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## **I. INTRODUCTION**

This report summarizes the alternatives and evaluations of the traffic patterns and congestion in the Village of Long Grove. Specific goals of the study include:

1. identifying and prioritizing traffic corridors for improvement including community wide collector and arterial traffic issues as they relate to traffic capacity deficiencies and roadway safety,
2. aid in prioritizing improvements on state and county system routes for the purposes of working with the respective agencies,
3. propose alternative solutions that will address the issues,
4. provide preliminary opinions on the construction costs, and
5. identify funding allocations for each improvement.

These evaluations included traffic studies of specific areas including:

1. the route along Schaeffer Road, Holly Court, Tribal Court and Country Club Drive for the area encompassing Country Club Meadows and Country Club Estates and Bridgewater Farms subdivisions. This evaluation includes a speed study and an overall traffic count, in order to assess the potential for traffic calming or other such improvements.
2. The Mardan Woods, Mardan Estates, Mardan Lakes, and Mardan Oaks access to IL Rte 53
3. The intersection of Old McHenry Road at Robert Coffin Road in Historic Downtown Long Grove

## II. EXISTING CONDITIONS

### A. Village Wide Overview

#### 1. Roadway System

The Village and nearby regions have few routes with north – south continuity. There is only one major north-south route through the Village of Long Grove. IL Route 83 runs from the north end of the Village along the eastern edge of the Village. IL Route 83 provides the only primarily north-south road with continuity for approximately 5 miles. South of historic Downtown Long Grove the intersection of IL Route 83 at IL Route 53 has a “tee” intersection that splits the north south traffic to either IL Route 53 or IL 83. Near the southeast side of the Village, IL Route 83 intersects with Arlington Heights Road. IL Route 53 runs from the southwest corner of the Village to the east side of the Village, approximately 1.5 miles north of the southern limit. While IL Route 83 heads to the east at this point, Arlington Heights Road continues to the southern limit of the Village. Both IL Route 53 and Arlington Heights Road intersect with Lake Cook Road which provides access to the freeway portion of IL Route 53. South of the Village limits several routes provide north – south continuity including Il 53, Arlington Hts. Road, Hicks Road (Old IL 53), and IL Route 83.

There are multiple east-west routes within or near the Village of Long Grove that provide extensive east-west continuity. Along the southern boundary of the Village, Lake Cook Road (Cook County jurisdiction) serves as a major arterial. IL Route 22 (State jurisdiction) runs east-west through the roughly the middle of the Village, approximately 1 mile north of the downtown area. Near the northern limits of the Village IL Route 60 provide north south continuity to the east, although limited east west continuity is to the west. Approximately 2 miles north of the Village IL Route 176 provides further east – west continuity.

Old McHenry Road and Gilmer Road both provide northwest – southeast access connection to IL 83 further creating a bottleneck as almost all traffic to / from the north and northwest traverses the intersections of IL 83 / IL 53 and Old McHenry Road / IL 53 immediately south of Downtown Historic Long Grove.

#### 2. Major Intersections

##### IL Route 83 / IL Route 60 & Midlothian Road

IL Route 83 / IL Route 60 intersects with Midlothian Road immediately north of the Village of Long Grove northern limits. IL Route 83 / IL Route 60 runs northwest – southeast and Midlothian Road runs southwest – northeast. All four legs of the signalized intersection consist of one thru lane and one left turn lane. This intersection is outside of the Village limits and is under State jurisdiction.

##### IL Route 83 / IL Route 60 & Diamond Lake Road

IL Route 83 / IL Route 60 intersects with Diamond Lake Road to the southeast of the IL Route 83 / IL Route 60 & Midlothian Road intersection. IL Route 83 / IL Route 60 runs northwest – southeast and Diamond Lake Road runs north-south. Both, the northwest

and southeast legs of IL Route 83 / IL Route 60 have two thru lanes and one left turn lane at the signalized intersection. The north leg of Diamond Lake Road has one thru lane and the south leg has one thru lane and one right turn lane. This intersection is outside of the Village limits and is under State jurisdiction.

#### IL Route 83 & IL Route 60

IL Route 83 intersects with IL Route 60 to the southeast of the IL Route 83 / IL Route 60 & Diamond Lake Road intersection. The two roads intersect at a signalized tee intersection. IL Route 60 is the east leg, IL Route 83 is the southeast leg and they combine to form the northwest leg. Both, the northwest (IL Route 83 / IL Route 60) and southeast (IL Route 83) legs have two thru lanes and one left lane. The east (IL Route 60) leg has two right lanes and one left lane. This intersection is outside of the Village limits and is under State jurisdiction.

#### IL Route 83 & IL Route 45

IL Route 83 intersects with IL Route 45 to the southeast of the IL Route 83 & IL Route 60 intersection. The two roads meet at a signalized intersection. IL Route 83 comprises the south and northwest legs, while IL Route 45 comprises the southeast and north legs. All four legs of the intersection consist of two thru lanes and one left turn lane. This intersection is outside of the Village limits and is under State jurisdiction.

#### IL Route 60 & IL Route 45

IL Route 60 intersects with IL Route 45 to the east of the IL Route 83 & IL Route 60 intersection and to the north of IL Route 83 & IL Route 60 intersection. The two roads cross at a signalized intersection. IL Route 60 runs east-west and IL Route 45 runs north-south. The north and west legs have two thru lanes and one left turn lane. The south and east legs have two thru lanes, one left turn lane and one right turn lane. This intersection is outside of the Village limits and is under State jurisdiction.

#### IL Route 83 & Gilmer Road

IL Route 83 intersects with Gilmer Road to the south of the IL Route 83 & IL Route 45 intersection. IL Route 83 runs north-south and Gilmer Road runs east-west. The north leg of IL Route 83 has two thru lanes, one left turn lane and one right turn lane at the signalized intersection. The south leg of IL Route 83 has two thru lanes and two left turn lanes. The west leg of Gilmer Road has one thru lane, one left turn lane and one right turn lane, while the east leg has one thru lane and one left turn lane. This intersection is within the Village limits and is under State jurisdiction.

#### IL Route 83 & IL Route 22

IL Route 83 intersects with IL Route 22 to the south of the IL Route 83 & Gilmer Road intersection. IL Route 83 runs north-south and IL Route 22 runs east-west. The north leg of IL Route 83 has two thru lanes and two left turn lanes at the signalized intersection. The south leg of IL Route 83 has two thru lanes, two left turn lanes and one right turn lane. The east leg of IL Route 22 has two thru lanes and one left turn lane. The west leg of IL Route 22 has two thru lanes, one left turn lane and one right turn lane. This intersection is within the Village limits and is under State jurisdiction.

#### IL Route 83 & Aptakistic Road

IL Route 83 intersects with Aptakistic Road to the south of the IL Route 83 & IL Route 22 intersection. IL Route 83 intersects with Aptakistic Road at a signalized tee intersection. The north leg of IL Route 83 has two thru lanes and two left turn lanes. The south leg of IL Route 83 has two thru lanes and one right turn lane. The east leg of Aptakistic Road has two left turn lanes and one right turn lane. This intersection is within the Village limits and is under State jurisdiction.

#### IL Route 83 & Robert Parker Coffin Road

IL Route 83 intersects with Robert Parker Coffin Road to the south of the IL Route 83 & Aptakistic Road intersection. IL Route 83 intersects with Robert Parker Coffin Road at a signalized tee intersection. The north leg of IL Route 83 has two thru lanes. The south leg of IL Route 83 has two thru lanes and one left turn lane. The west leg of Robert Parker Coffin Road has one left turn lane and one right turn lane. This intersection is within the Village limits and is under State jurisdiction.

#### IL Route 83 & IL Route 53

IL Route 83 intersects with IL Route 53 to the south of the IL Route 83 & Robert Parker Coffin Road intersection. IL Route 53 tees into IL Route 83 at a signalized intersection. The north leg of IL Route 83 has two thru lanes and one right turn lane. The southeast leg of IL Route 83 has two thru lanes and two left turn lanes. The west leg of IL Route 53 has two left turn lanes and one right turn lane. This intersection is within the Village limits and is under State jurisdiction.

#### IL Route 83 & Arlington Heights Road

IL Route 83 intersects with Arlington Heights Road to the southeast of the IL Route 83 & IL Route 53 intersection. IL Route 83 runs northwest – southeast and Arlington Heights Road runs north-south. The northwest leg of IL Route 83 has two thru lanes, one left turn lane, and one right turn lane at the signalized intersection. The southeast leg of IL Route 83 has two thru lanes and one left turn lane. The north leg of Arlington Heights Road has one thru lane and one left turn lane. The south leg of Arlington Heights Road has one thru lane and two left turn lanes. This intersection is outside of the Village limits and is under State jurisdiction.

#### Arlington Heights Road & Checker Road

Arlington Heights Road intersects with Checker Road to the south of the IL Route 83 & Arlington Heights Road intersection. Arlington Heights Road runs north-south and Checker Road runs east-west. The north and south legs of Arlington Heights Road have two thru lanes and one left turn lane at the signalized intersection. The east and west legs of Checker Road have one thru lane. This intersection is outside of the Village limits and is under Lake County jurisdiction.

#### Arlington Heights Road & Lake Cook Road

Arlington Heights Road intersects with Lake Cook Road to the south of the Arlington Heights Road & Checker Road intersection. Arlington Heights Road runs north-south

and Lake Cook Road runs east-west. The north leg of Arlington Heights Road has two thru lanes, one left turn lane, and one right turn lane at the signalized intersection. The south leg of Arlington Heights Road and the east and west legs of Lake Cook Road have two thru lanes and one left turn lane. This intersection is outside of the Village limits and is under Cook County jurisdiction.

#### IL Route 53 & Old McHenry Road

IL Route 53 intersects Old McHenry Road approximately one half mile south of Historic Downtown Long Grove. This intersection is impacted from time to time by the extensive queue at the intersection of IL 83 / IL 53.

#### IL Route 53 & Long Grove Road

IL Route 53 intersects with Long Grove Road to the north of the IL Route 53 & Lake Cook Road intersection. IL Route 53 runs northeast-southwest intersects with Long Grove Road, which runs northwest, at a signalized tee intersection. The northeast leg of IL Route 53 has one thru lane and one right turn lane. The southwest leg of IL Route 53 has one thru lane and one left turn lane. The northwest leg of Long Grove Road has one left turn lane and one right turn lane. This intersection is within the Village limits and is under State jurisdiction.

#### IL Route 53 / Hicks Road & Lake Cook Road

IL Route 53 / Hicks Road intersects with Lake Cook Road to the west of the Arlington Heights Road & Lake Cook Road intersection. IL Route 53 runs to the north, Hicks Road runs to the south and Lake Cook Road runs east-west. The east leg of Lake Cook Road has two thru lanes, one left turn lane, and one right turn lane at the signalized intersection. The north leg of IL 53, the south leg of Hicks Road, and the west legs of Lake Cook Road have two thru lanes and one left turn lane. This intersection within the Village limits and is under State jurisdiction.

#### IL Route 22 & Old McHenry Road

IL Route 22 intersects Old McHenry Road approximately 1 mile north of Historic Downtown Long Grove. Currently the Illinois Department of Transportation is in the beginning stages of improving Illinois Route 22 from Illinois Route 83 west through Long Grove to Kildeer. This study includes the intersection of Illinois Route 22 and Old McHenry Rd. This intersection is impacted from time to time by the extensive queue at Old McHenry and Robert Parker Coffin.

### **B. Old McHenry Road at Robert Parker Coffin Road**

Old McHenry Road intersects Robert Parker Coffin Rd in the downtown business district of Long Grove. The intersection consists of a four way stop with one lane in each direction. This intersection has been a major cause of congestion in Long Grove for some time. Lake County has indicated that they are interested in rehabilitating Old McHenry Rd. but the project has been put on hold to work with the Village in order to address downtown streetscape improvements as part of this overall improvement.

12 hour traffic counts were performed at Old McHenry and Robert Parker Coffin in order to evaluate intersection operations and to evaluate how potential future improvements will affect the traffic congestion and impact Historic Downtown Long Grove.

This intersection currently consists of a four way stop condition. The average delay of this intersection as it is currently configured is approximately 119 seconds which correlates to an intersection level of service of F. The westbound, northbound, and southbound approaches are a level of service F, while the eastbound approach is a level of service E.

### **C. Mardan Area Access**

To the northeast of the IL Route 53 & Long Grove Road intersection, various roads “tee” into IL Route 53 within close proximity to each other. The western most road, Mardan Drive intersects on the north side of IL 53. The middle intersection is Il 53 with Old Hicks Road on the south side. Middlesax Drive is the easternmost of the three and intersects on the north side. At all three of these un-signalized intersections, IL Route 53 consists of one eastbound and one westbound lane. Each of the intersecting roads consists of a two lanes (one entering and one exiting). Mardan Wood Drive and Middlesax Drive provide the only access to the Mardan Woods / Lakes / Estates / Oaks subdivisions

### **D. Country Club Estates/ Country Club Meadows / Bridgewater Farms Traffic Calming Evaluations**

Traffic volume and speed studies were performed to evaluate the area of Country Club Estates/ Country Club Meadows / Bridgewater Farms. Currently these roads are 24 ft wide with one lane in each direction. The roadway section is rural (ie no curb and gutter) with broad open areas adjacent to the road to provide for open drainage and limited direct driveway access. Schaeffer Rd is a relatively straight roadway from IL 53 to Holly Court. Such a typical section is generally consistent with higher volume higher speed roadways. Schaeffer Road was a continuous route from just south of downtown Long Grove to Lake Cook Road; however the Village removed a section of Schaeffer Road in 1999 to discourage perceived cut-through traffic. North-south continuity remains via Schaeffer Road/ Holly Court/Tanager Way/Country Club Drive

Traffic volumes and speeds were collected along the route at Schaeffer Road and Country Club Drive. Traffic volumes (1,230 ADT Schaeffer Rd., and 728 ADT Country Club Dr) were found to be consistent with the size and density of the neighborhood including adjacent subdivisions (see Exhibit 1 Traffic Volume Map). The speed studies show the average speeds and speed variances to be a significant concern.

Currently the posted speed limit is 25 mph and the 85<sup>th</sup> percentile of Schaeffer Rd is 40 mph while the 85<sup>th</sup> percentile of Country Club Dr is 34 mph (speed limits are set based on the 85<sup>th</sup> percentile of the speeds collected). Notably, the data collected revealed that in the 24 hour period evaluated, 16 vehicles were found to be traveling at a speed higher than 50 mph, of which 4 vehicles registered speeds greater than 55 mph. This is more than twice the posted speed limit. This significant variance in actual speeds versus speed limits is an indication that

the characteristics of the roadway corridor are not consistent with the conditions intended for the road and therefore this area is a candidate for effective traffic calming measures.

Additionally, a community meeting was conducted on October 19<sup>th</sup>, 2006 in order to obtain additional input and concerns from area residents as well as to provide the community with an update on the on-going evaluations. Various residents' comments described situations that would occur in areas where the motorist is not obeying the legal methods to control traffic. Residents noted that although there are not a lot of driveways with direct access to Schaeffer Rd, there are numerous homes that have backyards that boarder the road with concerns regarding children playing in these yards. Another main concern is that cars are disobeying the stop signs that are located along Schaeffer Rd at Antietam Rd / Sumter Rd and Manassas Rd. A notable comment included the lack of a pedestrian or multiuse path parallel to the road to separate pedestrians from the vehicles. The meeting minutes from the community meeting can be found in the Exhibit 2.

### **III. EVALUATION / ANALYSIS**

#### **A. Village Wide Overview**

Various methods and sources were used to evaluate the major intersections throughout the Village. 24 hour counts were performed along some of the major routes, including IL Route 22 and IL Route 53. Peak hour counts were performed at the intersections of IL Route 22 & N. Krueger Road, IL Route 53 & Old Hicks Road. Also, recently conducted traffic studies for private developments were also referenced, and traffic signal analysis / traffic count data from IDOT and Lake County DOT were also collected and evaluated.

The evaluations and analyses included capacity of significant through routes (arterials) as well as specific areas of concern.

- Access to Mardan Woods / Mardan Lakes (IL Route 53 at Mardan Drive / Old Hicks Road / Middlesax Drive.)
- Speed and traffic volumes studies for Country Club Woods/ Lakes/ Meadows/ Bridgewater Farms (Schaeffer Road / Country Club Drive / Tanager Way/ Holly Court)
- Capacity issues at Old McHenry Road and Robert Parker Coffin Road

#### **1. Level of Service Analysis**

The operation of the intersections for this study were evaluated using level-of-service analyses for un-signalized and signalized intersections (if peak hour traffic count data was available).

The concept of levels-of-service is defined as a qualitative measure describing operational conditions within a traffic stream, and their perception by motorists and/or passengers. A level-of-service definition generally describes these conditions in terms of such factors as speed and travel time, freedom to maneuver, traffic interruptions, comfort and convenience, and safety.

a) Signalized Intersections

Six levels of service are defined for signalized intersections. They are given letter designations, from A to F, with level-of-service A representing the best operating conditions and a level-of-service F the worst. The delay ranges for the various levels of service (LOS) are defined as follows:

- Level-of-service A. Delay per vehicle is 10.0 seconds or less.
- Level-of-service B. Delay per vehicle ranges from 10.1 to 15.0 seconds.
- Level-of-service C. Delay per vehicle ranges from 15.1 to 35.0 seconds.
- Level-of-service D. Delay per vehicle ranges from 35.1 to 55.0 seconds.
- Level-of-service E. Delay per vehicle ranges from 55.1 to 80.0 seconds.
- Level-of-service F. Delay per vehicle is greater than 80.0 seconds.

Level-of-service evaluations were conducted for the existing traffic volumes for the a.m. and p.m. weekday peak hours using the operation component of the signalized module of the Highway Capacity Software (HCS+ version 5.2).

- The signalized intersection of IL Route 83 and IL Route 22 has a level of service F (117.4 second delay).
- The signalized intersection of IL Route 22 and Old McHenry Road has a level of service D (51.7 second delay).
- The signalized intersection of IL Route 83 and IL Route 45 has a level of service D (35.1 second delay).
- The signalized intersection of IL Route 60 and IL Route 83 has a level of service D (54.7 second delay).
- The signalized intersection of IL Route 45 and IL Route 60 has a level of service D (54.7 second delay).

b) Un-signalized Intersections

Six levels of service are defined for un-signalized intersections. They are given letter designations, from A to F, with level-of-service A representing the best operating conditions and a level-of-service F the worst. The delay ranges for the various levels-of-service (LOS) are defined as follows:

- Level-of-service A. Delay per vehicle is 10.0 seconds or less.
- Level-of-service B. Delay per vehicle ranges from 10.1 to 15.0 seconds.
- Level-of-service C. Delay per vehicle ranges from 15.1 to 25.0 seconds.
- Level-of-service D. Delay per vehicle ranges from 25.1 to 35.0 seconds.
- Level-of-service E. Delay per vehicle ranges from 35.1 to 50.0 seconds.
- Level-of-service F. Delay per vehicle is greater than 50.0 seconds.

The procedure for determining delay in this situation is to assume no delay to the through movements on the major street. The delay is assigned entirely to the stopped legs of the intersection. For this reason, the levels-of-service for two-way stop sign controlled intersections are given as approach delays as compared to individual

movement delays for signalized intersections. The primary reason for this difference is that drivers expect different levels of performance from different kinds of transportation facilities. The expectation is that a signalized intersection is designed to carry higher traffic volumes than an un-signalized intersection. Additionally, several driver behavior considerations combine to make delays at signalized intersections less onerous than at un-signalized intersections. For example, drivers at signalized intersections are able to relax during the red interval, whereas drivers on the minor approaches to un-signalized intersections must remain attentive to the task of identifying acceptable gaps and vehicle conflicts. Also, there is often much more variability in the amount of delay experienced by individual drivers at un-signalized intersections than at signalized intersections. For these reasons, it is considered that the total delay threshold for any given level-of-service is less for an un-signalized intersection than for a signalized intersection.

Level-of-service evaluations were conducted for un-signalized intersections using the un-signalized module of the Highway Capacity Software (HCS+ version 5.2).

- The un-signalized intersection of IL Route 53 and Schaeffer Road has a level of service D (32.3 second delay).
- The un-signalized intersection of IL Route 22 and Krueger Road has a level of service A (7.4 second delay).

## **2. Planning Level - Capacity Analysis**

If peak hour intersection traffic counts were not readily available, the intersections were analyzed using the planning component of the signalized module of the Highway Capacity Software (HCS+ version 5.2). This component compares the volume of each movement to the capacity of the intersection. The capacity analysis is given as a critical v/c ratio. This ratio is then defined as Under Capacity, Near Capacity, At Capacity, and Over Capacity.

- Under Capacity – Critical v/c Ratio is less than or equal to 0.85
  - Near Capacity – Critical v/c Ratio is between 0.85 and 0.95
  - At Capacity – Critical v/c Ratio is between 0.95 and 1.00
  - Over Capacity – Critical v/c Ratio is greater than 1.00
- 
- The signalized intersection of IL Route 83 and IL Route 53 is Over Capacity with a critical v/c ratio of 1.31.
  - The signalized intersection of IL Route 53 and Long Grove Road is At Capacity with a critical v/c ratio of 0.96.
  - The signalized intersection of IL Route 53 and Lake Cook Road is Over Capacity with a critical v/c ratio of 1.30.
  - The signalized intersection of IL Route 83 and Arlington Heights Road is Over Capacity with a critical v/c ratio of 1.43.
  - The signalized intersection of IL Route 83 and Robert Parker Coffin Road is Over Capacity with a critical v/c ratio of 1.09.

- The signalized intersection of IL Route 83 and Aptakisic Road is Over Capacity with a critical v/c ratio of 1.08.
- The signalized intersection of IL Route 83 and Midlothian Road is Over Capacity with a critical v/c ratio of 1.39.
- The signalized intersection of IL Route 83 and Gilmer Road is Over Capacity with a critical v/c ratio of 1.18.
- The signalized intersection of IL Route 83 and Diamond Lake Road is Near Capacity with a critical v/c ratio of 0.86.

### **3. Signal Warrant Analysis**

For all of the intersections that are not signalized, a signal warrant analysis was performed. There are eight (8) different signal warrants that are used to determine if an intersection should be signalized. These warrants are listed in the Appendix.

#### **B. Old McHenry Road & Robert Parker Coffin Drive**

This intersection is projected to be rehabilitated along with the downtown streetscape and Lake County DOT's rehabilitation of Old McHenry Rd. The Village Board is in the process of considering potential improvements to the downtown streetscape. Lake County DOT has placed planned improvements on hold pending a final decision on the downtown streetscape by the Village of Long Grove.

As part of this traffic study, evaluations were performed in order to investigate the type of intersection improvement that would work best to address both the operational issues related to this heavily congested intersection and the Historic Character of Downtown Long Grove. Alternatives were evaluated based on the existing traffic volumes as well as preliminary 20 year projected traffic volumes (see exhibit 3).

Various options were evaluated as possible solutions to the traffic congestion at Old McHenry Road and Robert Parker Coffin Road. These include:

1. no changes
2. addition of a traffic signal at the intersection,
3. the expansion of Old McHenry Road with auxiliary lanes and a traffic signal and
4. the installation of a Modern Roundabout at the intersection.

Under the current conditions the intersection operates at a level of Service "F" with a calculated delay time of 119.4 seconds during the peak hours. Peak hour traffic can regularly be observed with excessive queues with spillover queues occasionally impacting operations as far as Old McHenry Road at IL Route 22. With likely projected increases in traffic over the next 20 years, this condition is expected to worsen if the no changes alternative is used.

The addition of a traffic signal would improve the delay time at the intersection. A traffic signal improves the intersection calculated level of service from the current level "F" with a delay time of 119.4 seconds to an intersection level of service "C" with a delay time of 33.7 seconds per vehicle. While this does improve the intersection delay under current conditions, future traffic volume increases would likely result in capacity failure. Based on the

preliminary 20 year projected traffic this would operate at a LOS E with an intersection delay of 76.2). This improvement would be a interim improvement rather than a long term solution to the congestion and delays. Also, in order to attempt to address the Historic Character of the area, the traffic signal would need to be designed with aesthetically pleasing and complementary poles. However, even with such a design, the traffic signal may be perceived as being inconsistent with the historic nature of the downtown area (LED Signal Heads and Control Boxes would still be necessarily visible)

The expansion of Old McHenry Rd to include auxiliary turn lanes also significantly improves existing traffic congestion including addressing capacity needs based on preliminary 20 year traffic projections. This improves the existing conditions at the intersection to a level of service "B" with a calculated delay of 19.0 seconds. Based on the preliminary 20 Year traffic projections, this intersection design operates at a level of service C with a calculated delay of 26.8 seconds in the projected condition. As with the "add traffic signal " alternative, even with such a design, the traffic signal may be perceived as being inconsistent with the historic nature of the downtown area (LED Signal Heads and Control Boxes would still be necessarily visible). Exhibit 4 illustrates the preliminary Right of Way impacts for this alternative. Although this alternative would help the congestion issues of the intersection, the impacts on adjacent buildings and the property would be significant and would therefore be inconsistent with Historic Downtown Long Grove.

Another alternative that was evaluated was is the installation of a Modern Roundabout. With this option the intersection functions at a under capacity volume to capacity ratio and maintains this level of service based on the preliminary 20-year projected traffic volumes. Based on the success of Modern Roundabout in recent studies, the Lake County Division of Transportation has expressed interest in developing such an intersection along its roadway system. Some minor concerns expressed included Modern Roundabout intersection impacts to pedestrian traffic. There have been numerous studies about pedestrian traffic at a roundabout and the results are varied. Some of these studies show that roundabouts are slightly more dangerous than a signalized intersection, while other studies indicate that Modern Roundabouts are approximately the same as signalized intersections with regards to pedestrian traffic, while still others show that they are safer than conventional intersections. It is important to note that education is a critical element to pedestrian and vehicular usage for Modern Roundabouts since these are not common in Illinois.

### **C. Mardan Woods**

Mardan Woods, Mardan Estates, Mardan Lakes, and Mardan Oaks subdivisions have been included in the study due to difficulties entering and exiting the subdivisions. Evaluations included the potential for the installing a traffic signal at these intersections. However, the traffic on neither Mardan Dr, nor Middlesax is sufficient enough to warrant a signal. Additionally, Old Hicks Road at IL Route 53 was evaluated for a traffic signal warrant as a means to create a gap in the traffic flow between these roads. However, Old Hicks also does not meet traffic signal warrants. An alternative solution of closing either Mardan Woods Drive or Middlesax Drive was also considered in order to meet traffic signal warrants. This would create a situation in which the traffic volumes on both Mardan Woods Dr and Midlesax Dr, are combined thereby improving the likelihood that a traffic signal would be warranted. This alternative did not meet

traffic signal warrants. Also a realigned intersection that would combine the volumes of Mardan Dr and Middlesax Dr while realigning a single access point with Old Hicks Rd. was evaluated. This would have significant Right of Way impacts including the acquisition and removal of one home. While this would have the benefit of significantly reducing conflict points and therefore likely improving safety at this location, this alternative intersection did not warrant a traffic signal. Based upon the severity of the impacts and the limited benefit this alternative was not considered for further evaluation.

Additionally the addition of auxiliary lanes as an alternative was considered in order to provide a safer queue area along IL Route 53. This would require installation of a bi-directional left turn lane along the center of IL Route 53, which would encompass Mardan Dr, Old Hicks Rd, and Middlesax Dr. and the addition of right turn lanes at Middlesax Road and Old Hicks Road. Exhibit 5 illustrates this alternative design.

Figure 1 (below) illustrates the current level of service at these three intersections:

<b>Fig 1. Intersection Level of Service</b>			
<b>Existing Conditions</b>			
<b>Movement</b>	<b>Mardan Dr.</b>	<b>Old Hicks Rd</b>	<b>Middlesax Dr</b>
<b>Left Turn movement</b>	<b>AM: A (9.1 second delay)</b>	<b>AM: B (14.3 second delay)</b>	<b>AM: A (9 second delay)</b>
	<b>PM: B (11.5 second delay)</b>	<b>PM: B (11.2 second delay)</b>	<b>PM: B (13 second delay)</b>
<b>Minor Street Turning Movement</b>	<b>AM: C (24.6 second delay)</b>	<b>AM: F (82.1 second delay)</b>	<b>AM: F (92.6 second delay)</b>
	<b>PM: F (88.6 second delay)</b>	<b>PM: F (248.6 second delay)</b>	<b>PM: F (90 second delay)</b>

Figure 2 below illustrates the proposed level of service with the installation of a bidirectional left turn lanes:

<b>Fig 2. Intersection Level of Service</b>			
<b>Proposed Conditions</b>			
<b>Movement</b>	<b>Mardan Dr.</b>	<b>Old Hicks Rd</b>	<b>Middlesax Dr</b>
<b>Left Turn movement</b>	AM: <b>A</b> (9.1 second delay)	AM: <b>B</b> (14.3 second delay)	AM: <b>A</b> (9.0 second delay)
	PM: <b>B</b> (11.5 second delay)	PM: <b>B</b> (11.2 second delay)	PM: <b>B</b> (13.0 second delay)
<b>Minor Street Turning Movement</b>	AM: <b>C</b> (15.2 second delay)	AM: <b>E</b> (37.8 second delay)	AM: <b>C</b> (22.3 second delay)
	PM: <b>C</b> (22.7 second delay)	PM: <b>C</b> (24.9 second delay)	PM: <b>D</b> (26.9 second delay)

Although, IDOT records do not indicate that this area is a high accident location, it is likely that by creating a safe queue area the traffic flow on IL Route 53 would also improve.

IL Route 53 is a state route and would therefore require a permit from the Illinois Department of Transportations in order to perform this work. The bi-directional turn lane will benefit the side streets, and would not significantly affect the traffic flow for IL Route 53. It is important to note that this is an initial study and more detailed evaluation and design would be required in order to obtain a permit for constructing the bidirectional lane.

**D. Country Club Estates/ Country Club Meadows / Bridgewater Farms Traffic Calming Evaluations**

The recommend improvements include a comprehensive approach to creating roadway characteristics (and therefore motorists perception) consistent with the local residential nature of the area.

A matrix of Traffic Calming Alternatives is shown in Exhibit 6. These alternatives were considered both separately and as part of a comprehensive approach. The recommended traffic calming plan may be found in Exhibit 7. This includes five key modifications to the roadway as follows:

- Installation of entrance medians on Schaeffer Road at the intersection of IL Route 53 and on Country Club Dr. at the intersection of Checker Rd. The goal of these is to make the driver better recognize that they have just entered a residential subdivision area. Currently at the intersection of IL Route 53 and Schaeffer, there is no visual change in appearance to mark the change in road characteristics. Residents also expressed concerns at the community meeting regarding back ups and geometry at the intersection of IL Route 53 and Schaeffer Rd. The traffic queue along IL 53

makes it difficult to make a left hand turn from IL 53 onto southbound Schaeffer Rd. Therefore the design of the entrance median will need to address this issue (set the beginning of the median far enough off the road to keep the median from becoming an obstacle that drivers must attempt to avoid while making the turn onto Schaeffer Road). The reconfigured entrance areas would also include landscaping and a raised roadway profile (speed table) to further enhance the traffic calming characteristics.

- Construction of a raised intersection with enhanced pavement markings at Schaeffer Rd./ Sumter Dr. -Antietam Dr. This improvement would enhance the effectiveness of the two stop controlled intersections that are currently ineffective and largely being ignored (based on public input).
- Installation of traffic circles at the intersection of Schaeffer Road / Manassas Lane and at the intersection of Tanager Way / Country Club Drive. These traffic circles along with the raised intersection (Schaeffer Rd / Sumter Dr) and required turn movement at Schaeffer Rd / Holly Court are spaced approximately equally through the neighborhood to maintain the traffic calming benefits and reinforce the character of the residential roadway.
- Installation of enhanced signage to include yield to pedestrian and stop sign ahead signage and highly visible speed limit signs.
- The installation of a sidewalk / multiuse path parallel to Schaeffer Road. This provides both the benefit of separating pedestrian / non motorized traffic from the roadway as well as further enhancing the residential characteristics within the roadway right of way. Such a path would connect to the path in the vacated Schaeffer Road Right of Way. This could also create a significant link in the Village path system by ultimately providing a connection to Historic Downtown Long Grove. It should be noted that while the other traffic calming recommendation should be completed concurrently, the installation of a parallel sidewalk / multiuse path may be done separately.

## IV. PRIORITY RECOMMENDATIONS

All of the intersections have been assigned a priority level of 1, 2, or 3. Level 1 is considered a highest priority recommendation for the Village to improve based on the impacts to the overall Village traffic patterns and congestion. Level 2 is a moderate priority for the Village due to either a currently acceptable level of service or a limited area of benefit. Level 3 is recommended as a low level priority for the Village based on a low benefit to addressing Village wide concerns Exhibit 8 illustrates a priority levels of the intersections and segments within (or near) the Village.

Several factors and criteria were used to determine the prioritization of areas for improvement. These include the need for improvement (level of service/ v/c ratio), the regional benefits (does the improvement benefit a larger population of Long Grove or is the benefit limited to a specific neighborhood or subdivision), the estimated cost of improvements, the proximity of the improvement to other to other critical areas, the jurisdiction of the route and future plans by other agencies, and whether the improvements are required for private development in order to enhance the Village tax base.

### A. Level 1 – High Priority

The following intersections are all recommended as the highest priority segments or intersections for the Village of Long Grove to improve.

#### Old McHenry Road & Robert Parker Coffin Road

This intersection is currently operating at a level of service of F. There is an immediate need for the Village to improve this intersection. Installation of a traffic signal without widening of Old McHenry Road addresses current traffic volumes but not preliminary projections of traffic. While the addition of auxiliary lanes along Old McHenry Road along with a traffic signal does provide capacity for both current and projected traffic, the impacts on Historic Downtown Long Grove are significant Preliminary analysis indicates that the installation of a Modern Roundabout at this location addresses both current and projected traffic volumes while minimizing impacts to adjacent properties. A Modern Roundabout also has the potential benefit of enhancing the identity of Historic Downtown Long Grove. Therefore the preferred alternative is the installation of a Modern Roundabout for the intersection of Old McHenry Rd. and Robert Parker Coffin. This is recommended as a high priority for the Village.

#### Downtown Long Grove / Long Grove Future Business District / IL Route 83

The approximately one mile segment of IL 83 between Aptakistic Road and Arlington Heights Road includes 4 signalized intersections all operating Over Capacity. Additionally there are proposed developments along this corridor which, while improving the Village's tax base, will cause further congestion and delay without commensurate improvements

- IL Route 83 & Aptakistic Road

This intersection is currently operating Over Capacity, therefore this is recommended as a High Priority for the Village.

- IL Route 83 & Robert Parker Coffin Road

This intersection is currently operating Over Capacity, therefore this is recommended as a High Priority for the Village.

- IL Route 53 & IL Route 83

This intersection is currently Over Capacity and this is also the highest traffic volume location within the Village Limits and therefore will likely have the greatest impact on Village wide and regional traffic congestion. Therefore this location should be a top priority for the Village. This is recommended as a High Priority for the Village.

- IL Route 53 & Old McHenry Road

This intersection is currently Over Capacity and this intersection is impacted by the extensive queue at the intersection of IL 83 / IL 53 (the highest traffic volume location within the Village Limits). Improvements to IL 83 / Il 53 would necessarily impact this intersection. Therefore, this is recommended as a High Priority for the Village.

Due to the proximity of this intersection to Historic Downtown Long Grove a design that is context sensitive may be desired. This may likely include limiting impacts to the adjacent scenic corridor area (similar to the section under construction from IL 83 to the east) and consideration of a Modern Roundabout intersection to aid in creating a unique identity for the segment of Old McHenry Rd from Il 22 to IL 53 (through downtown Long Grove).

- IL Route 83 & Arlington Heights Road

This intersection is currently operating Over Capacity. There is an immediate need for the improvement of this intersection that will benefit the Village and the neighboring communities. While this location is outside the Village limits, it is a critical link in the north – south traffic patterns and is immediately adjacent to proposed commercial developments within the Village; therefore this is recommended as a High Priority for the Village.

- IL Route 83 & Arlington Heights Road

This intersection is currently operating Over Capacity. There is an immediate need for the improvement of this intersection that will benefit the Village and the neighboring communities. While this location is outside the Village limits, it is a critical link in the north – south traffic patterns and is immediately adjacent to proposed commercial developments within the Village; therefore this is recommended as a High Priority for the Village.

IL Route 53 & Lake Cook Road

This intersection is currently Over Capacity and should be a top priority for the Village. There will be significant impact to this intersection with the development of Menard's at the corner. As part of the Menard's development requirements, the developer will be responsible

for improving the intersection. These private benefit improvements include the addition of a second south bound left turn lane, additional through lanes at the intersection, construction of a new access point with turn lanes and a new traffic signal. This proposed improvement improves the calculated intersection delay from the current \_\_\_ seconds to \_\_\_ seconds in the existing condition and \_\_\_ seconds in the full build out condition with projected traffic through the year 2016. The proposed improvements have preliminary approvals for IDOT (at the time of this report). The developer's improvements will increase the capacity of the intersection without the Village having to make improvements.

#### Arlington Heights Road & Lake Cook Road

This intersection is currently operating Over Capacity. There is an immediate need for the improvement of this intersection that will benefit the Village and the neighboring communities. Lake County DOT and Cook County Highway Department have proposed for a Continuous Flow Intersection (CFI) to be investigated at this location. The CFI is projected to improve LOS considerably. The Lake County Department of Transportation as the lead agency, with funding from Cook County Highway Department, has initiated preliminary studies for this improvement. Although outside the limits of Long Grove, this intersection has significant impacts on north-south traffic patterns within the Village, therefore this is recommended as a High Priority for the Village.

#### IL Route 83 & Midlothian Road

This intersection is currently operating Over Capacity. There is an immediate need for the improvement of this intersection that will benefit the Village and the neighboring communities therefore this is recommended as a High Priority for the Village.

#### Country Club Estates / Meadows / Bridgewater Farms Traffic Calming

This area has limited Village wide congestion benefits. However, based on the significant issues related to average speeds and speed variances this is a safety concern, therefore this is recommended as a High Priority for the Village.

It should also be noted that other subdivisions and neighborhoods have expressed interest in traffic calming. Any traffic calming improvements within this area should be monitored for their effectiveness and the policies and procedures for determining appropriateness of traffic calming within the Village should be standardized for consistency.

#### IL Route 22 & N. Krueger Road

Although this intersection is currently operating at a level of service of A, it meets a signal warrant. This is due to the high volume of traffic on the minor stop controlled leg, which does not directly impact the traffic on IL Route 22. However, this does create an unsafe condition, as motorists will likely attempt to turn onto IL Route 22 from N. Krueger Road when there is insufficient gap time; creating the potential for accidents. Therefore it is recommended that a traffic signal be installed at this intersection which will provide for traffic to safely enter & exit N. Krueger Rd. Due to the intersection warranting a traffic signal and the related safety concerns of this location this is recommended as a High Priority for the Village.

## **B. Level 2 – Moderate Priority**

The following intersections are all recommended as moderate priority intersections for the Village of Long Grove to improve.

### IL Route 53 & Mardan/ Middlesax/ Old Hicks

The intersections of Mardan, Middlesax and Old Hicks Roads all operate at unacceptable levels for the minor leg. Although IL Route 53 traffic is relatively unaffected, this does create a potentially unsafe condition. With significant delays it is likely that motorists will attempt to turn onto IL Route 53 from the minor cross streets when there is insufficient gap time; creating the increased potential for accidents. The traffic volumes at the minor streets are sufficiently low to not meet signal warrants, even if one of the access points to the Mardan Woods / Mardan Estates are is closed. The addition of auxiliary lanes along IL 53, including a bi-directional turn lane and right turn lanes improves the level of service at the side streets. Therefore the preferred alternative is the addition of a bidirectional left turn lane and right turn lanes for this section of IL Route 53. The addition of these lanes will decrease the delay time for the cross streets to acceptable levels. While this improvement has capacity improvements the benefit is limited to primarily the localized area of Mardan Woods / Mardan Lakes therefore this is recommended as a moderate priority for the Village.

### IL Route 22 & N. Krueger Road

Although this intersection is currently operating at a level of service of A, it meets a signal warrant. This is due to the high volume of traffic on the minor stop controlled leg, which does not directly impact the traffic on IL Route 22. However, this does create an unsafe condition, as motorists will likely attempt to turn onto IL Route 22 from N. Krueger Road when there is insufficient gap time; creating the potential for accidents. Therefore it is recommended that a traffic signal be installed at this intersection which will provide for traffic to safely enter & exit N. Krueger Rd. IDOT is currently conducting a Design and Environmental Study for this segment of IL 22. Therefore, this intersection should have a moderate priority level.

### IL Route 22 & Old McHenry Road

This intersection is currently operating at a level of service of D. This intersection is recommended for widening in order to accommodate the traffic volumes. However, since this intersection is operating at an acceptable level of service, this should be considered a moderate priority.

IDOT is currently conducting a Design and Environmental Study for this segment of IL 22. As part of this study the IL 22 / Old McHenry Rd intersection is proposed for improvements. Due to the proximity of this intersection to Historic Downtown Long Grove a design that is context sensitive may be desired. This may likely include limiting impacts to the adjacent scenic corridor area (similar to the section under construction from IL 83 to the east) and consideration of a Modern Roundabout intersection to aid in creating a unique identity for the segment of Old McHenry Rd from Il 22 to IL 53 (through downtown Long Grove)

#### IL Route 83 (60) & Midlothian Road

This intersection is currently operating Over Capacity. There is an immediate need for the improvement of this intersection that will benefit the Village and the neighboring communities. However this intersection is on the far northern limits of the Village and therefore has a limited overall impact to Village wide traffic patterns, therefore the priority for this intersection should be considered a moderate priority level.

#### IL Route 83 & Gilmer Road

This intersection is currently operating Over Capacity. Although, this intersection is over capacity, it is still operating at a better level than many of the other intersections within the Village. Therefore, the priority for this intersection should be considered a moderate priority level.

#### IL Route 53 & Long Grove Road

This intersection is currently operating At Capacity. While regional increases in traffic volumes will ultimately cause this intersection LOS to decrease, the need for the improvement of this intersection is not immediate. Therefore, this intersection should have a moderate priority level.

#### IL Route 83 & US Route 45

This intersection is currently operating at a level of service of D. This intersection is operating at an acceptable level. Additionally, IDOT has initiated a study of this area which has since been put on hold. Therefore, the priority for this intersection should be considered a moderate priority level.

#### IL Route 83 & IL Route 60

This intersection is currently operating at a level of service of D. Although, this intersection is operating at an acceptable level, it is at the low end of that level of service. Additionally, IDOT has initiated a study of this area which has since been put on hold. Therefore, the priority for this intersection should be considered a moderate priority level.

#### IL Route 60 & US Route 45

This intersection is currently operating at a level of service of E. Although, this intersection is not operating at an acceptable level, it is still operating at a better level than many of the other intersections. Additionally, IDOT has initiated a study of this area which has since been put on hold. Therefore, the priority for this intersection should be considered a moderate priority level.

### **C. Level 3 – Low Priority**

The following intersections are all recommended as low priority intersections for the Village of Long Grove to improve.

#### IL Route 83 & IL Route 22

This intersection is currently operating at a level of service of F. There is an immediate need for the improvement of this intersection that will benefit the Village and the neighboring communities. However, this intersection is currently under construction including the

addition of through lanes and auxiliary lanes on all legs of the intersection. Based upon the current construction which is expected to result in significant operational and safety improvements when completed, this should be considered a low priority level

IL Route 53 & Schaeffer Road

This intersection is currently operating at a level of service of D. This intersection is operating at an acceptable level. Additionally, any improvements to IL 53 / Old McHenry Road and IL 53 / IL 83 would likely impact this intersection. Therefore, the priority for this intersection should be considered a low priority level.

IL Route 83 & Diamond Lake Road

This intersection is currently operating Near Capacity. Although future traffic increases will likely require this intersection to be improved, it is recommended that this intersection as a low level priority. It is outside of the Village limits and due to its distance to other intersections; it has a limited impact on traffic within the Village.

Arlington Heights Road & Checker Road

This intersection is currently operating Under Capacity. There is not an immediate need for the improvement of this intersection. Therefore, the priority for this intersection should be considered a moderate priority level.

## **BUDGETARY COSTS AND PRELIMINARY FUNDING OPTIONS**

These aforementioned priorities are intended to provide a roadmap for future improvements. In order to further aid in this process, preliminary budget estimates for various recommended improvements are included as well as options for obtaining outside funding sources. This section evaluates the identified High Priority locations for funding issues.

### Old McHenry Road & Robert Parker Coffin Road

The proposed improvement of this location by Lake County DOT is in the 5 year TIP and would include the pavement and drainage improvements. The Village is also considering streetscape improvements as part of an SSA. The incremental cost difference of constructing a Modern Roundabout versus a traffic signal would be negligible. The Village will likely be required to reconstruct Robert Parker Coffin Rd as part of any such improvements to the Historic Downtown Area. The costs for reconstruction / rehabilitation of Robert Parker Coffin Road are already included in the Village's annual street maintenance program as a high priority improvement based on the poor condition of the roadway. This project can be funded through a combination of Lake County and Village Downtown Streetscape Funds.

### Downtown Long Grove / Long Grove Future Business District / IL Route 83

The approximately one mile segment of IL 83 between Aptakisic Road and Arlington Heights Road includes 4 signalized intersections all operating Over Capacity. The 3 intersections within the Village as well as the nearby intersection of IL 53 and Old McHenry Road are a critical bottleneck in the Village's transportation system. Budgetary Estimates indicate a total cost for construction and engineering in the range of \$4,400,000 for this segment of IL 83 including the intersections of IL Route 83 & Aptakisic Road, IL Route 83 & Robert Parker Coffin Road, IL Route 53 & IL Route 83, and IL Route 53 & Old McHenry Road. Currently proposed developments along this segment of IL 83 will require off-site improvements that maintain the current poor levels of service. Alternatively, these projects may be combined and matched with State and Federal funding in order to better leverage the Village's and Developers resources. As an example, the Village / Developer may provide \$700,000 with the State (IL 83 and IL 53) and County (Aptakisic Road) providing \$700,000 (through the a variety of programs such as MFT funds, safety funds, congestion relief funds or through EDP funding due to the nature of the developments) This \$3,000,000 could be matched by federal funds through the STP program to create sufficient resources to improve the entire segment of roadway. This can be either with IDOT as lead agency or with the Village as the lead agency (CMAP Lake County Council). Cost sharing issues would need to be addressed clearly up front. Such joint projects have worked successfully in various locations throughout the Chicagoland region. If such a project were undertaken it is likely that interim improvements would still be required for the proposed developments. More extensive studies and coordination with IDOT and Lake County DOT are required to determine the nature and timing of such interim improvements.

- IL Route 83 & Arlington Heights Road

#### IL Route 53 & Lake Cook Road

The proposed improvements have preliminary approvals for IDOT (at the time of this report) as part of the Village approved Menards PUD. The developer's improvements will increase the capacity of the intersection without the Village having to make or fund improvements. Future improvements for capacity will also likely be required

#### Arlington Heights Road & Lake Cook Road

The Cook County Highway Department as the lead agency has initiated preliminary studies for this improvement as part of a joint Lake County / Cook County Project. Since these agencies are already pursuing such an improvement it is recommended to monitor this and request that the project be added to the 5 year Transportation Improvement Plan.

#### IL Route 83 & Midlothian Road

##### Country Club Estates / Meadows / Bridgewater Farms Traffic Calming

The preliminary cost estimates for this recommended improvement are \$000,000 (see cost estimate in Exhibit 9) as a stand alone project. State and other outside funding sources do not readily apply to this type of improvement, therefore funding will need to be local (Village General Funds, MFT funds or Special Service Area funds or other such sources may be used

An important note is that as part of the Village approved Menard's PUD proposed for the northeast corner of Lake-Cook Rd and IL Route 53 an off-site sanitary sewer that will require reconstruction of half of Schaeffer Road and Checker Road (including the intersection of Checker Road and Country Club Drive) This improvement is planned to begin in the Spring of 2007. It is recommended that any traffic calming project is planned to run concurrent with this sanitary sewer work in order to help limit the costs of these improvements ( a potential savings of \$000,000) as well as to limit impacts on the neighborhood.

#### IL Route 22 at Kruger Road

IDOT is currently conducting a Design and Environmental Study for this segment of IL 22. Therefore an installation of a traffic signal will likely be part of the recommended improvement. Based upon the typical time frames to complete such a study, acquire required right of way, prepare plans, specification and cost estimates and bid the project for construction (which can typically take up to 10 years for the entire process) it is recommended that the Village pursue installation of temporary traffic signals at this location. Temporary traffic signals typically cost between \$25,000 and \$35,000 including engineering and construction and can be completed within a few months. Funding for this may be available through IDOT (Safety Funds etc). However, IDOT currently has numerous unfunded warranted traffic signal locations with limited funding resources. Alternatively the Village may construct the temporary traffic signals through the permitting process.