conclusions of this Transportation Brief are as follows:

- The proposed development is comprised of 144 residential apartment/condo units, 6,897 ft² of commercial floor area, 75 bicycle spaces and 172 parking spaces. Vehicular access to the garage is provided via a rightin/right-out connection to St. Joseph Boulevard;
- Sidewalks exist on both sides of the adjacent St. Joseph Boulevard and Duford Drive, however, there are no delineated on-road cycling facilities on either road;
- Study area intersections 'as a whole' are currently operating at an acceptable LoS 'B' or better during both the weekday morning and afternoon peak hours. With regard to the 'critical movements' at study area intersections, they are operating at an acceptable LoS 'A' during the morning peak hour. During the afternoon peak hour, the southbound left-turn movement at the St. Joseph/Place d'Orleans and at the St. Joseph/Duford intersections are operating close to capacity (LoS 'D'). All movements at the St. Joseph/Napoleon intersection are operating at LoS 'A' during both peak hours;
- Historic traffic counts along the adjacent section of St. Joseph Boulevard indicate only a marginal increase from 2010 to 2014. Accordingly, a 5% growth rate has been used for through traffic movements to derive 2018/2019 background traffic volumes;
- After applying appropriate modal splits to the proposed development's projected peak hour person trips, the development is estimated to generate a two-way total of approximately 40 vph and 60 vph during the weekday morning and afternoon peak hours, respectively. Peak hour transit ridership is estimated to be 20 to 30 persons per hour, respectively;
- For the projected 2019 traffic conditions (2019 background traffic + site generated traffic), all projected study area intersection level of service indicators are the same or very similar to existing conditions. As such, site-generated traffic will have negligible impact on the operations of adjacent streets and intersections;
- The proposed location and width of the site's driveway connection to St. Joseph Boulevard meet By-Law requirements and the proposed grades and off-set from the street edge will result in good sight lines of and for exiting vehicles;
- All aspects of the garage's internal design (ramp grades, aisle widths and parking space dimensions) meet By-Law requirements. However, at two locations in the garage, as noted is Section 6.2, two vehicles cannot pass at the same time (even though the aisle width meets By-Law), so appropriate measures are required to warn vehicles entering these two areas to give way to the entering (inbound) vehicles; and
- The proposed development is well serviced by transit, well connected to the adjacent sidewalks and meets the By-Law requirements with regard to the supply of bicycle parking.

8.2. RECOMMENDATIONS

Based on the foregoing, the proposed Site Plan is recommended from a transportation perspective. Please call if there are any questions

Sincerely,

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Ronald Jack, P. Eng. Senior Transportation Engineer Attachments

Appendix A Current Study Area Traffic Counts



Turning Movement Count - Peak Hour Diagram ST. JOSEPH BLVD @ DUFORD DR/PLACE D'ORLEANS DR

Survey Date: Friday, July 04, 2014 WO No: Start Time: 07:00 Jamar **Device:** Technologies, Inc DUFORD DR/PLACE D'ORLEANS DR E lt Ε S Heavy Vehicles Cars ST. JOSEPH BLVD Ļ t |U| L, Ł **AM Period** f → **Peak Hour** \$ 09:00 10:00 ₩ + F r ก t Cars øд **\$** Heavy Vehicles Total × * 1t



Turning Movement Count - Peak Hour Diagram ST. JOSEPH BLVD @ DUFORD DR/PLACE D'ORLEANS DR

Survey Date: Friday, July 04, 2014 WO No: Start Time: 07:00 Jamar **Device:** Technologies, Inc DUFORD DR/PLACE D'ORLEANS DR E Î Ε S Heavy Vehicles Cars ST. JOSEPH BLVD Ļ t |U| L, Ł **PM Period** f -**Peak Hour** ç 16:30 17:30 ₩ ♣ F r ก t Cars **\$** Heavy Vehicles Total × + ļţ



Turning Movement Count - Peak Hour Diagram ST. JOSEPH BLVD @ 193 E OF PLACE D'ORLEAN-W/PL





Turning Movement Count - Peak Hour Diagram ST. JOSEPH BLVD @ 193 E OF PLACE D'ORLEAN-W/PL





Turning Movement Count - Peak Hour Diagram PLACE D'ORLEANS DR W @ ST. JOSEPH BLVD





Turning Movement Count - Peak Hour Diagram PLACE D'ORLEANS DR W @ ST. JOSEPH BLVD



Appendix B SYNCHRO Analysis: Existing Conditions

Existing AM 1: St. Joseph & Place d'Orleans

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Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR	
Lane Configurations	5	≜1 5	ň	≜1 ≽	5	ĥ	5	•	1	
Traffic Volume (vph)	183	436	12	496	7	2	96	6	197	
Future Volume (vph)	183	436	12	496	7	2	96	6	197	
Lane Group Flow (vph)	193	473	13	633	7	9	101	6	207	
Turn Type	pm+pt	NA	Perm	NA	Perm	NA	Perm	NA	Perm	
Protected Phases	5	2		6		8		4		
Permitted Phases	2		6		8		4		4	
Detector Phase	5	2	6	6	8	8	4	4	4	
Switch Phase										
Minimum Initial (s)	5.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	
Minimum Split (s)	11.2	38.8	38.8	38.8	22.7	22.7	24.7	24.7	24.7	
Total Split (s)	14.0	65.0	51.0	51.0	25.0	25.0	25.0	25.0	25.0	
Total Split (%)	15.6%	72.2%	56.7%	56.7%	27.8%	27.8%	27.8%	27.8%	27.8%	
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	
All-Red Time (s)	2.9	3.5	3.5	3.5	2.4	2.4	2.4	2.4	2.4	
Lost Time Adjust (s)	-2.2	-2.8	-2.8	-2.8	-1.7	-1.7	-1.7	-1.7	-1.7	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Lead/Lag	Lead		Lag	Lag						
Lead-Lag Optimize?	Yes		Yes	Yes						
Recall Mode	None	C-Max	C-Max	C-Max	None	None	None	None	None	
Act Effct Green (s)	67.2	67.2	53.1	53.1	14.8	14.8	14.8	14.8	14.8	
Actuated g/C Ratio	0.75	0.75	0.59	0.59	0.16	0.16	0.16	0.16	0.16	
v/c Ratio	0.33	0.19	0.03	0.32	0.03	0.03	0.46	0.02	0.49	
Control Delay	5.3	3.9	6.1	8.2	29.3	18.9	40.1	29.0	8.8	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	5.3	3.9	6.1	8.2	29.3	18.9	40.1	29.0	8.8	
LOS	А	А	А	А	С	В	D	С	А	
Approach Delay		4.3		8.1		23.4		19.3		
Approach LOS		А		А		С		В		
Queue Length 50th (m)	7.3	9.5	0.9	24.3	1.0	0.3	16.2	0.9	0.0	
Queue Length 95th (m)	17.8	19.2	2.9	45.6	4.4	4.0	28.7	3.8	16.5	
Internal Link Dist (m)		145.4		174.9		36.7		180.0		
Turn Bay Length (m)	65.0		50.0		15.0				65.0	
Base Capacity (vph)	591	2524	506	1959	313	369	312	416	512	
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.33	0.19	0.03	0.32	0.02	0.02	0.32	0.01	0.40	
Intersection Summers										
Cuele Length: 00										
Cycle Lengin: 90										
Actuated Cycle Length: 90			Chart of Cr							
Vilset: 50 (56%), Referenced to phase	e z:ebil a		, Start of Gr	een						
Natural Cycle: 75										
Control Type: Actuated-Coordinated										
Waximum V/C Ralio: 0.49				L. J						
Intersection Signal Delay: 8.8				Int	ersection L	JS: A				
Intersection Capacity Utilization 59.6%)			IC	U Level of S	Service B				
Analysis Period (min) 15										
Splits and Phases: 1: St. Joseph &	Place d'Orl	eans								
								4		
-Ø2(R)								+	‴Ø4	
65 S								25	S	
▶ a5	P)								08	
	N .							DE		
17 5 DI S								20	2	

Existing AM 2: St. Joseph & Napoleon

	٨	-	+	×.	1		
Lane Group	EBL	EBT	WBT	WBR	SBL		
Lane Configurations	N.	* *	* *	1	¥		
Traffic Volume (vph)	20	519	603	15	0		
Future Volume (vph)	20	519	603	15	0		
Lane Group Flow (vph)	21	546	635	16	11		
Turn Type	Perm	NA	NA	Perm	Prot		
Protected Phases	1 0.111	2	6	1 01111	4		
Permitted Phases	2			6			
Detector Phase	2	2	6	6	4		
Switch Phase	-	-	Ū		•		
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0		
Minimum Snlit (s)	15.0	15.0	27.9	27.9	30.0		
Total Split (s)	60.0	60.0	60.0	60.0	30.0		
Total Split (%)	66.7%	66.7%	66.7%	66.7%	22.2%		
Vellow Time (s)	22	22	22	22	22		
All Dod Time (s)	2.5	2.5	J.J 2.6	J.J 2.6	3.5		
Lost Time Adjust (s)	2.0	2.0	2.0	2.0	2.7		
Total Lost Time (s)	-1.9	-1.9	-1.9	-1.9	-2.0		
	4.0	4.0	4.0	4.0	4.0		
Lead Log Ontimize?							
Lead-Lag Optimize?	0.14-1	0.14	0.14-1	0.14-1	News		
Recall Mode	C-IVIAX	C-IVIAX	C-IVIAX	C-IVIAX	None 14.0		
Act Effect Green (S)	83.2	83.2	83.2	83.2	14.8		
Actuated g/C Ratio	0.92	0.92	0.92	0.92	0.16		
V/C Ratio	0.03	0.17	0.20	0.01	0.02		
Control Delay	2.8	1.8	2.4	2.2	0.1		
Queue Delay	0.0	0.0	0.0	0.0	0.0		
Total Delay	2.8	1.8	2.4	2.2	0.1		
LOS	A	A	A	A	A		
Approach Delay		1.8	2.4		0.1		
Approach LOS		A	A		A		
Queue Length 50th (m)	0.0	0.0	0.0	0.0	0.0		
Queue Length 95th (m)	3.2	20.1	32.9	2.2	0.0		
Internal Link Dist (m)		174.9	285.1		70.5		
Turn Bay Length (m)	80.0			25.0			
Base Capacity (vph)	677	3134	3134	1403	651		
Starvation Cap Reductn	0	0	0	0	0		
Spillback Cap Reductn	0	0	0	0	0		
Storage Cap Reductn	0	0	0	0	0		
Reduced v/c Ratio	0.03	0.17	0.20	0.01	0.02		
Intersection Summary							
Cycle Length: 90							
Actuated Cycle Longth: 00							
Offect: 24 (27%) Deferenced to phase		nd 4 MDT	Start of Cro	0 n			
Volset. 24 (27%), Referenced to pride	SE Z.EDIL d		Start of Gre	en			
Control Type: Actuated Coordinated							
Control Type: Actuated-Coordinated							
Maximum v/c Ratio: 0.20						•	
Intersection Signal Delay: 2.1	24			Int	tersection LOS:	A	
Intersection Capacity Utilization 32.6	%			IC	U Level of Serv	ce A	
Analysis Period (min) 15							
Splits and Phases: 2: St. Joseph &	Napoleon						
→ Ø2 (R)							04
60 s							30 s
▲ [±]							
Ø6 (R)							

50 s

Existing AM 3: Duford/Place d'Orleans & St. Joseph

	≯	-	4	-	1	1	¥	Ļ	~	
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR	
Lane Configurations	ň	≜ 16	۲	≜1 ≽	۲.	ĥ	۲.	•	1	
Traffic Volume (vph)	98	345	5	520	76	89	73	28	46	
Future Volume (vph)	98	345	5	520	76	89	73	28	46	
Lane Group Flow (vph)	103	411	5	627	80	101	77	29	48	
Turn Type	pm+pt	NA	pm+pt	NA	Prot	NA	Prot	NA	Perm	
Protected Phases	5	2	1	6	3	8	7	4		
Permitted Phases	2		6						4	
Detector Phase	5	2	1	6	3	8	7	4	4	
Switch Phase										
Minimum Initial (s)	5.0	10.0	5.0	10.0	5.0	10.0	5.0	10.0	10.0	
Minimum Split (s)	10.3	30.3	10.3	30.3	10.8	35.9	10.8	35.9	35.9	
Total Split (s)	11.0	37.0	11.0	37.0	21.0	36.0	21.0	36.0	36.0	
Total Split (%)	10.5%	35.2%	10.5%	35.2%	20.0%	34.3%	20.0%	34.3%	34.3%	
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	
All-Red Time (s)	2.0	3.0	2.0	3.0	2.5	3.6	2.5	3.6	3.6	
Lost Time Adjust (s)	-1.3	-2.3	-1.3	-2.3	-1.8	-2.9	-1.8	-2.9	-2.9	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Lead/Lag	Lead	Lag	Lead	Lag	Lead	Lag	Lead	Lag	Lag	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Recall Mode	None	C-Max	None	C-Max	None	None	None	None	None	
Act Effct Green (s)	65.2	63.6	60.3	53.3	12.1	17.6	11.9	17.4	17.4	
Actuated g/C Ratio	0.62	0.61	0.57	0.51	0.12	0.17	0.11	0.17	0.17	
v/c Ratio	0.23	0.20	0.01	0.37	0.41	0.34	0.40	0.10	0.13	
Control Delay	12.6	13.0	13.4	18.9	48.7	38.2	48.6	34.5	0.7	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
l otal Delay	12.6	13.0	13.4	18.9	48.7	38.2	48.6	34.5	0.7	
LUS Approach Dolou	В	12 O	В	10 O	D	12 D	D	21.0	А	
Approach LOS		I2.9		18.9		42.8		31.0		
Approach LOS	7 4	D 14 0	0.4	D 27 (15 /	10 A	14.0	ل د د	0.0	
Queue Length 95th (m)	7.4	10.0	0.4	37.0 72.2	10.4	18.4	14.8	0.3 10.0	0.0	
Internal Link Dist (m)	23.1	40.1 205.1	Z.0	15.3	20.0	27.5	20.0	142.4	0.0	
Turn Bay Length (m)	100.0	200.1	50.0	137.7	20.0	220.7	60.0	145.0		
Base Canacity (unb)	450	2021	577	1602	20.0	540	274	5/2	566	
Starvation Can Poductn	430	2021	0	1072	2/4	040	2/4	0	00	
Snillback Can Reductn	0	0	0	0	0	0	0	0	0	
Storage Can Reductin	0	0	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.23	0.20	0.01	0 37	0.29	0.19	0.28	0.05	0.08	
	0.20	0.20	0.01	0.07	0.27	0.17	0.20	0.00	0.00	
Intersection Summary										
Cycle Length: 105										
Actuated Cycle Length: 105										
Unset: 0 (0%), Referenced to phase 2	EBIL and	6:WBIL, S	tart of Gree	n						
Natural Cycle: 90										
Movimum v/a Datio: 0.41										
Intersection Signal Delay: 21.0				In	orcoction I (
Intersection Capacity Litilization 47.2%						JS. C				
Analysis Period (min) 15	1			iC						
Splits and Phases: 3: Duford/Place	d'Orleans à	& St. Joseph	1							
🕈 Ø1 🕴 🍎 Ø2 (R)				-	\ Ø3		•	Ø4		

√ Ø1	∎ →ø2 (R)	★ Ø3	🍨 ø4	
11 s	37 s	21 s	36 s	
∕× ø₅	🚽 🐨 Ø6 (R)	▶ ø7	₽ ø8	
11 s	37 s	21 s	36 s	

Existing PM 1: St. Joseph & Place d'Orleans

· · · ·	۶	→	4	-	1	1	1	Ļ	~
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Configurations	1	A 1.	<u> </u>	A 1.	3	1	3	•	1
Traffic Volume (vph)	282	716	13	583	19	14	224	23	300
Future Volume (vph)	282	716	13	583	19	14	224	23	300
Lane Group Flow (vph)	297	778	14	694	20	20	236	24	316
Turn Type	pm+pt	NA	Perm	NA	Perm	NA	pm+pt	NA	Perm
Protected Phases	5	2		6		8	7	4	
Permitted Phases	2		6		8		4		4
Detector Phase	5	2	6	6	8	8	7	4	4
Switch Phase									
Minimum Initial (s)	5.0	10.0	10.0	10.0	10.0	10.0	5.0	10.0	10.0
Minimum Split (s)	11.2	38.8	38.8	38.8	22.7	22.7	11.0	24.7	24.7
Total Split (s)	21.0	60.0	39.0	39.0	25.0	25.0	15.0	40.0	40.0
Total Split (%)	21.0%	60.0%	39.0%	39.0%	25.0%	25.0%	15.0%	40.0%	40.0%
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3
All-Red Time (s)	2.9	3.5	3.5	3.5	2.4	2.4	2.7	2.4	2.4
Lost Time Adjust (s)	-2.2	-2.8	-2.8	-2.8	-1.7	-1.7	-2.0	-1.7	-1.7
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag	Lead		Lag	Lag	Lag	Lag	Lead		
Lead-Lag Optimize?	Yes		Yes	Yes	Yes	Yes	Yes		
Recall Mode	None	C-Max	C-Max	C-Max	None	None	None	None	None
Act Effct Green (s)	69.9	69.9	51.6	51.6	13.1	13.1	22.1	22.1	22.1
Actuated g/C Ratio	0.70	0.70	0.52	0.52	0.13	0.13	0.22	0.22	0.22
v/c Ratio	0.56	0.33	0.04	0.40	0.12	0.09	0.81	0.06	0.55
Control Delay	11.5	7.6	14.4	12.3	38.6	31.0	55.3	26.3	6.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	11.5	/.6	14.4	12.3	38.6	31.0	55.3	26.3	6.9
LOS	В	A	В	B	D	C	E	C	A
Approach Delay		8.7		12.4		34.8		27.5	
Approach LUS	01.0	A	0.0	B	2.5	C	20.0		0.0
Queue Length 50th (m)	21.8	32.0	0.9	23.4	3.5	2.6	39.0	3.5	0.0
Queue Lengin 95in (m)	4Z.Z	52.0	3.Z	29.5	9.0	8.7	56.0	0.0 100.0	17.5
Turn Ray Longth (m)	45.0	145.4	E0.0	1/4.9	15.0	30.7		180.0	4E 0
Pace Capacity (mb)	00.0	2257	0.UC	1710	15.0	240	201	440	00.0
Stanuation Can Doducto	000	2307	327	1/19	211	302	291	042	139
Snillback Can Reductin	0	0	0	0	0	0	0	0	0
Storage Can Reducto	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.52	0 33	0.04	0.40	0.07	0.06	0.81	0.04	0 13
	0.52	0.00	0.04	0.40	0.07	0.00	0.01	0.04	0.43
Intersection Summary									
Cycle Length: 100									
Actuated Cycle Length: 100									
Offset: 61 (61%), Referenced to phase	se 2:EBTL a	nd 6:WBTL	, Start of Gr	een					
Natural Cycle: 85									
Control Type: Actuated-Coordinated									
Maximum v/c Ratio: 0.81									
Intersection Signal Delay: 14.7				In	ersection L(OS: B			
Intersection Capacity Utilization 72.99	%			IC	U Level of S	Service C			
Analysis Period (min) 15									
Splits and Phases: 1: St. Joseph &	Place d'Orl	eans							
-4ø2 (R)						1	₽ _Ø4		
60 s						4(0 s		
*	+						1		

- 4 ø2 (R)		∲ ø4	
60 s		40 s	
∕ <i>ø</i> 5	₩ Ø6 (R)	Ø7	≜ Ø8
21 s	39 s	15 s	25 s

Existing PM 2: St. Joseph & Napoleon

	≯	+	+	•	×	
Lane Group	EBL	EBT	WBT	WBR	SBL	
Lane Configurations	K	**	**	1	M	
Traffic Volume (vnh)	90	1004	642	25	30	
Future Volume (vph)	90	1004	642	25	30	
Lane Group Flow (vph)	95	1057	676	25	64	
	nm+nt	NA	NA	Perm	Prot	
Protected Phases	pin+pt 5	2	6	I CIIII	1100	
Dermitted Dhases	3 2	2	0	6	т	
Detector Phase	5	2	6	6	Λ	
Switch Dhaso	J	2	0	0	4	
Minimum Initial (c)	5.0	10.0	10.0	10.0	10.0	
Minimum Split (s)	10.0	10.0	27.0	27.0	20.0	
Total Split (s)	10.7	67.0	21.7 /0.0	21.7 /0.0	22.0	
Total Split (%)	10.0	67.0%	49.0	49.0	22.0%	
Vallow Time (s)	10.0%	07.0%	47.0%	47.0%	JJ.U%	
All Ded Time (S)	3.3	3.3	3.3	3.3	3.3	
All-Ked Time (S)	2.6	2.6	2.6	2.6	2.1	
Lost Time Adjust (s)	-1.9	-1.9	-1.9	-1.9	-2.0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	
Lead/Lag	Lead		Lag	Lag		
Lead-Lag Optimize?	Yes		Yes	Yes		
Recall Mode	None	C-Max	C-Max	C-Max	None	
Act Effct Green (s)	80.4	81.2	70.7	70.7	14.8	
Actuated g/C Ratio	0.80	0.81	0.71	0.71	0.15	
v/c Ratio	0.16	0.38	0.28	0.02	0.24	
Control Delay	3.7	4.2	8.5	4.9	22.6	
Queue Delay	0.0	0.0	0.0	0.0	0.0	
Total Delay	3.7	4.2	8.5	4.9	22.6	
LOS	А	А	А	А	С	
Approach Delay		4.1	8.4		22.6	
Approach LOS		А	А		С	
Queue Length 50th (m)	3.8	25.4	24.8	0.3	5.7	
Queue Length 95th (m)	m8.0	35.7	53.5	4.4	14.8	
Internal Link Dist (m)		174.9	285.1		70.5	
Turn Bay Length (m)	80.0			25.0		
Base Capacity (vph)	649	2753	2395	1049	493	
Starvation Can Reductn	0	0	0	0	0	
Snillback Can Reductn	0	0	0	0	0	
Storage Can Reducto	0	0	0	0	0	
Poduced v/c Patio	0 15	0.38	0.28	0 02	0.13	
	0.15	0.50	0.20	0.02	0.15	
Intersection Summary						
Cycle Length: 100						
Actuated Cycle Length: 100						
Offset: 66 (66%), Referenced to phase	e 2:EBTL a	nd 6:WBT, 3	Start of Gre	en		
Natural Cycle: 70						
Control Type: Actuated-Coordinated						
Maximum v/c Ratio: 0.38						
Intersection Signal Delay: 6.3				Int	tersection LOS	: A
Intersection Capacity Utilization 44 39	%			IC	U Level of Ser	vice A
Analysis Period (min) 15	· ·			10		
m Volume for 95th percentile queue	s is metered	by unstream	m signal			

Splits and Phases: 2: St. Joseph & Napoleon

→ø2 (R)	· · · ·	Ø4
67 s		33 s
∕ <mark>∕</mark> ø5	Ø6 (R)	
18 s	49 s	

Existing PM 3: Duford/Place d'Orleans & St. Joseph

	۶	-	4	-	1	1	¥	Ļ	~	
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR	
Lane Configurations	٦	≜ †}	۲		۲	f,	ň	•	1	
Traffic Volume (vph)	118	792	14	428	54	87	275	138	72	
Future Volume (vph)	118	792	14	428	54	87	275	138	72	
Lane Group Flow (vph)	124	965	15	585	57	99	289	145	76	
Turn Type	pm+pt	NA	pm+pt	NA	Prot	NA	Prot	NA	Perm	
Protected Phases	5	2	1	6	3	8	7	4		
Permitted Phases	2		6						4	
Detector Phase	5	2	1	6	3	8	7	4	4	
Switch Phase										
Minimum Initial (s)	5.0	10.0	5.0	10.0	5.0	10.0	5.0	10.0	10.0	
Minimum Split (s)	10.3	30.3	10.3	30.3	10.8	35.9	10.8	35.9	35.9	
Total Split (s)	11.0	33.0	11.0	33.0	25.0	36.0	25.0	36.0	36.0	
Total Split (%)	10.5%	31.4%	10.5%	31.4%	23.8%	34.3%	23.8%	34.3%	34.3%	
Yellow Lime (s)	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	
All-Red Time (s)	2.0	3.0	2.0	3.0	2.5	3.6	2.5	3.6	3.6	
Lost Time Adjust (s)	-1.3	-2.3	-1.3	-2.3	-1.8	-2.9	-1.8	-2.9	-2.9	
lotal Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Lead/Lag	Lead	Lag	Lead	Lag	Lead	Lag	Lead	Lag	Lag	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Recall Mode	None	C-Max	None		None	None 17 F	None	None	None	
Actuated a/C Datia	0.10	0.51	5Z.Z	45.2	10.7	17.5	20.5	20.2	20.2	
Actualed g/C Rallo	0.55	0.51	0.50	0.43	0.10	0.17	0.20	0.25	0.25	
V/C Rallo	0.31	0.07	0.00	0.41	0.55	0.33	0.07	0.33	0.10	
	17.5	23.3	10.4	23.3	40.1	30.2	07.0	32.0	0.7	
Total Delay	17.3	22.2	0.0 16.4	22.2	0.0 /10 1	28.2	67.6	22.8	0.0	
	17.3 R	23.3	10.4 R	23.3	40.1 D	JU.2	07.0 F	JZ.0	Δ	
Approach Delay	D	22.6	D	23.1	D	41.8	L	47.7	л	
Approach LOS		22.0 C		23.1		чт.0 D		ч <i>г.т</i> D		
Queue Length 50th (m)	11.6	60.7	13	40.9	11.0	18.0	574	24.9	0.0	
Queue Length 95th (m)	29.5	#151.1	6.0	70.2	22.5	27.0	#101.8	34.5	0.0	
Internal Link Dist (m)	2710	285.1	010	159.9	2210	226.7		143.6	010	
Turn Bay Length (m)	100.0	20011	50.0	10,11,	20.0	22017	60.0	11010		
Base Capacity (vph)	401	1706	277	1414	339	539	339	566	574	
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.31	0.57	0.05	0.41	0.17	0.18	0.85	0.26	0.13	
Intersection Summany										
Cycle Length: 105										
Cycle Lengin: 105										
Offset: 0 (0%) Referenced to phase 2).FRTL and	6-WRTL St	art of Groo	n						
Natural Cyclo: 100	2. LDTL anu	0.VVDTL, SI		11						
Control Type: Actuated Coordinated										
Maximum v/c Ratio: 0.87										
Intersection Signal Delay: 29.4				Int	ersection I (JS.C				
Intersection Capacity Utilization 72 19	6			IC	U Level of S	ervice C				
Analysis Period (min) 15	0			10	0 20101 01 0					
# 95th percentile volume exceeds c	apacity, que	eue may be	longer.							
Queue shown is maximum after tw	o cycles.									
Splits and Phases: 3: Duford/Place	d'Orleans a	& St. Joseph	ı							
€ Ø1 ■ - Ø2 (R)		I		1 Ø3			4	Ø4		
11 s 33 s				25 s			36	S		
≠ø5 • √ø6 (R)				•ø7			· ·	Ø8		
11 s 3 3 s				25 s			36	s		

Appendix C SYNCHO Analysis: Projected Conditions

Projected AM 1: St. Joseph & Place d'Orleans

	≯	+	4	4	•	Ť	×	Ļ	1	
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR	
Lane Configurations	ň	≜1 ≽	ň	≜1 ≽	5	ĥ	ň	•	1	
Traffic Volume (vph)	192	467	12	521	7	2	106	6	207	
Future Volume (vph)	192	467	12	521	7	2	106	6	207	
Lane Group Flow (vph)	202	506	13	664	7	9	112	6	218	
Turn Type	pm+pt	NA	Perm	NA	Perm	NA	Perm	NA	Perm	
Protected Phases	5	2		6		8		4		
Permitted Phases	2		6		8		4		4	
Detector Phase	5	2	6	6	8	8	4	4	4	
Switch Phase										
Minimum Initial (s)	5.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	
Minimum Split (s)	11.2	38.8	38.8	38.8	22.7	22.7	24.7	24.7	24.7	
Total Split (s)	14.0	65.0	51.0	51.0	25.0	25.0	25.0	25.0	25.0	
Total Split (%)	15.6%	72.2%	56.7%	56.7%	27.8%	27.8%	27.8%	27.8%	27.8%	
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	
All-Red Time (s)	2.9	3.5	3.5	3.5	2.4	2.4	2.4	2.4	2.4	
Lost Time Adjust (s)	-2.2	-2.8	-2.8	-2.8	-1.7	-1.7	-1.7	-1.7	-1.7	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Lead/Lag	Lead		Lag	Laa						
Lead-Lag Optimize?	Yes		Yes	Yes						
Recall Mode	None	C-Max	C-Max	C-Max	None	None	None	None	None	
Act Effct Green (s)	66.8	66.8	52.6	52.6	15.2	15.2	15.2	15.2	15.2	
Actuated g/C Ratio	0.74	0.74	0.58	0.58	0.17	0.17	0.17	0.17	0.17	
v/c Ratio	0.36	0.20	0.03	0.34	0.03	0.03	0.50	0.02	0.50	
Control Delay	5.7	4.1	6.3	8.6	28.9	18.7	40.7	28.7	8.6	
Oueue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	5.7	4.1	6.3	8.6	28.9	18.7	40.7	28.7	8.6	
LOS	A	A	A	A	С	В	D	С	A	
Approach Delay		4.5		8.6	Ŭ	23.1	5	19.7		
Approach LOS		A		A		С		В		
Queue Length 50th (m)	8.0	10.7	0.9	26.7	1.0	0.3	17.9	0.9	0.0	
Oueue Length 95th (m)	18.7	20.8	2.8	48.3	4.4	3.9	31.4	3.8	16.9	
Internal Link Dist (m)		145.4		174.9		36.7		180.0		
Turn Bay Length (m)	65.0		50.0		15.0				65.0	
Base Capacity (vph)	571	2507	485	1938	313	369	312	416	521	
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.35	0.20	0.03	0.34	0.02	0.02	0.36	0.01	0.42	
Intersection Summary										
Cycle Longth: 00										
Actuated Cycle Longth: 00										
Offect: 50 (56%) Deferenced to phase	2.EDTI a	nd 6.W/DTI	Start of Cr	000						
Natural Cyclo: 75	ZLDIL a			een						
Control Type: Actuated Coordinated										
Movimum v/o Dotio: 0.50										
Intersection Signal Delay: 0.2				اما	orcotion					
Intersection Capacity Hilitation (0.00)						JS: A				
Analysis Daried (min) 15)			iC	O LEVELUI S	DEI VICE D				
Analysis Penou (IIIII) 15										
Solits and Phases: 1: St. Joseph & J	Place d'Orl	eans								
								A.		
🗝 Ø2 (R) 💗								¥	Ø4	
65 s								25	S	
A									<u>ا ا</u>	
- Ø5 🛛 🕴 🖉 Ø6 (R)							1	Ø8	
14 s 51 s								25	S	

Projected AM 2: St. Joseph & Napoleon

	≯	+	Ļ	•	1	
Lane Group	EBI	EBT	WBT	WBR	SBL	
Lane Configurations	3	**	**	1	M	
Traffic Volume (vph)	20	559	634	15	0	
Future Volume (vph)	20	559	634	15	0	
Lane Group Flow (vph)	21	588	667	16	11	
Turn Type	Perm	NA	NA	Perm	Prot	
Protected Phases		2	6		4	
Permitted Phases	2			6		
Detector Phase	2	2	6	6	4	
Switch Phase						
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	
Minimum Split (s)	15.9	15.9	27.9	27.9	30.0	
Total Split (s)	60.0	60.0	60.0	60.0	30.0	
Total Split (%)	66.7%	66.7%	66.7%	66.7%	33.3%	
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3	
All-Red Time (s)	2.6	2.6	2.6	2.6	2.7	
Lost Time Adjust (s)	-1.9	-1.9	-1.9	-1.9	-2.0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	C-Max	C-Max	C-Max	C-Max	None	
Act Effct Green (s)	83.2	83.2	83.2	83.2	14.8	
Actuated g/C Ratio	0.92	0.92	0.92	0.92	0.16	
v/c Ratio	0.03	0.19	0.21	0.01	0.02	
Control Delay	2.8	1.8	2.4	2.2	0.1	
Oueue Delay	0.0	0.0	0.0	0.0	0.0	
Total Delay	2.8	1.8	2.4	2.2	0.1	
105	Α	A	Α	A	A	
Approach Delay		18	24	/ \	0.1	
Approach LOS		Α	Δ		Δ	
Oueue Length 50th (m)	0.0	0.0	0.0	0.0	0.0	
Oueue Length 95th (m)	m3.2	21 3	34.8	2.0	0.0	
Internal Link Dist (m)	110.2	174.9	285.1	2.2	70.5	
Turn Bay Length (m)	80.0	174.7	200.1	25.0	10.0	
Base Capacity (vph)	655	3134	3134	1403	637	
Starvation Can Reductn	000	0	0	0	0	
Snillback Can Reductn	0	0	0	0	0	
Storage Can Reductin	0	0	0	0	0	
Reduced v/c Ratio	0.03	0 19	0.21	0.01	0.02	
	0.05	0.17	0.21	0.01	0.02	
Intersection Summary						
Cycle Length: 90						
Actuated Cycle Length: 90						
Offset: 24 (27%), Referenced to ph	ase 2:EBTL a	nd 6:WBT,	Start of Gre	en		
Natural Cycle: 60						
Control Type: Actuated-Coordinated	d					
Maximum v/c Ratio: 0.21						
Intersection Signal Delay: 2.1				Int	tersection LC	OS: A
Intersection Capacity Utilization 33.	.5%			IC	U Level of S	Service A
Analysis Period (min) 15						
m Volume for 95th percentile que	ue is metered	by upstrea	m signal.			
		, , , , ,	0			
Splits and Phases: 2: St. Joseph	& Napoleon					

→Ø2 (R)	₩ø4
60 s	30 s
Ø6 (R)	
60 s	

Projected AM <u>3: Duford/Place d'Orleans & St. Joseph</u>

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Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR	
Lane Configurations	5	≜1 ≽	5	≜1 ≽	5	î,	ň	•	1	
Traffic Volume (vph)	118	368	5	547	76	89	77	28	48	
Future Volume (vph)	118	368	5	547	76	89	77	28	48	
Lane Group Flow (vph)	124	441	5	660	80	101	81	29	51	
Turn Type	pm+pt	NA	pm+pt	NA	Prot	NA	Prot	NA	Perm	
Protected Phases	5	2	<u>'</u> 1	6	3	8	7	4		
Permitted Phases	2		6						4	
Detector Phase	5	2	1	6	3	8	7	4	4	
Switch Phase										
Minimum Initial (s)	5.0	10.0	5.0	10.0	5.0	10.0	5.0	10.0	10.0	
Minimum Split (s)	10.3	30.3	10.3	30.3	10.8	35.9	10.8	35.9	35.9	
Total Split (s)	11.0	37.0	11.0	37.0	21.0	36.0	21.0	36.0	36.0	
Total Split (%)	10.5%	35.2%	10.5%	35.2%	20.0%	34.3%	20.0%	34.3%	34.3%	
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	
All-Red Time (s)	2.0	3.0	2.0	3.0	2.5	3.6	2.5	3.6	3.6	
Lost Time Adjust (s)	-1.3	-2.3	-1.3	-2.3	-1.8	-2.9	-1.8	-2.9	-2.9	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Lead/Lag	Lead	Lag	Lead	Lag	Lead	Lag	Lead	Lag	Lag	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Recall Mode	None	C-Max	None	C-Max	None	None	None	None	None	
Act Effct Green (s)	65.1	63.5	59.8	52.8	12.1	17.5	12.1	17.6	17.6	
Actuated g/C Ratio	0.62	0.60	0.57	0.50	0.12	0.17	0.12	0.17	0.17	
v/c Ratio	0.28	0.22	0.01	0.39	0.41	0.34	0.42	0.10	0.13	
Control Delay	13.2	13.2	13.4	19.5	48.7	38.3	48.8	34.3	0.8	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	13.2	13.2	13.4	19.5	48.7	38.3	48.8	34.3	0.8	
LOS	В	В	В	В	D	D	D	С	А	
Approach Delay		13.2		19.5		42.9		31.0		
Approach LOS		В		В		D		С		
Queue Length 50th (m)	9.1	17.4	0.4	40.8	15.4	18.4	15.6	5.3	0.0	
Queue Length 95th (m)	27.1	49.6	2.8	77.7	28.6	27.4	29.0	10.8	0.0	
Internal Link Dist (m)		285.1		159.9		226.7		143.6		
Turn Bay Length (m)	100.0		50.0		20.0		60.0			
Base Capacity (vph)	436	2018	560	1676	274	540	274	543	566	
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.28	0.22	0.01	0.39	0.29	0.19	0.30	0.05	0.09	
Intersection Summany										
Cuele Length: 105										
Cycle Length: 105										
Actuated Cycle Length: 105			last of Cross	-						
Unset: 0 (0%), Referenced to phase 2	2:EBTE and	6:WBIL, S	tart of Gree	n						
Natural Cycle: 90										
Maximum u/a Datic 0.42										
Internetion Circle Delay 21.1					ana altere 14					
Intersection Signal Delay: 21.1				Int	ersection LC	JS: C				
Intersection Capacity Utilization 48.49	0			IC	U Level of S	ervice A				
Analysis Period (min) 15										
Splits and Phases: 3: Duford/Place d'Orleans & St. Joseph										
🖌 Ø1 🚽 🗖 Ø2 (R)					Ø 3		4	Ø4		

√ Ø1	🚽 📥 ø2 (R)	Ø 3	🔹 ø4		
11 s	37 s	21 s	36 s		
∕× _{Ø5}	🛛 🕈 Ø6 (R)	Ø7	¶ø8		
11 s	37 s	21 s	36 s		

Projected PM 1: St. Joseph & Place d'Orleans

	۶	+	4	Ļ	•	†	×	Ļ	~	
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR	
Lane Configurations	7	≜ 15-	۲	≜ †₽	7	4Î	7	•	1	
Traffic Volume (vph)	296	766	13	613	19	14	248	23	315	
Future Volume (vph)	296	766	13	613	19	14	248	23	315	
Lane Group Flow (vph)	312	830	14	729	20	21	261	24	332	
Turn Type	pm+pt	NA	Perm	NA	Perm	NA	pm+pt	NA	Perm	
Protected Phases	5	2		6		8	7	4		
Permitted Phases	2		6		8		4		4	
Detector Phase	5	2	6	6	8	8	7	4	4	
Switch Phase										
Minimum Initial (s)	5.0	10.0	10.0	10.0	10.0	10.0	5.0	10.0	10.0	
Minimum Split (s)	11.2	38.8	38.8	38.8	22.7	22.7	11.0	24.7	24.7	
Total Split (s)	21.0	60.0	39.0	39.0	25.0	25.0	15.0	40.0	40.0	
Total Split (%)	21.0%	60.0%	39.0%	39.0%	25.0%	25.0%	15.0%	40.0%	40.0%	
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	
All-Red Time (s)	2.9	3.5	3.5	3.5	2.4	2.4	2.7	2.4	2.4	
Lost Time Adjust (s)	-2.2	-2.8	-2.8	-2.8	-1.7	-1.7	-2.0	-1.7	-1.7	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Lead/Lag	Lead		Lag	Lag	Lag	Lag	Lead			
Lead-Lag Optimize?	Yes		Yes	Yes	Yes	Yes	Yes			
Recall Mode	None	C-Max	C-Max	C-Max	None	None	None	None	None	
Act Effct Green (s)	69.9	69.9	51.3	51.3	13.1	13.1	22.1	22.1	22.1	
Actuated g/C Ratio	0.70	0.70	0.51	0.51	0.13	0.13	0.22	0.22	0.22	
v/c Ratio	0.60	0.35	0.05	0.43	0.12	0.09	0.90	0.06	0.56	
Control Delay	12.5	7.8	14.5	12.6	38.6	30.1	67.2	26.3	7.0	
Queue Delav	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	12.5	7.8	14.5	12.6	38.6	30.1	67.2	26.3	7.0	
LOS	В	А	В	В	D	С	E	С	А	
Approach Delay		9.1		12.7		34.2		33.2		
Approach LOS		А		В		С		С		
Queue Length 50th (m)	23.2	34.8	0.9	24.5	3.5	2.6	43.8	3.5	0.0	
Queue Length 95th (m)	44.3	56.3	3.1	30.8	9.6	8.7	62.0	8.6	18.0	
Internal Link Dist (m)		145.4		174.9		36.7		180.0		
Turn Bay Length (m)	65.0		50.0		15.0				65.0	
Base Capacity (vph)	552	2359	309	1709	277	361	291	642	749	
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.57	0.35	0.05	0.43	0.07	0.06	0.90	0.04	0.44	
Intersection Summary										
Cycle Length: 100										
Actuated Cycle Length: 100										
Offset: 61 (61%), Referenced to phase	e 2:EBTL a	nd 6:WBTL	Start of Gr	een						
Natural Cycle: 85										
Control Type: Actuated-Coordinated										
Maximum v/c Ratio: 0.90										
Intersection Signal Delay: 16.4				Int	ersection LC	DS: B				
Intersection Capacity Utilization 75.1%)			IC	U Level of S	Service D				
Analysis Period (min) 15										
Splits and Phases: 1: St. Joseph & Place d'Orleans										
ø2 (R) ■							Ø4			
60 s						4) s			
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15 s

25 s

21 s

39 s

Projected PM 2: St. Joseph & Napoleon

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Lane Group	EBL	EBT	WBT	WBR	SBL	
Lane Configurations	×	**	**	1	¥	
Traffic Volume (vph)	90	1082	675	25	33	
Future Volume (vph)	90	1082	675	25	33	
Lane Group Flow (vph)	95	1139	711	26	67	
Turn Type	pm+pt	NA	NA	Perm	Prot	
Protected Phases	5	2	6		4	
Permitted Phases	2			6		
Detector Phase	5	2	6	6	4	
Switch Phase						
Minimum Initial (s)	5.0	10.0	10.0	10.0	10.0	
Minimum Split (s)	10.9	15.9	27.9	27.9	30.0	
Total Split (s)	18.0	67.0	49.0	49.0	33.0	
Total Split (%)	18.0%	67.0%	49.0%	49.0%	33.0%	
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3	
All-Red Time (s)	2.6	2.6	2.6	2.6	2.7	
Lost Time Adjust (s)	-1.9	-1.9	-1.9	-1.9	-2.0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	
Lead/Lag	Lead		Lag	Lag		
Lead-Lag Optimize?	Yes		Yes	Yes		
Recall Mode	None	C-Max	C-Max	C-Max	None	
Act Effct Green (s)	80.4	81.2	70.7	70.7	14.8	
Actuated g/C Ratio	0.80	0.81	0.71	0.71	0.15	
v/c Ratio	0.16	0.41	0.30	0.02	0.25	
Control Delay	3.6	4.3	8.6	5.0	23.3	
Queue Delay	0.0	0.0	0.0	0.0	0.0	
Total Delay	3.6	4.3	8.6	5.0	23.3	
LOS	А	А	А	А	С	
Approach Delay		4.3	8.5		23.3	
Approach LOS		А	А		С	
Queue Length 50th (m)	3.6	28.3	26.5	0.4	6.2	
Queue Length 95th (m)	m7.4	m38.6	56.6	4.5	15.5	
Internal Link Dist (m)		174.9	285.1		70.5	
Turn Bay Length (m)	80.0			25.0		
Base Capacity (vph)	633	2753	2395	1048	494	
Starvation Cap Reductn	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	
Reduced v/c Ratio	0.15	0.41	0.30	0.02	0.14	
Intersection Summary						
Cycle Length: 100						
Actuated Cycle Length: 100						
Offset: 66 (66%), Referenced to phase	se 2:EBTL a	nd 6:WBT, 3	Start of Gre	en		
Natural Cycle: 70						
Control Type: Actuated-Coordinated						
Maximum v/c Ratio: 0.41						
Intersection Signal Delay: 6.4				Int	ersection LOS	S: A
Intersection Capacity Utilization 46.6	%			IC	U Level of Ser	rvice A
Analysis Period (min) 15						
m Volume for 95th percentile queu	e is metered	by upstrea	m signal.			

Splits and Phases: 2: St. Joseph & Napoleon

→ø2 (R)	· · · ·	▶ø4
67 s		33 s
∕ <mark>∕</mark> ø5	Ø6 (R)	
18 s	49 s	

Projected PM 3: Duford/Place d'Orleans & St. Joseph

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Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR	
Lane Configurations	۲	¢۴	۲	≜ †}	۲	4Î	۲	•	1	
Traffic Volume (vph)	141	837	14	450	54	87	289	138	76	
Future Volume (vph)	141	837	14	450	54	87	289	138	76	
Lane Group Flow (vph)	148	1017	15	614	57	99	304	145	80	
Turn Type	pm+pt	NA	pm+pt	NA	Prot	NA	Prot	NA	Perm	
Protected Phases	5	2	1	6	3	8	7	4		
Permitted Phases	2		6						4	
Detector Phase	5	2	1	6	3	8	7	4	4	
Switch Phase										
Minimum Initial (s)	5.0	10.0	5.0	10.0	5.0	10.0	5.0	10.0	10.0	
Minimum Split (s)	10.3	30.3	10.3	30.3	10.8	35.9	10.8	35.9	35.9	
Total Split (s)	11.0	33.0	11.0	33.0	25.0	36.0	25.0	36.0	36.0	
Total Split (%)	10.5%	31.4%	10.5%	31.4%	23.8%	34.3%	23.8%	34.3%	34.3%	
Yellow Lime (s)	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	
All-Red Time (s)	2.0	3.0	2.0	3.0	2.5	3.6	2.5	3.6	3.6	
Lost Time Adjust (s)	-1.3	-2.3	-1.3	-2.3	-1.8	-2.9	-1.8	-2.9	-2.9	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Leau/Lay	Leau	Lay	Leau	Lay	Leau	Lay	Leau	Lay	Lay	
	Nono	C Max	Nono	C Max	Nono	Nono	Nono	Nono	Nono	
Act Effet Green (s)	57 3	53 5	51 /	U-IVIAX 1/1 2	10.7	17.5	20.8	26.5	26.5	
Actuated a/C Patio	0.55	0.51	0.40	0 / 2	0.10	0.17	0.20	0.25	0.25	
v/c Ratio	0.33	0.51	0.49	0.42	0.10	0.17	0.20	0.25	0.25	
Control Delay	18.8	24.0	16.4	24.1	48.1	38.2	72.0	32.6	0.10	
Oueue Delay	0.0	24.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	
Total Delay	18.8	24.0	16.4	24.1	48.1	38.2	72.0	32.6	0.0	
	B	2 1.0 C	B	C	D	D	, <u>2</u> .0	C	A	
Approach Delay	5	23.4	5	23.9	5	41.8	-	50.4	<i>/</i> 1	
Approach LOS		С		С		D		D		
Queue Length 50th (m)	14.0	65.5	1.3	44.1	11.0	18.0	61.0	24.9	0.0	
Queue Length 95th (m)	34.6	#163.5	6.0	74.3	22.5	27.0	#109.0	34.5	0.0	
Internal Link Dist (m)		285.1		159.9		226.7		143.6		
Turn Bay Length (m)	100.0		50.0		20.0		60.0			
Base Capacity (vph)	390	1696	258	1388	339	539	339	566	574	
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.38	0.60	0.06	0.44	0.17	0.18	0.90	0.26	0.14	
Intersection Summary										
Cycle Length: 105										
Actuated Cycle Length: 105										
Offset: 0 (0%). Referenced to phase 2	EBTL and	6:WBTL. St	art of Gree	n						
Natural Cycle: 100		0111012/01		•••						
Control Type: Actuated-Coordinated										
Maximum v/c Ratio: 0.90										
Intersection Signal Delay: 30.4				Int	ersection LC	OS: C				
Intersection Capacity Utilization 74.4%	0			IC	U Level of S	Service D				
Analysis Period (min) 15										
# 95th percentile volume exceeds ca	apacity, que	eue may be	longer.							
Queue shown is maximum after two	o cycles.		0							
Splits and Phases: <u>3</u> : Duford/Place	d'Orleans	& St. Joseph	1							
			-	1 03			4	Ø4		
11 s 33 s				25 s			36	s		
				1				+		
∽ Ø5 🔮 🦸 Ø6 (R)				•Ø7				Ø8		
11 s 33 s				25 s			36	S		