

# **Sylvan Lake Subdivision Development Traffic Impact Assessment**

**Submitted To:**

**Red Deer Properties Developments Ltd.**

**Submitted By:**

**MMM Group**



**July, 2010**

### **STANDARD LIMITATIONS**

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# EXECUTIVE SUMMARY

## Methodology

MMM Group was retained to complete a traffic impact assessment (TIA) to support the rezoning and subdivision approval of approximately 53 lot subdivisions for single-unit family houses in Stage 1. Given that the total extent of the full development has yet to be agreed MMM were asked to assume a conservative estimate of a maximum of 450 single-unit family houses, for the ultimate stage (assumed in the 20 year horizon). Whilst it is unlikely that 450 single-unit family houses will be developed in the foreseeable future MMM shall use this figure during the analysis, to estimate the 'worst case scenario' impact on the community. This TIA includes an assessment of the impacts of the proposed development on the road network and access of the proposed development at the Twp Rd 400, by the Stage 1 and ultimate stage. Recommendations about the type and configuration of the intersection are made, as well as any recommendation where improvements are required.

This TIA analyzed the 2010 and 2030 weekday morning and afternoon peak hours as well as the estimated daily traffic volumes for the post-development scenario. Detail analysis using Synchro traffic modeling software is included for the ultimate stage (assuming full build-out by the year 2030).

## Results

The intersection of Twp Rd 400 and proposed development access have one stop control on the access road and free flow on the Twp Rd 400. All approaches movements will operate at level of service LOS B or better. The results of the traffic analysis are summarized in the **Table ES1.1**

**Table ES1.1: Development Access and Twp Rd 400 Intersection Analysis – Year 2030**

Critical Movements – Ultimate Stage (Year 2030)						
Scenario	ICU LOS (Intersection Utilization)	Intersection Delay (sec)	WB Thru/Left		NB Right/Left	
			LOS (Delay)	Queue (meters)	LOS (Delay)	Queue (meters)
Weekday Morning Peak Hour	A (35%)	6.4	A (7.8 s)	1.5	B (11.5 s)	11.7
Weekday Afternoon Peak Hour	A (40%)	6.1	A (8.4 s)	6.3	B (11.7 s)	7.9

### Conclusions

The analysis shows that a Type IVa intersection will be required at the development access and Twp Rd 400 intersection. The Synchro 7.0 traffic analysis software was used to confirm the need for storage bay and their length for right turn and left turn movements. The westbound left turn movement will require 100 metres of storage (120m from the centre line) and 210m of 60:1 taper. The eastbound right turn movement will require 100 metres of storage (120m from the centre line) and 140m of 40:1 taper, based on the Alberta Transportation Geometric Standard Guidelines and the detail analysis.

The assessment showed that the weekday afternoon peak hour flow is greater than the weekday morning peak hour flow. During the weekday afternoon peak hour period, the proposed development is expected to generate approximately 60 vehicle trips by the year 2010, and 450 vehicle trips by the year 2030. The total daily traffic generated by the proposed development is estimated to be about 580 and 4310 vehicle trips per day by the year 2010 and 2030, respectively.

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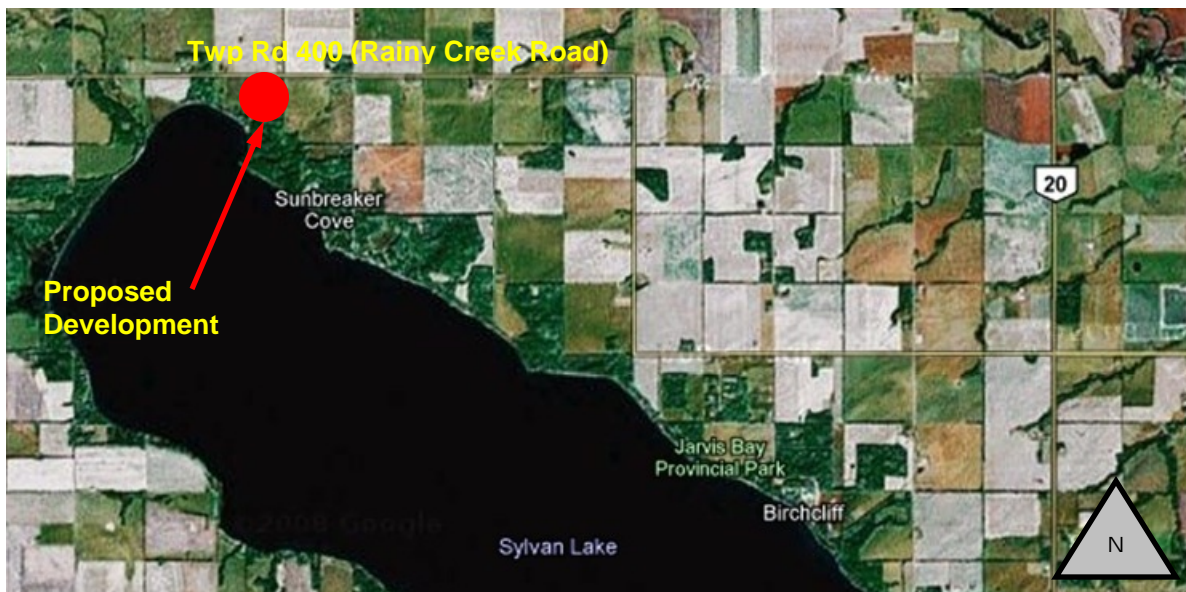
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## 1.0 INTRODUCTION

### 1.1 Proposed Development

Red Deer Properties Development Ltd. c/o retained MMM Group Limited (MMM) to conduct a traffic impact assessment to support the rezoning and subdivision approval of a new proposed development. The proposed subdivision development contains approximately 63.73 hectares located on the north end of the Sylvan Lake in the Lacombe County, Alberta. The proposed development limits to the north with the Twp Rd 400 (Rainy Creek Road), between Rg Rd 22 and Rg Rd 24; and to the east with the proposed Skyy Country Golf and RV Park Development. The main access is planned to be located along Twp Rd 400, 360 m from the east property line and 450 m west of the nearest government road allowance. **Figure 1.1** shows the location of the proposed development.

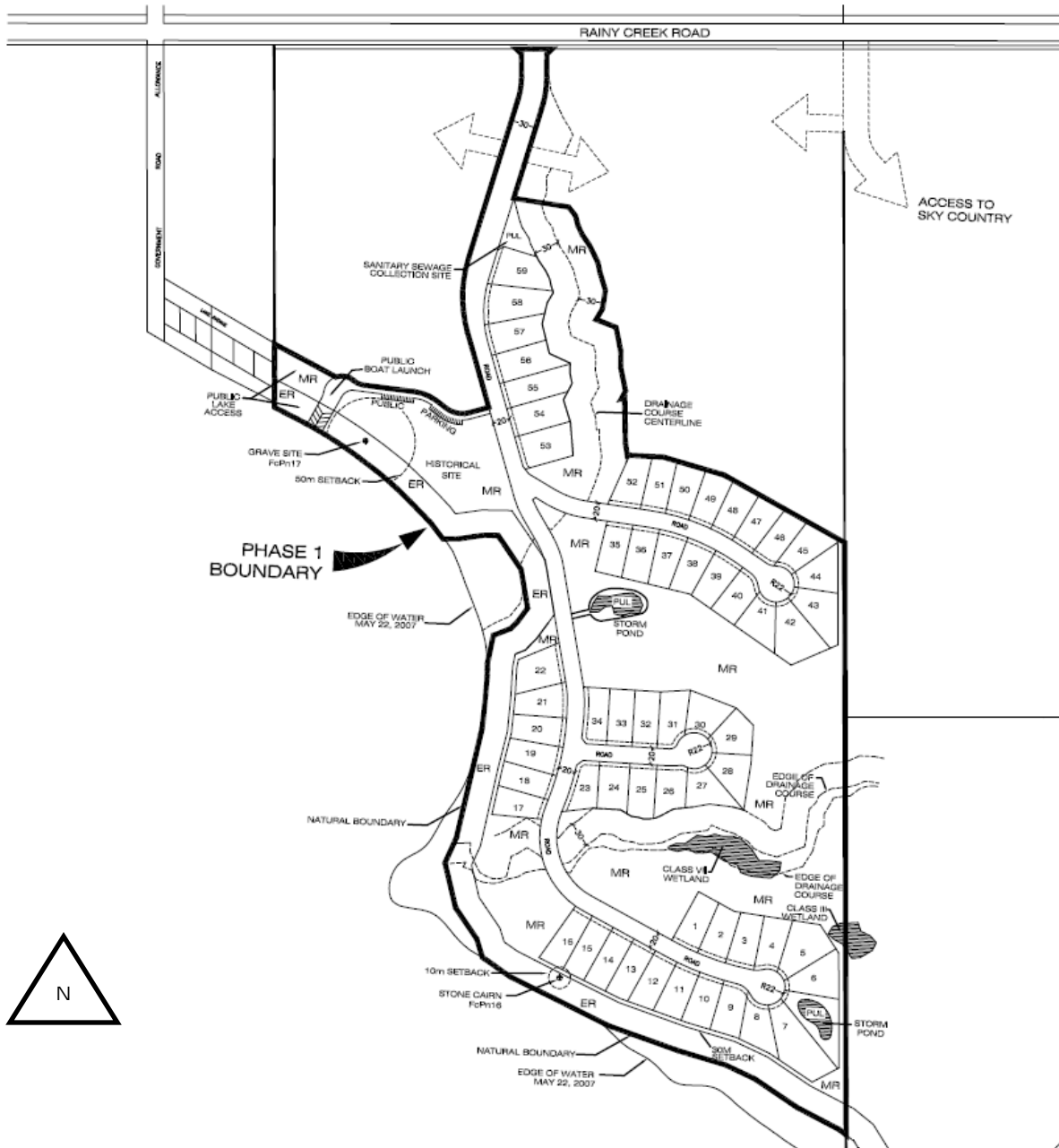
**Figure 1.1: Site Location** (Source: Google maps, 2010)



During the first stage of build-out, the proposed development will be limited to the rezoning and subdivision approval of approximately 53 residential single-unit family lots. Given that the total extend of the full development has yet to be agreed MMM were asked to assume a conservative estimate of a maximum of 450 single-unit family houses, for the ultimate stage (assumed in the 20 year horizon). Whilst it is unlikely that 450 single-unit family houses will be developed in the foreseeable future MMM shall use this figure during the analysis, to estimate

the 'worst case scenario' impact on the community. The current proposed site plan is illustrated in **Figure 1.2**.

**Figure 1.2: Site Plan** (Source: Qualico, 2010)



\* ALL LOTS MIN. 0.202 HECTARES

Exhibit  
Phase 1 Lotting



**PALMS COVE**  
SYLVAN LAKE, ALBERTA





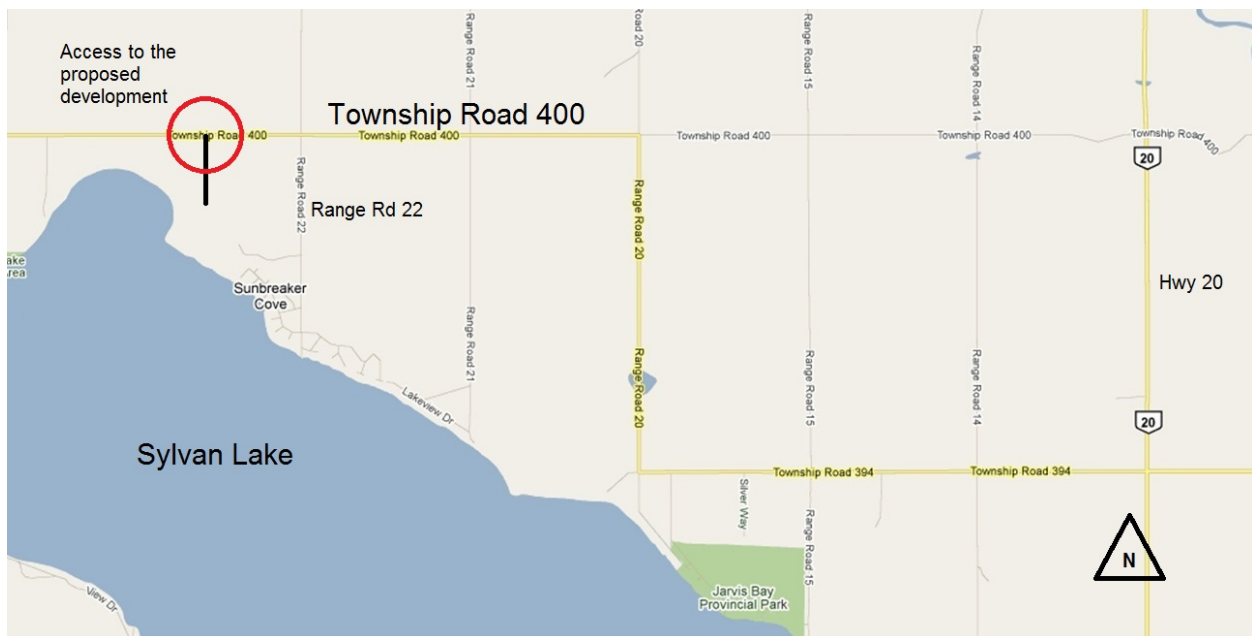
This study investigates the potential traffic impact of the proposed development on the Twp Rd 400 in terms of the capacity (daily and weekday peak hours), as well as determine the intersection treatments required for the development access. In addition, a Level 'A' (high level) cost estimate of the new intersection (proposed access on Twp Rd 400) and potential road improvements required for the Twp Rd 400 is also provided (see **Appendix E**).

## 1.2 Methodology

MMM first agreed the scope of the study with the approving authority, Lacombe County. MMM agreed to evaluate the post-development operations at the intersection of the proposed access road with Twp Rd 400 (shown in figure 1.3), for the 2030 horizon.

The proposed development required the introduction of a new intersection for access at Twp Rd 400 (Rainy Creek Road). This access was evaluated in terms of its: proximity to adjacent intersections, queuing capacity, intersection type and connectivity of the main roadway network. Error! Reference source not found. illustrates the key intersection evaluated in this TIA.

**Figure 1.3: Key Intersection** (Source: Google maps, 2010)



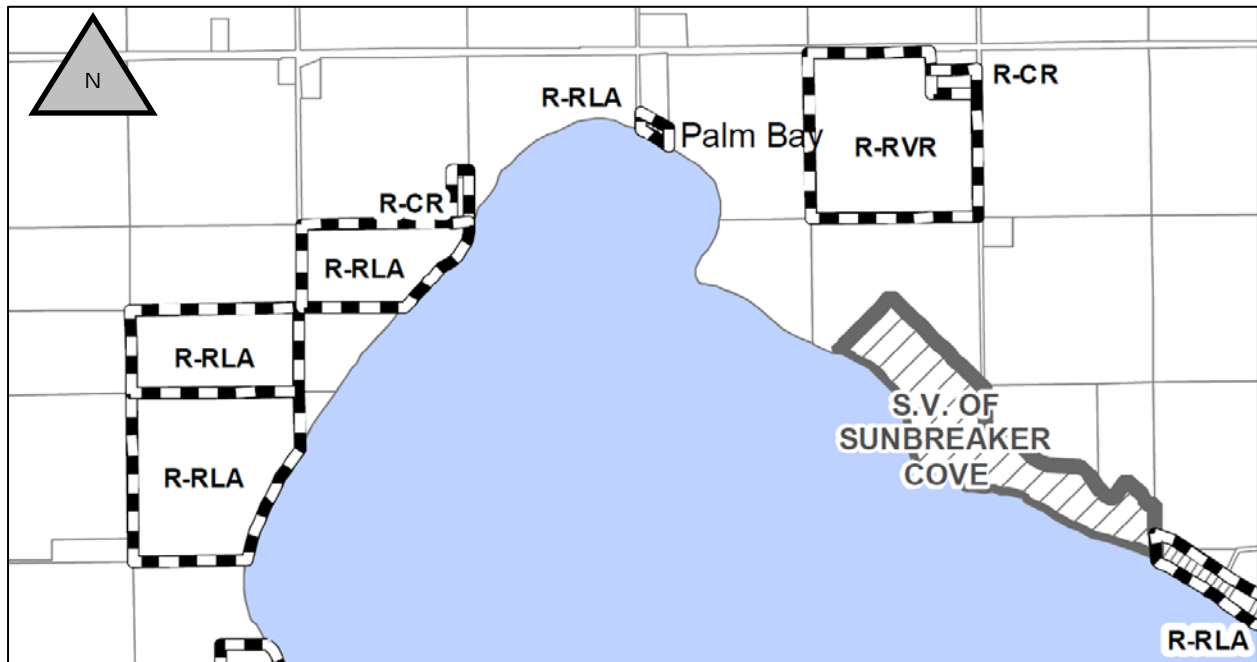
MMM undertook the following steps to develop the Traffic Impact Assessment Report:

- ▶ Identification and review of background information, including relevant details of previous studies and details concerning future local developments
- ▶ Confirmation of planned or existing geometric and operational conditions within the study area.
- ▶ Generation of site traffic estimates for the weekday AM and PM peak periods base on land use type and intensity of the proposed development, and using trip generation rates from the Institute of Transportation Engineers (ITE) Trip Generation Manual. The project team also estimated daily traffic volumes generated by the site using ITE trip rates.
- ▶ Trip distribution and trip assignment of the vehicular trips generated by the proposed development and other major developments in the area by the 2010 and 2030 time horizons. Within this task, MMM Group prepared a regional trip distribution and a directional split, for each time horizon, at the key intersection. These travel patterns were based on available traffic data, the development location, the location of residential and employment centres, road network connectivity, and input from the Lacombe County. Our traffic distribution and assignment were agreed with the Lacombe County prior to the analysis.
- ▶ Review of traffic operations at the intersections identified above to determine if there are any deficiencies in the local transportation network for the 2010 and 2030 horizons at post-development traffic conditions (assuming full build-out). This involved a review of the following elements, of each intersection:
  - Control systems and traffic capacity,
  - Pedestrian and cyclist requirements,
  - Geometric constraints,
  - Left and right turn lane requirements and storage, and
  - Review of illumination requirements.
- ▶ Estimation of post-development daily traffic volumes and required road standard for the Twp Rd 400.

### 1.3 Existing and Future Developments

Currently the area located in the southwest quadrant of the intersection of Twp Rd 400 and Rg Rd 22 is dedicated as *Recreational Vehicle Resort District (R-RVR)* and *Country Residential District (R-CR)* base on the Land Use Bylaw No. 1056/07, as shown on the *Sylvan Lake Region Overview Map* (viewable on the Lacombe County website). The property west of the proposed residential developed (Palm Bay), is classified as *Residential Lake Area District (R-RLA)*. Error! Reference source not found. illustrates the existing land use bylaw.

**Figure 1.4: Land Use Bylaw** (Source: Land Use Bylaw District Maps, Lacombe County, 2010)



This traffic impact assessment (TIA) was prepared to support the rezoning and subdivision approval of approximately 53 lot subdivisions for single-unit family houses in Stage 1. As indicated in conversations with Red Deer Properties Developments Ltd, the size of the full development is unknown although MMM would assume a maximum of 450 single-unit family houses, in the ultimate stage (assuming a 20 year horizon).

The Lacombe County confirmed and provided the trips generated by the Skyy Country Golf and RV Park development. Trip distribution was also discussed and agreed with the County.

The Lacombe County confirmed that other developments, in various stages of approval, will also take place on the surrounding area. However, the County could not confirm the total number of trips generated by these developments. In order to account for these developments the County agreed that annual traffic growth rate should be assumed to be 4% (for comparison purposes the provincial average is normally between 2 to 3% pa).

## 2.0 ROAD DESCRIPTION

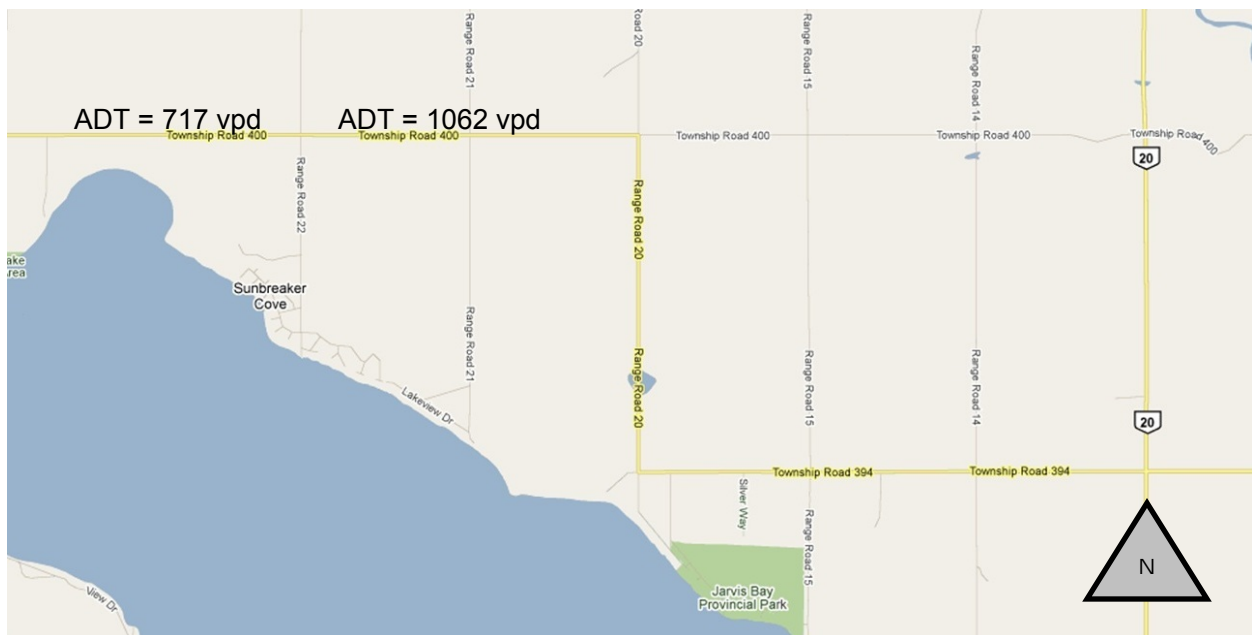
The proposed Red Deer development access will be located approximately 8.4 km west of the intersection of Hwy 12 and Twp Rd 400. Twp Rd 400 (or Rainy Creek Road) is classified as being a *County main asphalt road*. It is a two-way undivided paved road having a right of way of approximately 40.23 metres. Each lane is approximately 3.5 metres wide and the road has 1.2m wide shoulders on both sides. The posted speed is 100 kph and the design speed is 110 kph.

## 3.0 TRAFFIC VOLUMES

### 3.1 Background Traffic

Background traffic refers to the traffic that already uses the roadway, or will use the roadway in the time horizon, irrespective of the proposed development. The existing (2010) traffic volume along Twp Rd 400, between Rg Rd 22 and Rg Rd 24, is approximately 717 vehicles per day (vpd). This figure was obtained by applying a 4% growth factor to the 2009 flows provided by the County. The design hour volume is assumed to be approximately 15 percent of the daily traffic volume. **Figure 3.1** shows the daily traffic volumes by the year 2010.

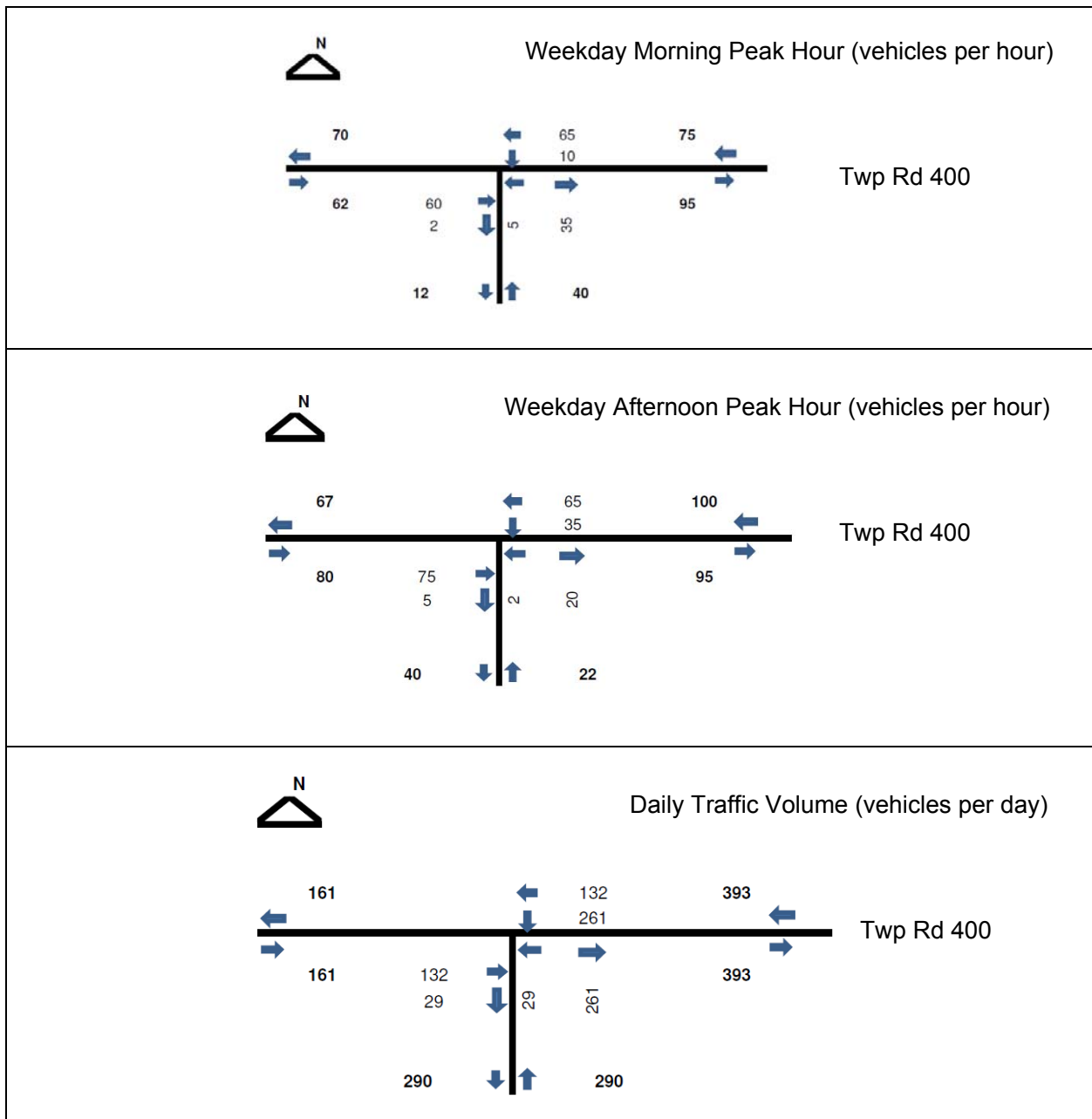
**Figure 3.1: 2010 Daily Traffic Volumes** (Source: Google Maps, 2010)



### 3.2 Post-Development Traffic By 2010

Post-Development traffic by 2010 refers to the background traffic (including any traffic generated by other developments) plus the additional traffic generated by the Red Deer development if stage one were opened by 2010. **Figure 3.2** illustrates the post-development traffic volumes by the year 2010.

**Figure 3.2: Post-Development Traffic Volumes by Year 2010**



### 3.3 Post-Development Traffic By 2030

Post-development traffic refers to the forecast background traffic volumes by the year 2030, with the addition of the traffic generated by the Skyy Country Golf and RV Park development assuming full build-out, and the traffic generated by the Red Deer residential development, assuming full built-out of 450 units. **Figure 3.3** illustrates the post-development traffic during the weekday morning and afternoon peak hour as well as the estimated combined daily traffic, by the year 2030.

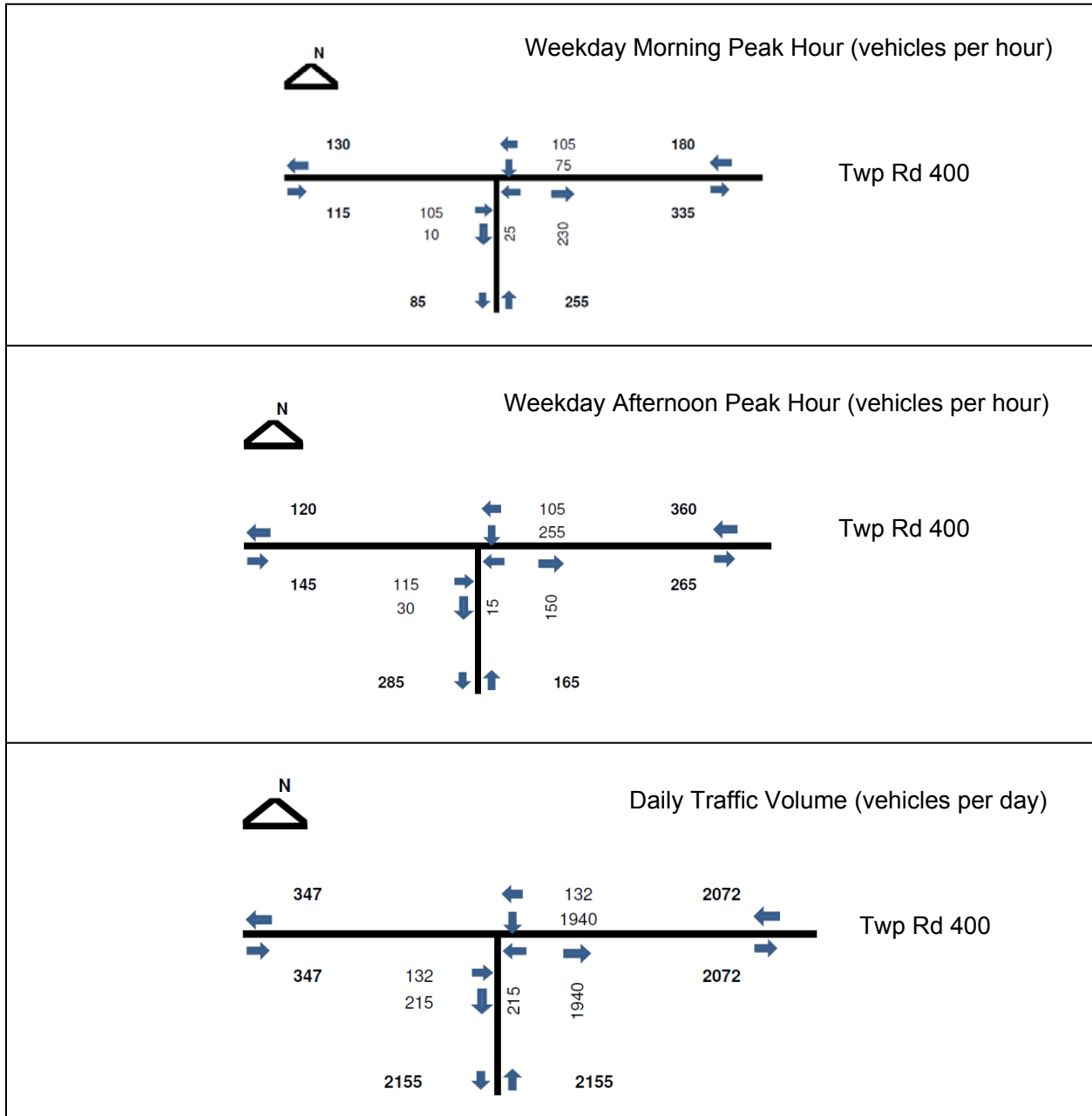
The Lacombe County confirmed and provided the trips generated by the Skyy Country Golf and RV Park development. This development is estimated to generate approximately 2,650 vehicles per day at full built-out (assumed by the year 2030); 176 new trips during the weekday morning peak hour and 310 new trips during the weekday afternoon peak hour. **Table 3.1** illustrates the generation of new trips by the Skyy Country Golf and RV Park development and its distribution.

**Table 3.1: Skyy Country Golf and RV Park Development Trip Generation**

Estimate	Trip Direction		Trips Generated		
	In	Out	In	Out	Total
Daily Traffic Volume (ADT) *	50%	50%	1325	1325	2650
Weekday Morning Peak Hour **	43%	57%	76	100	176
Weekday Afternoon Peak Hour **	60%	40%	186	124	310
* Traffic volumes in vehicles per day ** Traffic volumes in vehicles per hour					

Section 3.4 describes the methodology followed for estimating trip generation, trip distribution, and trip assignment for the post-development traffic.

Figure 3.3: Post-Development Traffic Volumes by Year 2030



### 3.4 Travel Forecasting For Future Traffic

#### 3.4.1 Trip Generation

Trips generated by the proposed development were estimated for the weekday morning and afternoon peak hour. The generated daily traffic volumes were also estimated. Estimates of inbound and outbound trips per hour or day are based on trip rates obtained from the Institute of Transportation Engineers (ITE) Trip Generation - An ITE Informational Report, 8th Edition. Currently, the size of the proposed development is just 53 lot subdivisions for single-unit family houses in Stage 1. The full development size is assumed to be a maximum size of 450 single-unit family houses, in the ultimate stage (2030). **Table 3.2** summarizes the forecast trip generation for the proposed development. Trip estimates have been rounded to the nearest five vehicles per hour.

**Table 3.2: Proposed Development Trip Generation**

Development Size	Unit (1)	Fitted Curve Equation	Trip Direction		Trips Generated		
			In	Out	In	Out	Total
Year 2010 (Stage 1)							
Daily Traffic Volume (ADT) *	53	$\ln(T) = 0.92\ln(X) + 2.71$	50%	50%	290	290	580
Weekday Morning Peak Hour **	53	$T = 0.70X + 9.43$	25%	75%	13	38	50
Weekday Afternoon Peak Hour **	53	$\ln(T) = 0.90\ln(X) + 0.53$	63%	37%	38	22	60
Year 2030 (Ultimate Stage)							
Daily Traffic Volume (ADT) *	450	$T = 9.57X$	50%	50%	2155	2155	4310
Weekday Morning Peak Hour **	450	$T = 0.75X$	25%	75%	85	255	340
Weekday Afternoon Peak Hour **	450	$T = 1.01X$	63%	37%	284	167	450
(1) Single-unit family houses * Traffic volumes in vehicles per day ** Traffic volumes in vehicles per hour							



### 3.4.2 Trip Distribution and Assignment

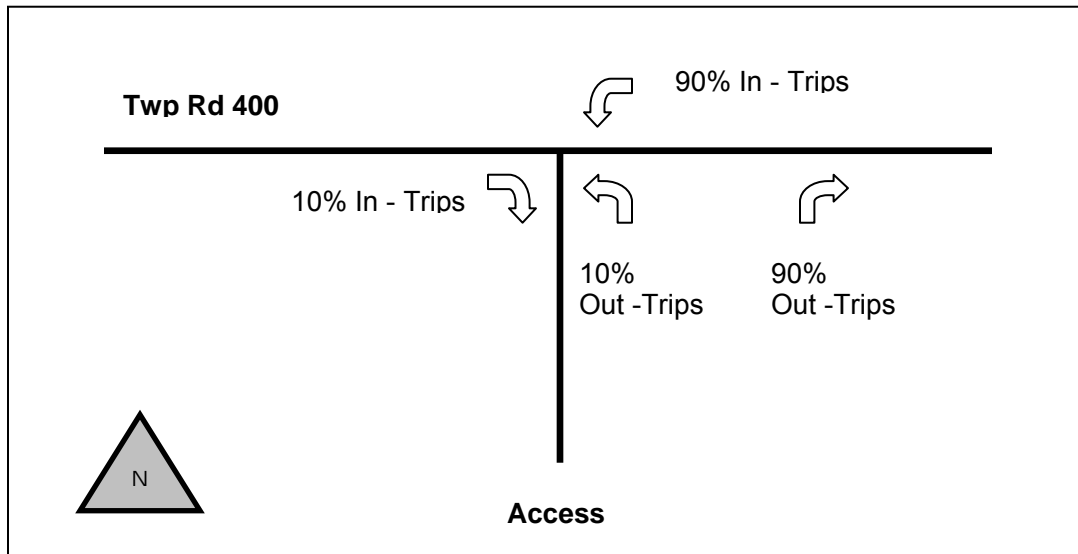
Trip distribution refers to the directional split of traffic entering and exiting the study area. Trip assignment refers to the allocation of the distributed trips to specific links into the road network.

Trip distribution for was discussed and agreed with the Lacombe County and is based on their local knowledge and on the current traffic patterns. The trip distribution was agreed as follows:

- ▶ 10% of development generated traffic will travel to/from the east along Twp Rd 400
- ▶ 90% of development generated traffic will travel to/from the west along Twp Rd 400 and will split through the local network
- ▶ Most of the traffic to/from the east will originate in the main residential areas along Hwy 2, such as Calgary, Edmonton and Red Deer.

Figure 3.3 illustrates trip assignment at the proposed development access along Twp Rd 400.

**Figure 3.3: Trip Distribution at Access along Twp Rd 400** (Source: MMM, 2010)



## **4.0 TRAFFIC ANALYSIS**

### **4.1 Intersection Analysis**

The traffic analysis for the proposed development was undertaken using Synchro 7.0 traffic analysis software. The relative performance of an intersection is measured in terms of level of service (LOS) and the volume-to-capacity (v/c) ratio. Intersection level of service ranges from A (excellent) to F (beyond capacity). Level of service criteria for unsignalized intersections is defined in terms of the delay. Delay is the total elapsed time from when a vehicle stops at the end of the queue until the vehicle departs from the stop line. This includes the time required for the vehicle to travel from the last-in-queue position to the first. In the case of a two-way stop-controlled intersection the LOS is defined for each minor movement, and the LOS is not defined for the intersection as a whole.

Intersection capacity utilization level of service (ICU LOS) provides additional insight into how an intersection is functioning and how much extra capacity is available to handle traffic fluctuations and incidents. ICU LOS ranges from A (excellent) to H (beyond capacity), with ICU LOS E generally considered being at practical capacity.

#### **4.1.1 Stage 1 - Year 2010**

The procedure outlined in the Alberta Transportation Geometric Standard Guidelines, Section D, was followed to determine the type of intersection required at the access of the new development as well as warrant analysis for left and right turning movements (based on the forecasted traffic volumes and posted speed on the Twp Rd 400). The analysis shows that a “Type IIa” intersection will be suitable for the expected traffic operations in 2010.

#### **4.1.2 Ultimate Stage – Year 2030**

The procedure outlined in the Alberta Transportation Geometric Standard Guidelines, Section D, was follow to determine the type of intersection required at the access of the new development as well as warrant for left and right turns, based on the forecasted traffic volumes by the year 2030 and posted speed of 100 kph on the Twp Rd 400. The analysis shows that a Type IVa intersection will be required and that a more detailed traffic analysis was required in order to determine storage length requirements for left and right turns. Therefore, a detail traffic analysis was conducted using Synchro 7.0 traffic analysis software.

Error! Reference source not found. presents the results of the intersection analysis for the 2030 Post-Development weekday morning and afternoon peak traffic conditions.

The proposed development access at Twp Rd 400 will required a T Intersectional Treatment (Type IVa). The westbound left turn movement will require 100m of storage (120m from the centre line) and 210m of 60:1 taper. The eastbound right turn movement will require 100m of storage (120m from the centre line) and 140m of 40:1 taper.

Giving the proximity of the access to Skyy Country Golf and RV Park development (approximately 380m from centre line to centre line) and their intersection requirements, it might be necessary to extend the Left turn storage lane between both intersections. As result, Twp Rd 400 would have 2 lanes in the westbound direction (one for exclusive left turn movements and one for through movements) between both accesses.

**Table 4.1: Development Access and Twp Rd 400 Intersection Analysis – Year 2030**

Critical Movements – Ultimate Stage (Year 2030)											
Scenario	ICU LOS (Intersection Utilization)	Intersection Delay (sec)	EB Right			WB Thru/Left			NB Right/Left		
			V/C	LOS (Delay)	Queue (meters)	V/C	LOS (Delay)	Queue (meters)	V/C	LOS (Delay)	Queue (meters)
Weekday Morning Peak Hour	A (35%)	6.4	0.01	A (0 s)	0	0.06	A (7.8 s)	1.5	0.34	B (11.5 s)	11.7
Weekday Afternoon Peak Hour	A (40%)	6.1	0.02	A (0 s)	0	0.22	A (8.4 s)	6.3	0.26	B (11.7 s)	7.9

### 4.1.3 Illumination and Signal Warrant Analysis

Signal warrant calculations were not conducted since the operation analysis provided adequate traffic operational levels.

Based on the Alberta Transportation’s warrants for illumination, illumination would be required at the development access and Twp Rd 400 by 2030. Collision data along Twp Rd 400 could not be obtained by this time; however delineation lighting is warranted due to the projected traffic even if the number of night time collisions is zero. **Appendix D** presents the illumination warrant calculations.

### 4.1.4 Road Segment Capacity

The Twp Rd 400 road segment between 500 m west of the proposed development access and 500 m east of the Skyy Country Golf and RV Park development access were analysed to identify the volume-to-capacity ratio and level of service. The analysis was done for the existing and post-development scenarios. The Highway Capacity Software HCS was used for the Two-Way analysis by the weekday afternoon peak hour as it was identify as the most critical design hour. Error! Reference source not found. presents the results of the two-way analysis. The analysis shows no major impact on the Twp Rd 400 in the vicinity area, except for the road segment east of the Skyy Country Golf and RV Park Access, where a LOS C could be expected for the post-development traffic volumes by the year 2030, during the weekday afternoon peak hour.

**Table 4.2: Two-Way Twp Rd 400 Analysis**

Critical Movements – Weekday Afternoon Peak Hour						
Scenario	West of Proposed Development Access		Btw Proposed Access		East of Skyy Country Golf & RV Park Access	
	V/C	LOS	V/C	LOS	V/C	LOS
2010 Existing	0.07	A	0.07	A	0.07	A
2010 Post-Development	0.09	A	0.12	A	0.19	A
2030 Post-Development	0.16	A	0.27	B	0.34	C

## 5.0 CONCLUSIONS AND RECOMMENDATIONS

The results of the traffic operation review indicate that the key intersection (proposed development access at Twp Rd 400) is expected to operate satisfactorily as a T intersection with a stop sign control in the access approach and free flow along Twp Rd 400. By the year 2030, it is estimated an approach LOS A on the movements along Twp Rd 400 and an approach LOS B on the movements along the new development access.

The analysis shows that a Type IVa intersection will be required. The Synchro 7.0 traffic analysis software was used to confirm the need for storage bay and their length for right turn and left turn movements. The westbound left turn movement will require 100 metres of storage (120m from the centre line) and 210m of 60:1 taper. The eastbound right turn movement will require 100 metres of storage (120m from the centre line) and 140m of 40:1 taper, based on the Alberta Transportation Geometric Standard Guidelines and the detail analysis.

The analysis uses an assumed development of 450 single-unit family houses by the year 2030. This development is unlikely to happen any time soon but assumptions in type and size of the total development were necessary to estimate future possible demand and delays.

Special consideration must be give to the access of the Skyy Country Golf and RV Park development (approximately 380 metres from centre line to centre line) and their intersection requirements. The need for left turn storage lanes and tapers in both developments will lead to the practical solution of provide, along Twp Rd 400, 2 lanes in the westbound direction (one for exclusive left turn movements and one for through movements) between both accesses.

The assessment showed that the weekday afternoon peak hour flow is greater than the weekday morning peak hour flow. During the weekday afternoon peak hour period, the proposed development is expected to generate approximately 60 vehicle trips by the year 2010, and 450 vehicle trips by the year 2030. The total daily traffic generated by the proposed development is estimated to be about 580 and 4310 vehicle trips per day by the year 2010 and 2030, respectively.