Appendix 3: High Volume Three-Lane Roads

Illinois

St. Charles Road in Elmhurst, Illinois

IDOT has and continues to approve all upgrades to St. Charles Road in Elmhurst for the last 15 years as St. Charles Road is federally funded. In 2000, St. Charles Road was upgraded from a two-lane undivided to a three-lane from West Ave. to Spring/Hagan Road. The ADT was 18,100vpd. The current traffic volume as of August 7, 2001 is 18,000 ADT. St. Charles Road was reconstructed in 1996 between Illinois Route 83 and Spring/Hagans Road. It was originally 38 feet (edge to edge) and consisted of two thru-lanes plus exclusive left-turn lanes. The reconstruction project typically provided 36 feet of pavement plus curb and gutter (except near Illinois Route 83). Currently, there are five lanes on the short stretch from Illinois Route 83 and West Ave. The rest of the project is three lanes. I don't have any comparison of the accident data. Hope this helps you. Good luck!

Mike Dever
City Engineer
Elmhurst Illinois

Iowa

I am aware of three-lane roadways on VERY high volume state highways in Branson and Osage Missouri (tourist areas). The City of Seattle Washington has converted some four-lane roadways to three-lane roadways which have traffic volumes in excess of 20,000 vehicles per day. These are located primarily through residential neighborhoods. Oakland California converted a four-lane roadway to three lanes which had a traffic volume which had traffic volumes of 24,000 vehicles per day.

U.S.-71 through the cities of Okoboji and Arnolds Park in NW.

The project you referred to is US-71 through the Cities of Okoboji and Arnolds Park in NW Iowa . This is a major tourist destination in Iowa. The most recent summer traffic volumes indicate that the traffic volume is about 23,700 vehicle per day on the summer weekends, and about 19,000vpd on the summer weekdays. The average nonsummer traffic volume is about 16,000vpd.

This project was one of the first "context sensitive" designs implemented in Iowa . The communities and local environmental groups had opposed widening the existing two-lane roadway to a 4 lane undivided or wider highway through these communities . As such we agreed to build a 1.75 mile long section of three lane roadway through the commercial area and the area adjacent to Okoboji Lake . This three-lane section is in the highest volume segment of US- 71. North of the three-lane section is a four-lane divided section and south a 4 lane undivided highway section . There are 3 traffic signals along the 1.75 mile long three-lane highway and many commercial driveways . THE COMMERCIAL DEVELOPMENT IS PRIMARILY SMALL RETAIL STORES, MOTELS,RESORTS AND RESTAURANTS . AS SUCH AT SOME LOCATIONS WE DO GET CONSIDERABLE MIDBLOCK PEDESTRIAN CROSSINGS . THE SPEED LIMIT ON THE THREE-LANE SECTION IS 30 MPH. HOWEVER, DURING THE SUMMER WEEKENDS THE TRAFFIC GENERALLY MOVES 20 MPH TO 25 MPH (PER THE CITY OF OKOBOJI CITY CLERK.) WHEN THE TRAFFIC LIGHTS ARE GREEN.

This is a unique highway corridor . The Iowa DOT agreed to this alternative, in part, because an alternative bypass route was available for those US-71 motorists who do not want to drive through Okoboji and Arnolds park during the peak traffic volume hours. ALSO, tourists expect and will accept a lower level-of-service in a tourist area. than they would on an URBAN COMMUTER ROUTE . AS SUCH, WE WOULD

GENERALLY LIMIT THE APPLICATION OF A three-lane ROADWAY TO URBAN ROUTES WITH LESS THAN 18,000 VEHICLES PER DAY

We realized that the three-lane alternative was not the best traffic engineering alternative but were comfortable that it would improve both traffic flow and safety along THIS UNIQUE TOURIST route.

Our crash data analysis reflects the following: (NOTE WE ONLY HAVE ONE YEAR OF AFTER DATA)

The widening from two lanes to three lanes reduced the crash rate by 23 % (one year after vs. average of three years before data)

The crash rate on the higher volume three-lane section is about one - half the crash rate on the adjacent lower volume 4 lane undivided section of US-71

The year 2000 5 month (May through September)crash rate on the three-lane section is 443 crashes per hundred million vehicles of travel . The one year after crash rate on the three-lane section is 332 crashes per hundred million vehicles per mile

Our staff interviewed the two City Chief of Police for their comments on the high volume three-lane highway in the summer. Both Chiefs of Police are very pleased with the improvement in summer peak hour traffic flow and reduction in crashes as compared to the old two-lane highway. They said the traffic generally flows pretty steady. City of Okboji Chief of Police said occasionally motorists must wait two signal phases to go through one of the traffic signal intersections. They said aggressive motorcycle drivers will try to use the center lane as a passing lane , but that there have been no crashes associated with passing in the center lane

U.S.-75 in Sioux Center, Iowa

We completed a similar project in Sioux Center Iowa on highway US- 75. This roadway now has a traffic volume around 16,000 vehicle per day (including 1,400 trucks). This was a four-lane undivided roadway. Due to local safety concerns (pedestrian fatality and numerous other near misses, excessive speeding and high number of accidents) we proposed to convert the middle highest volume section of the roadway to a three-lane roadway . . We left the roadway on either section as 4 lane roadway. Just about everyone was skeptical about this idea , but one year later most everyone is very pleased with the results. We obtained a 50% reduction in accidents . While average and 85 % speeds changed very little a significant traffic calming was accomplished. Before the conversion 45 % of the motorists exceeded the speed limit by more than 5 mile per hour. After the conversion to a three-lane roadway only 15 % drove in excess of 5 mph above the speed limit . We were able to maintain a level-of-service C in this corridor, but there was some increase in congestion (from a small town Iowa perspective) during the noon hour (folks in small town Iowa still drive home for lunch!) and the afternoon "rush hour". Again the community accepts this a trade off to the improved safety and traffic calming . We originally thought this would be an interim improvement until we could widen the roadway to a five-lane section. But right now, based on the results of the three-lane conversion we have no plans to propose a widening project in the near future . A five-lane section would remove the traffic calming benefits of the three-lane section and could quite possibly increase the accident rate along THIS corridor. (due to higher speeds , more variability of speeds , more difficult to judge the speeds and gaps in traffic in 4 through lanes than two thru-lanes in order to cross the roadway, more lanes changes and sideswipe accidents, making a left off the roadway could be more difficult- a large SUV or truck in the inside lane could block the few of a smaller car in the outside lane (next to the curb), more difficult pedestrian crossing , more accident due to aggressive high speed driving .) However, the five-lane section would be superior to the existing 4 lane undivided roadway . A five-lane would provide a much higher level-of-service than a three-lane section and reduce rear end collisions more than a three-lane section, provide more gaps in the traffic to cross and turn off the highway which could reduce some associated accidents .

Both a five-lane and three-lane roadway are "better" than a two-lane or a 4 lane undivided roadway on roadways with volumes between 10,000 and 20,000vpd. In the 20,000 to 25,000vpd range both the five-

lane and three-lane have distinct advantages AND disadvantages for which each community and individual must make their own judgment on .It becomes a "value judgment " and not everyone can be expected to agree on what is the best alternative for each unique project, as we will all place a different "value" on reduced congestion, environmental impacts, traffic calming etc . This make it very difficult for the ultimate decision makers.

I trust the research report will add to your knowledge on 3 and five-lane roadways and assist everyone in making an informed decision on your project , whether it be a five-lane or three-lane roadway.

Iowa Crash Data on Two-lane to Three-lane Roadway Widening Projects.

In the late 1980's there was much debate within the Iowa DOT on the safety merits of building three-lane highways . We were allowed to do several as pilot studies. The before after crash data on these first 6 pilot studies follows:

Location	Traffic Volume	Accident Reduction
US-6 in Atlantic	11,400	-48%
IA-92 in Indianola	12,000	-23%
IA-150 in Olwein	13,500	-36%
IA-64 in Maquoketa	13,000	-47%
IA-163 in Pella	6,500	-44%
US-6 in Newton	12,000	-42%

I am not aware of any two-lane to five-lane widening projects in Iowa. Our 4 lane undivided to five-lane widening projects have had accident rate reductions ranging from -10% to -70%. (based on one year before and after study)

The above three-lane highways have accident rates anywhere from 302 to 530 accidents per hundred million vehicle miles of travel .(429,381,359,381,302 and 503)

I could only find the accident rate on two five-lane highways . One roadway which has a traffic volume of 23,000 has an accident rate of 210 accidents per hundred million miles of travel, . The other which has a traffic volume of 15,000 has an accident rate of 390 / HMVM

It appears from this very limited data that in the 10,000 to 15,000 volume the three-lane and five-lane have comparable accident rates in Iowa.

Tom Welch
State Transportation Safety Engineer
Iowa Department of Transportation

Michigan

I can provide the following data in regards to your request for information on the conversion of West Grand River Avenue to three lanes.

Before the change to three lanes, the roadway was a four-lane undivided facility carrying about 18,000 vehicles per day. The roadway is a state trunkline (M-43) which runs through a mostly residential are. Approximately 1 mile of roadway was changed to three lanes.

Initially, when the idea was sent to the Michigan DOT folks for review, they were not very supportive. However, when they evaluated the high accident frequency along Grand River Avenue and the capacity of the single traffic signal at approximately the 1/2 mile point along the roadway, they decided that a three-

lane cross section would probably have sufficient capacity to handle existing traffic volumes and traffic accidents would probably go down.

The change was made in the Fall of 1997 and a comparison of the before and after traffic crash data was made for the period from January 1, 1997 through November, 1997 with the period from January 1, 1998 through November 1, 1998. During the 1997 period there were a total of 62 crashes and during the 1998 period there were 33 crashes. Traffic volume along Grand River has remained at around 18,000 vehicles per day, but I have not completed any follow up traffic accident studies.

Traffic flow along the roadway seems to work fairly well. We are getting some complaints about backups at the traffic signal however. We're considering signal timing changes to address this problem.

John Matuszak, P.E.
City engineer
East Lansing, MI

Minnesota

Duluth

21st Ave East was converted from four lanes to three lanes and has an ADT of 16,000 to 17,000. It is a ½ mile section. The posted speed is 30 mph and flows through a residential area in Duluth. There are two signalized intersection and one two-way stop along the stretch. The road was converted from four lanes to three lanes for accident reduction purposes. Too many left turn movements were causing not only collisions but congestion in the thru-lanes. After conversion, congestion was eliminated and accident rates dropped. Generally it has been our experience that four-lane to three-lane conversion reduces accidents by 1/3, especially rear ends.

London Road, trunk highway 61 was a four-lane undivided to three-lane conversion. ADT is 17,400. Minor side streets run along this ½ mile stretch of road to the west. They are T-intersections as Lake Superior is on the East side of the road. Posted speed limit is 40 mph. There is no congestion after conversion. The road runs through an upscale—old mansion neighborhood. The reason for conversion was safety. It is the view of Mn/DOT that four-lane undivided roads are not safe. There is a big push to convert them to three-lanes when at all feasible.

Paul Scanlan
Sr. Engineer and Technician
Duluth Public Works

Twin City Area

State Highway 49 (Rice Street) in Ramsey County is located in a commercial area and has an ADT of 17,000 to 23,000. It was converted from a four-lane to a three-lane. Accident rates decreased by 28%. Head-on accidents went from 5 a year before conversion to zero the year after. Rear end accidents were reduced by 43%, sideswipe from passing by 38%, left turn by 13%, right angle by 13%.

The lower volume is in the residential section with two intersections along the 1 ½ mile lower volume stretch. The higher volume section is ½ mile long and has five intersections. Because capacity is intersection driven, it is that fact that there are five intersections rather than 23,000 cars that make the high volume section have a LOS C/D compared to a higher level-of-service in the residential area where there are fewer intersections. Traffic volumes along this section were this high at conversion.

Rice Street is a trunkline highway and has exit ramps to Highway 36. There are a mix of driveways on both sides along the entire 2 mile three-lane section. Posted speed limit is 40 mph. Generally the road

works pretty well. Even though we have a higher than usual traffic volume on it we converted to three lanes instead of five because of Right of Way issues and economics as there was a four-lane bridge involved. Streamlining the road was our intention and we are satisfied with the results.

Rice Street is a three-lane with shoulders for help with slow moving vehicles. During rush hour, there is no problem with illegal passing on the right or left on the three-lane section.

Generally, Ramsey County advocates four-lane to three-lane conversions for roads with traffic volumes in the teens especially in the lower teens. Four-lane roads with Traffic volumes of 13,000vpd or lower are always converted to three lanes. We have roads in Ramsey county that are three lanes with traffic volumes at or a little above 20,000vpd however, those roads are carefully scrutinized for suitability of conversion and must meet many feasibility criteria at those traffic volumes otherwise they are converted to five lanes.

Currently there have been many four-lane to three-lane conversions in Ramsey County. As of January 2002 there are 30 miles worth of three-lane roads in this county.

Mr. Dan Solar
Traffic Engineer
Ramsey County Department of Transportation
Minnesota

Oregon

Hwy 003, Oregon Route 43 is a true 3-lane highway. It is a three-lane for 1.85 miles. It has 23, 289 vehicles per day. It has a posted speed limit of 45 miles per hour. It had twelve crashes in the year 2000. The Accident rate is 0.76 accidents/mvm.

Theresa A. Heyn, Crash Analyst
ODOT Crash Analysis and Reporting Unit

Lake Oswego Road-Route 43 travels through an urban area that is residential. When I-205 was constructed and there was connectivity to the route, traffic volumes rose. But the residents feel that three lanes are adequate and do not want widening.

Cynthia Gardiner
Oregon DOT

Washington

Seattle

N. 45th ST. between Latona AVENE and Stone WYN the AAWDT is 24,500. This is a three-lane that is considered mainly commercial and business. There are 8 intersections.

25th AVNE between NE 44 ST. and NE 54 ST has 19,100 vehicles per day.

Belridge Way between SW. Andover St. and 22 Ave SW has 20,900 vehicles per day. This road travels through residential neighborhood and schools. The main reason for conversion was speeding reduction.

Verne March and Cal Agatsuma
Seattle Transportation

Kirkland

Washington Lake Boulevard.
Length is 1.0 mile
Traffic Volume: 26,000 vehicles per day
Level-of-service: B/C
Two signalized intersections with curb and gutter. It has 2 bike lanes that are four feet wide each and two 11-foot travel lanes and one 12-foot continuous left-turn lane. Sidewalks on both sides. Land uses are mixed with residential single and multi-family, office, a 100-room hotel, retail. Private driveways access this facility. There are no plans to widen.

Iris Cabrera P.E.
Kirkland Public Works

California

Laguna Beach

ORA-133 has a section of three-lane roadway that is 2.366 miles long. The average traffic volumes from 1998-2000 is 36,500 ADT. The peak traffic volume during those years was 38,000 vehicles per day. The average accident rate for this road in the three-lane section over the same years is 1.63 ACC/MVM. There are four unsignalized intersections along the route. All are "stop on cross street". This is an urban area with a mixed residential and business access

Janice Benton
Division of Traffic Operations
TASAS Branch
CALTRANS

It is a two-lane road with a bi-directional left turn facility. On the Southbound side of the street there is little side friction. There is only three major driveways for access to an Art College, a 700 unit parking facility, and a State Park access. The northbound side of the street has heavy side-friction. Over 100 driveways exist to light commercial, light retail complexes. This road is the major artery between Laguna Beach, which is a no growth upscale bedroom community, and places of business. ORA 133 is also a major route for tourism to Laguna Beach and scenic areas. There is a sizeable commute traffic volume. The LOS of the road does become less under the shear volume of traffic. Speeds drop from the posted 45 mph to 30 mph. However traffic does move along safely and reasonably.

Bill Liebel P.E.
Public Works
Laguna Beach, CA

Oakdale

STA 120 is a three-lane section of road that is 0.949 miles long. The average ADT (1998, 1999, 2000) for this road is 24,300. The average accident rate is 1.9 ACC/MVM over the same three year period. There are three unsignalized intersections. All intersections are "stop on cross street". This is an urban area with mixed residential and business access.

Janice Benton
Division of Traffic Operations
TASAS Branch
CALTRANS

This road is one of the main arteries between the California Bay area and Yosemite, Dodge Ski Resort and many Reservoirs. The road functions extremely well Monday-Friday with not a lot of congestion. There is also truck traffic on this stretch as well. Congestion occurs primarily during the weekends when there is heavy tourist traffic. Traffic increases approximately 1.5 times what traffic is during the rest of the week. However traffic still moves fairly well.

Route STA 120 has three intersections in this three-lane section. Stearns Road, Lundy Road, and Maag Road. At the intersection of 120 and Stearns the cross section remains three lanes, 120 and Lundy Road the cross section is again three lanes. Route STA 120 and Maag Road the intersection becomes five lanes but Route STA 120 goes back to being three lanes after 900 feet past the intersection.

Because of the increasing amount of tourist traffic, a bypass is planned to the north of STA 120. Construction is to begin in 2004 and finish 2007. The bypass will be 9 miles long. There are no plans to widen STA 120. The bypass is expected to cost $100,000,000.

Mike Pettinger P.E.
Director of Public Works
Oakdale, California

ITE Message Board Discussion

Initial Question

We would like to know the maximum traffic volumes (ADT) carried by three-lane facilities (single lane in each direction with a center two-way left-turn lane). Also, what is your (public's) perception of these "busy" corridors regarding delay, safety, and operations?

We had considerable success converting urban 4-lane undivided roadways to 3-lane roadways, Crash rates are significantly reduced without significantly increasing travel times. However, we have been reluctant to try a 3-lane cross-section on roadways with volumes over 15,000 vehicles/day--afraid driver frustrations will outweigh the safety benefits.

Thanks,
Tim Simodynes

Some Responses

Tim,

I would be interested to see the responses not sent to the whole group. We are working on a state highway (SH 7) near Boulder that has some 3-lane characteristics, currently carries 21,000vpd. Our project is a widening study that may result in five lanes, or maybe just a better 3-lane. My opinion: I'm sure this road became a three-lane out of necessity, it really should be 5-lane, but environmental and political forces may result in an improved three-lane. My other opinion is that the three-lane section works fine, the problems are at an endpoint intersection that lacks good turn lanes, it causes the driver frustration.

Dave Woolfall

Tim-

A local three-lane road, 35 mph speed limit, with fairly continuous low density commercial development, and straight fairly flat alignment is reported by the local planning agency to carry an ADT of 21,600.

Though there is a lot of forced flow, there is room for more. This is mostly automobiles with a heavy am /pm directional flow. I do not know what the accident rate is.

Robert Kolar

Tim-

We have two-lane arterials with over 20,000 vehicles per day. I would think a three-lane road would easily handle that much traffic.

Martin Bretherton, P.E.

Tim-

Signalized intersection capacity will drive the decision of what will work. 15,000 will most probably always work, but beyond that it is site-specific. Kirkland WA has one pushing 30,000. Salem Oregon has one failing at 20,000.

Rick Perez, P.E.

Tim-

It has been Athens-Clarke County's experience that it is more a function of the number of side streets and curb-cut density that dictates whether or not a conversion will be a success. We have converted roadways with over 20,000 (peak hour of 1,900) that has been a success in moving traffic along the corridor but has been a complete disaster from the sense of providing sufficient gaps for the 50 business that line the corridor within a mile.

David Clark, P.E.

Tim-

There is a report put together by Walkable Communities on this very issue with examples of cities that have done this. The report can be found at www.walkable.org/download/download.htm The name of the file is "Road Diets".

Hope this helps.

Alonzo Linan, PE

Tim-

We converted a four-lane collector with 17,000 ADT to a three-lane collector this past year to install bike lanes and have nothing but positive results.

Thomas Mericle