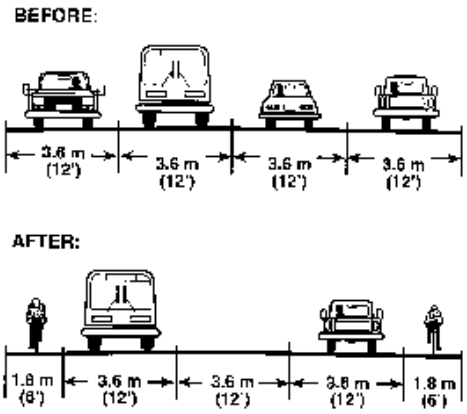
Four to Three Lane Conversions

In recent years, many traffic engineers have advocated converting four-lane undivided urban streets to three-lane two-way left-turn facilities (i.e., one lane in each direction and a two-way left turn lane). A number of these conversions have been successfully implemented. Accident rates have decreased while corridor and intersection levels of service remained acceptable.



The three-lane configuration can vary in design. The Two-Way Left Turn Lane (TWLTL) can be a continuous left turn lane or it can be striped as dedicated left turns at intersections, which is desirable where there are no driveways between intersections.

Some four-lane undivided roadways currently operate as "defacto" three-lane roadways (especially during peak hours). In order to prevent this situation, many cities prohibit left-turns during peak hours. However, this limits accessibility leading to longer trip and likely traffic diverting to other routes.

Advantages

- **Improved vehicular safety –** Case studies show a reduction in the total number of crashes (from 17 to 62 percent) when four-lane undivided roadways were converted to three-lane cross section.

- **Improved pedestrian safety –** The three-lane configuration allows pedestrians to focus on one-lane of traffic at a time and medians or left-turn lanes can provide a refuge for pedestrians if needed. While the left-turn lanes are active lanes, they would have lower traffic volumes and slower speeds. Three-lane roadways create a more comfortable environment for pedestrians with less noise due to slower and more consistent traffic speeds. Fatality rates for pedestrians substantially higher at higher speeds. A pedestrian hit by a vehicle traveling 40 mph has an 85 percent change of dying, a pedestrian hit by a vehicle traveling 30 mph has only a 45 percent chance of dying.

- **Traffic calming** – Case studies found a reduction of average and 85th percentile speeds (i.e. typically less than five miles per hour). Perhaps more importantly, case studies indicated a relatively dramatic reduction in excessive speeding (e.g. a 60 to 70 percent reduction in the number of vehicles traveling five miles per hour faster than the posted speed limit was measured in two cases). Another result of the 3-lane configuration is lower speed variability (i.e. the range of speeds), which creates a more predictable and consistent travel environment.

- **Improved Emergency Response Time** – Emergency vehicles often find it difficult to travel down four-lane urban roadways. Waiting for all the traffic to move over to the curb lane can cause delays to emergency vehicles. The center two-way left-turn lane can be used as a lower-conflict access route along the roadway corridor.

- **Relatively Inexpensive** – Converting four-lane undivided roadways to three-lanes is relatively inexpensive, generally only requiring repainting lane stripes and altering traffic signals. Because restriping is not costly, t is not unusual for Cities to restripe a three-lane in order to test configuration, before committing any hardscape changes to the roadway. In Seattle, lane reconfiguration costs of from $10,000 to $50,000 per mile (for comparison, installing traffic signals at an intersection costs about $100,000 to $200,000). The greatest costs is relocating loop detectors.

Disadvantages:

- **Increased Travel Delay –** Increased travel delay along the corridor is the primary concern many have with converting a four-lane roadway to a three-lane facility. Many assume there will be a 50% reduction in corridor capacity because the number of "through lanes" is reduced by half. In reality the capacity of a three-lane facility is very near that of a four-lane undivided roadway. Drivers who want to travel through the corridor generally stay in the outside curb lane to avoid getting caught behind mid-block left-turning vehicles. During these peak hours the inside lanes are generally used by left-turning vehicles and very few through trips are made in those lanes. As such, only one lane in each direction is accommodating most of the through trips—which is similar to a three-lane facility. The actual capacity of a corridor is controlled by the signalized intersections. These intersections generally have high volumes of left-turning traffic. As such, once again most of the through traffic is carried in one lane—the outside curb lane.

- **Frequent-stop and/or slow moving vehicles** (e.g. transit buses) will have a greater impact on the operation of a three-lane roadway, because of the inability of passenger cars to legally pass these vehicles. This does not occur with a four-lane undivided cross section. However, providing pullout areas can minimize the impact of frequent stop vehicles. From the transit perspective, better pedestrian environments are generally much better for transit.

- **Increased Delay at Driveways –** Conversion to a three-lane roadway will result in fewer gaps in the traffic stream and motorists will have to be more patient. However, backing onto a four-lane undivided highway and into a traffic lane is a high-risk traffic maneuver.

- **Loss of Passing Opportunities –** A concern often heard is from aggressive motorists who do not want to lose the opportunity to pass vehicles along the corridor. As previously discussed, that disadvantage provides a benefit to pedestrians and other motorists trying to enter or cross the roadway. Some are of the opinion that aggressive drivers will use the center lane as a passing lane. While this does occur occasionally it is generally not a problem.

Three-lane Feasibility:
The feasibility of a four-lane undivided to a three-lane configuration from an operational point of view (with respect to volume only) are as follows based on bi-directional peak-hour traffic:

- < or = 1,500 vehicles per hour (vph): ..... feasibility probable
- 1,500 to 1,750 vph: ..... exercise caution
- > or = 1,750 vph: ..... feasibility less likely

These volumes are general guidelines. Three-lane conversions have been used on

roads with an AADT of up to 24,000.

Four-lane undivided roadways should be considered for three-lane conversions when:

- Existing average and/or 85th percentile speeds are not appropriate given corridor land uses (traditional neighborhoods or commercial areas with short setbacks).
- Speed variability creates safety concerns and/or noise problem.
- The road is near pedestrian activity areas, such as parks and schools or where improving the pedestrian environment is a priority.
- The road is an existing or planned bicycle corridor.
- High crash rates exist due to turning movements, excessive weaving, and/or stop and go traffic.

Along four-lane undivided corridors, where it is not acceptable to add more lanes or a median, the key question to answer during an evaluation of alternatives is:

What is the primary need in the corridor?

Is the primary purpose of corridor to move high volumes of traffic as quickly as possible? Or is it to improve corridor safety for motorists and pedestrians, while providing an acceptable level of service to corridor traffic? The answers to these questions will determine if converting to a three-lane facility is a viable alternative to include in your study.

But can it work on Lake Street?

How would you answer these questions:

- Are existing average and/or 85th percentile speeds appropriate given corridor land uses (e.g. traditional neighborhoods or commercial areas with short setbacks)?
- Does speed variability create safety concerns and/or noise problem?
- Is the road near pedestrian activity areas, such as parks and schools or where improving the pedestrian environment is a priority?
- Is the road an existing or planned bicycle corridor
- Do high crash rates exist due to turning movements, excessive weaving, and/or stop and go traffic?

Is a 3-lane configuration on Lake Street feasible for the amount of traffic?

The map shown on this page is from the Minnesota Department of Transportation's (MnDOT) official 2000 Average Annual Daily Traffic (AADT) map. The AADT map on the following page is from the Hennipen County' Traffic Flow Map.

- Lake Street Daily traffic is at the high end for 4-lane to 3-lane conversion feasibility; but certainly not to an unreasonable extent.

However, peak hour traffic is a more important factor in determining 4-land to 3-lane conversion feasibility. Generally, peak hour traffic is estimated to be between 8 to 12

percent. However, this can vary dramatically by route. Peak hour traffic on commuter routes (e.g. Park Ave and Portland Ave) is likely a much higher percentage of their daily traffic, whereas traffic along commercial/ retail corridors may have traffic that is more evenly spread out during the day and evening thus having a much lower peak hour percentage. Unfortunately, daily traffic data by hour of day was not readily available.

However, the table below illustrates the impact of the daily distribution of traffic can have. Assuming peak hour traffic accounts for ten percent of the daily traffic, a three-lane configuration would appear to be less feasible. However, a six- percent peak hour rate, would fall well within the 3-lane feasibility guidelines.

Sample Peak Hour Rates for Lake Street Traffic

	2000 AADT	10% Peak	8% Peak	6% Peak
I-35 to Chicago	21,400	2,140	1,712	1,284
Chicago to Cedar	20,700	2,070	1,656	1,242
Cedar to Hiawatha	19,900	1,990	1,592	1,194

Personal observations suggest that Lake Street traffic is busy throughout the day and evening, suggesting a lower peak hour rate.

Traffic counts by weekday hour and turning movement counts are needed.

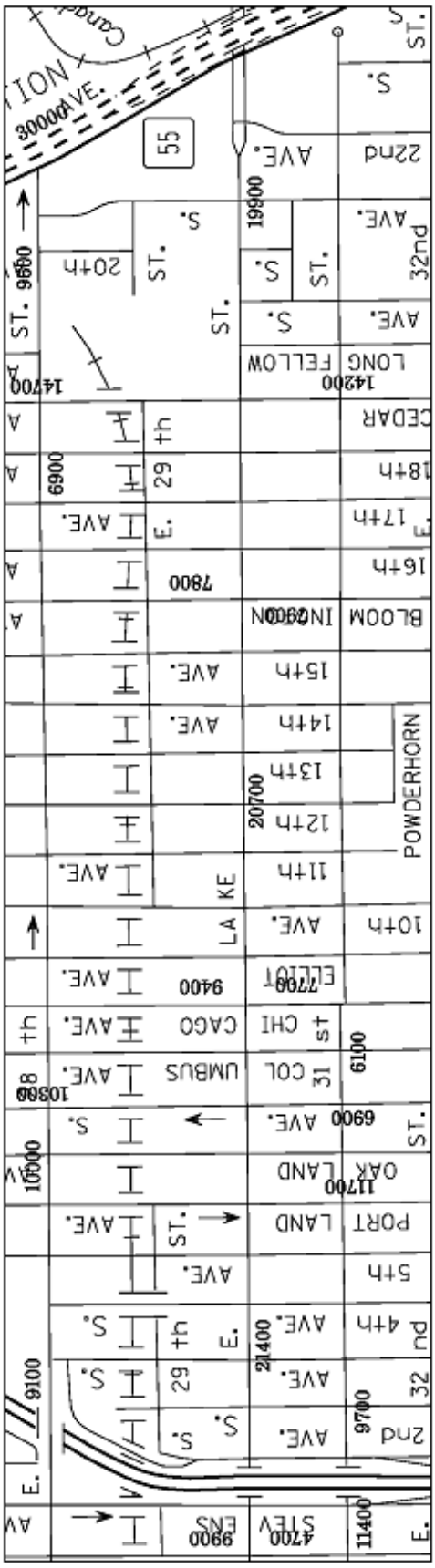
But what about future traffic?

Hennepin County had produced traffic forecasts for the year 2000, The following table illustrates the differences between the forecasted and actual changes in AADT between 1995 and 2000. 2000 traffic counts stayed about the same and actually decreased slightly from 1995. Traffic modes are helpful tools, but the

Lake Street Traffic Forecast Accuracy

	1995 AADT	2000 Forecast	Forecast Difference	2000 AADT	Actual Difference
I-35 to Chicago	21,600	26,000	20%	21,400	-1%
Chicago to Cedar	23,500	29,000	23%	20,700	-12%
Cedar to Hiawatha	20,700	24,000	16%	19,900	-4%

Traffic forecasts for 2010 and 2020 are shown in the table below. Traffic forecasts tend to be self-fulfilling prophesies, since they are often used to justify road expansions, which in turn promote more auto use. It remains to be seen how realistic these forecasts are given this area's employment and population growth, transit investments, and roadway constraints. The assumptions used in creating the model greatly affect the results. These assumptions may or may not be reasonable given any specific neighborhood or corridor.



Lake Street Traffic Forecasts

	2000 AADT	2010 Forecast	Percent Change	2020 AADT	Percent Change
I-35 to Chicago	21,600	32,000	50%	30,000	40%
Chicago to Cedar	23,500	28,500	38%	29,000	40%
Cedar to Hiawatha	20,700	28,500	43%	29,500	48%

Observations/conclusions:

- **Left-turns** – Left-turns appear to be a substantial part of the problem. There seem to be few gaps in traffic for left turns resulting in more stop and go traffic. In fact, it seems that Lake Street's inside-lane is used mostly as a turning-lane with through traffic staying in the right lane.

- **Speeds** – High speeds and high-speed variability appear to be an issue.

- **Corridor context** – Given high transit use, on-street parking, businesses with short setbacks and the traditional neighborhood design elements, speeds greater than 30 mph do not seem appropriate. Investments in LRT and transit-oriented development suggest a quality pedestrian environment is essential for a successful Lake Street.

- **Bicycle environment** – The corridor is identified as a "poor" bicycle environment on the Metro area bike map in an area that is appropriate for promoting bicycle use.

- **Safety** – There appears to be excessive weaving between lanes and significant amounts of stop and go traffic for those trying to get around turning vehicles and slower moving vehicles, creating a safety problem/concern.

- **Cut-through traffic** – Traffic diverting to parallel routes is a legitimate an important concern. Under current conditions, traffic may already be diverting to parallel routes, particularly given the left-turn prohibitions during peak times. Because of the stop and go traffic and waiting for left-turning traffic, travel speeds are less predictable. Predictability is an important component to route choice.

  The three-lane concept has the potential to produce smoother and more predictable traffic flow, which may make it a more desirable route. A computer traffic simulation could prove to be a useful tool in measuring these impacts. Case studies do not consistently show less traffic after the conversion to a three-lane configuration. In most cases, traffic volumes increased or remained the same following the conversion. Parallel routes can/should be made less desirable as through-routes by implementing traffic calming strategies.

- **Traffic Volumes** – Considering traffic counts alone, the Lake Street does not appear to be an unreasonable candidate for a three-lane configuration. Traffic volumes throughout the day will likely be an important consideration for the feasibility of a three-lane. Still, there are many other factors to consider in addition to traffic volumes. Traffic forecasts can be a useful tools that should be considered, however, there assumptions are not always applicable to specific areas and/or corridors.

- **Three-lane test** – Restriping the current roadway prior to major reconstruction could serve as a test of the three-lane concept.

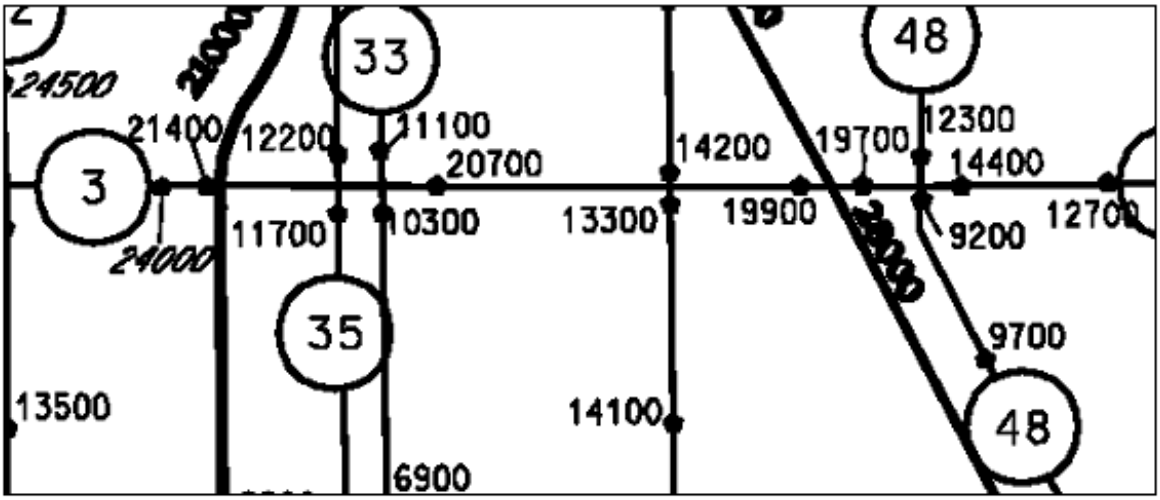
HENNEPIN COUNTY

2002 TRAFFIC FLOW

Volumes represent Annual Average Daily Traffic (A.A.D.T.)

(II) 2001 Volumes
(See Note 1)

(I) 2002 Volumes
(See Note 1)



1. Traffic volumes on the Hennepin County Highway System are counted on an alternating year basis. Area I is counted in even years and Area II is counted in odd years. If a count is not current, *the prior count is indicated in italics.*
2. Traffic volumes on the County Highway System within the City of Minneapolis were furnished by the Traffic Engineering Division, Minneapolis Department of Public Works. Minneapolis follows the same alternating year schedule as Hennepin County. Zone I counts on this interim map are from 2000 and Zone II counts are from 2001. For further information or updates, call the City at (612) 673-5750