SECTION 3
ALTERNATIVES

This section describes how the alternatives were developed and the process that led to the identification of the practical alternatives that are analyzed in Section 4.

3.1 Alternatives Development

This DEIS involved analysis of a variety of alternatives and options that held potential to address the project purpose and need. Environmental and engineering analyses were augmented by computer modeling to examine the effects of developing mass transit and a high-occupancy vehicle (HOV) lane. Technical documentation supports the conclusions reached with respect to these modes.

Alternatives discussion originated with MDOT, FHWA and ideas from the public and the I-75 Council established for the study. The Council consisted of elected officials from the corridor, representatives of planning agencies, and other stakeholders. Interested members of the public also attend these meetings. Meeting dates and key activities at each are listed below. (See Section 6 for more detail).

- May 22, 2002 – Introduction to the project, schedule, information about the first public meeting.
- July 30, 2002 – Review of transit/HOV methodology, indirect and cumulative methodology, the upcoming scoping meeting, and the second public meeting.
- November 7, 2002 – Results of the transit and HOV analyses.
- June 5, 2003 – Review of project status, capacity analysis, crash study results, and preliminary impact analysis results.

Public meetings were held to solicit the views of the public with respect to alternatives development, inform them of the results of the ongoing analysis, and gain their participation in the decision-making process. These meetings and their focus are listed below. The public was encouraged to submit comments on forms provided at each meeting or later, via telephone, fax, or email. Project documents are available on the project web site, which has been continuously updated during the project.

- June 5 and 6, 2002 – Introduction to the project and its schedule.
- August 21, 2002 – Preliminary results of the transit and HOV analyses.
- March 12, 2003 – Preliminary roadway layout, including 12 and 14 Mile Road interchanges. Noise simulation.

No Build, Mass Transit, and several “build” alternatives were analyzed for this DEIS, together with Transportation Systems Management (TSM) techniques, Transportation Demand Management (TDM) techniques, and Intelligent Transportation System (ITS) measures. TSM techniques are designed to maximize the efficiency of the arterial street system. TDM involves strategies for managing transportation demand - usually to reduce it or to shift it to different times, locations, routes, or modes. ITS measures involve the collection and dissemination of information to drivers in real time (overhead message boards on freeways), incident management (clearing crashes and breakdowns quickly), traffic signal systems that respond to demand, and similar measures.

The recommended alternative will not be determined until after the public hearing and comment period are concluded and all comments have been considered.

3.2 No Build Alternative

The No Build Alternative consists of continued regular maintenance of I-75. Current bridge and pavement conditions are summarized in Section 2. I-75 in the project area was constructed in the 1960s, which means it needs major reconstruction. Major reconstruction typically may involve reconstruction of the road base, as well as its surface. Drainage modifications may be required by that reconstruction. This need for major reconstruction of I-75 is independent of the proposed widening project, but would be included in the widening project, if widening becomes the chosen alternative.

Bridges need more frequent major rehabilitation than roads. Many of I-75's bridges in the project area have undergone rehabilitation/reconstruction since they were constructed. This could involve work on footings, piers, beams, decks, parapet railings, sidewalk/shoulder areas, or other required work. The No Build Alternative would continue a pattern of maintenance and minor adjustments. It would continue use of the combined sewer system in the southern part of the corridor. It would not require the acquisition of additional right-of-way.

The No Build Alternative would result in a breakdown of traffic flow through much of the day.

3.3 Transportation Systems Management (TSM) Techniques

Transportation Systems Management (TSM) techniques apply to the arterial street system, which, in large part, is under the control of local units of government and the Road Commission for Oakland County. The Feasibility Study recommended numerous improvements to arterials. A number of projects are either built or listed in SEMCOG'S *Regional Transportation Plan*. More are needed and await funding. Traffic modeling finds a need for improvements to the arterial system, but because of the way travel demand has developed along I-75, adding capacity to the arterial network cannot meet the project purpose and need. Only a lane addition on I-75 can meet that need. TSM techniques are and will continue to be included as area roadway improvements occur.

3.4 Transportation Demand Management (TDM) Techniques

Transportation Demand Management (TDM) means reducing demand or shifting it to different times, locations, routes, or modes. It focuses principally on administrative actions, such as working with major employers to support carpool and vanpool programs, or programs that encourage transit use. MDOT works actively with SEMCOG to promote alternative transportation modes. TDM techniques will continue, but will not alone meet the project purpose and need. These activities would expand, if the HOV Alternative were selected.

Ramp metering is one way to control use of a freeway, by allowing vehicles onto the freeway only when there is capacity. During the Feasibility Study ramp metering was considered, but not included in the recommended plan, based upon accumulated experience of similar communities. Ramp metering cannot provide equitable access to all commuters. It favors suburban motorists who get on the freeway first.

3.5 Intelligent Transportation Systems

Intelligent Transportation System (ITS) measures are continually evolving. They are generally defined as use of technology in transportation to save lives, time, and money. The measures are multimodal, but have particular utility for freeways such as I-75. Techniques include the collection and dissemination of information to drivers in real time (overhead message boards on freeways), incident management (clearing crashes and stopped vehicles quickly), coordinating traffic signals at ramp ends with the surrounding signal system, providing intelligent signal systems that adjust to traffic demand, and other similar measures. With the build alternatives, conduit could be laid at the time of construction in anticipation of future ITS needs.

MDOT and the Road Commission for Oakland County (RCOC) are national leaders in ITS. RCOC's FAST-TRAC program in Oakland County uses SCATS (Sydney Coordinated Adaptive Traffic System). FAST-TRAC is a system that makes better use of existing roadways by employing advanced traffic management technologies to respond, in real time, to actual traffic flow, thus minimizing traffic tie-ups and improving safety. Seven regional computers are connected to a central management system at RCOC's Traffic Operations Center, where traffic engineers monitor conditions and balance traffic flow along major corridors. Along the project length of I-75, FAST-TRAC has been implemented in Hazel Park, Madison Heights, Troy and Auburn Hills. The system in undergoing continued expansion. Improvements in the interface with MDOT's ITS program are likewise ongoing.[1] The FAST-TRAC program will continue independently of the proposed I-75 project and will support it.

MDOT's ITS program in Southeast Michigan includes 180 miles of freeways, with closed circuit television cameras, changeable message signs, and traffic detecting loops. There are plans for addition surveillance and detection equipment on I-75, and additional changeable message signs near M-59.[2] The Michigan Intelligent Transportation System (MITS) Center in downtown Detroit operates the system and houses the Michigan State Police's 911 Regional Dispatch Center. Further, there has been research performed on a "511" system and DIRECT (Driver Information Radio). These systems would provide current traveler information. MDOT's ITS efforts are ongoing.

Research indicates that more than fifty percent of total delay experienced by urban motorists results from incidents (accidents, stopped vehicles, debris in the road, and other conditions or distractions).[3] Recognizing this reality, MDOT, in conjunction with a number of Southeast Michigan governmental units and private sector participants, sponsors the Freeway Courtesy Patrol program. This program keeps service vans ready to clear incidents along several area freeways. Patrols currently operate on I-75 from downtown as far north as 12 Mile Road.

ITS maximizes use of the existing transportation infrastructure, but cannot substitute for physical expansion of roadway capacity, once efficiency is maximized. For this reason, while ITS will be an ongoing component of traffic management on I-75, it will not alone meet the project purpose and need.

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[1] *Draft ITS Predeployment Study*, Cambridge Systematics, 2002.
[2] Ibid.
[3] *The 2002 Urban Mobility Report*, Schrank and Lomax, Texas Transportation Institute, June 2002.

3.6 Mass Transit

The DEIS included an extensive study of whether a rapid transit system can meet the purpose and need for the project (Figure 3-1). Rapid transit has significant potential in the Woodward Corridor (which parallels I-75) south of 9 Mile Road, but analysis shows rapid transit and an extensive supporting bus system do not eliminate the need for the proposed lane addition on I-75 through the study area of M-102 (8 Mile Road) to M-59.[4]

A high performance, generic transit concept was evaluated on Woodward Avenue from downtown Detroit (Jefferson Avenue) to Pontiac. The Woodward Corridor has been the historic focus of mass transit analysis, and there has been general agreement that when rapid transit develops, it will be done in the Woodward Corridor.[5] The mass transit system was given every opportunity in the modeling effort for this project to attract riders, e.g., frequent feeder bus service in Oakland County (which does not exist today), rapid transit vehicles on exclusive right-of-way along Woodward Avenue at speeds as high as physically feasible, and optimal spacing of stations/stops between downtown Detroit and Pontiac along Woodward Avenue. More specifically, the system was characterized by:

- High speed (60 mph where distances and conditions permit);
- High quality vehicles with a quiet, smooth ride;
- Separation from other traffic to avoid congestion;
- Short headways – 3 minutes;
- Short dwell times at stations – 15 seconds or less;
- Timed transfers with intersecting routes to avoid missed transfers;
- Communication between buses also to avoid missed transfers;
- Park-and-ride lots at stops north of, and including, the Michigan State Fairgrounds;
- Fare integration with intersecting transit to permit a single fare for all trip segments; and,
- Pre-paid fares at platforms to reduce boarding times.

The result is a rapid transit system that attracts almost 50,000 daily riders. But, ridership was found to fall off sharply north of M-102 (8 Mile Road) (Table 3-1). As a result, even the rapid transit system that was modeled does not eliminate the need to add a lane to I-75 in Oakland County. Several reasons are apparent:

- Oakland County residential development is too dispersed to support a high level of transit service.
- Many I-75 trips are internal to Oakland County and not easily diverted to transit.
- There is more travel demand in the I-75 corridor than there is capacity. This means that when rapid transit diverts motorists from I-75, others who would typically use the road, except for its heavy congestion, quickly replace them.

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[4] *I-75 Corridor Planning/Environmental Study Refined Analysis of Transit and HOV Concepts (Technical Memorandum No. 2)* by The Corradino Group for the Michigan Department of Transportation, October 2002.

[5] Between December 1975 and April 1977 the Southeast Michigan Transportation Authority conducted detailed studies of Southeast Michigan's travel corridors and concluded that the first-stage light rail element that resulted from planning would be in the Woodward Corridor.

Table 3-1
Rapid Transit Station Activity

STATION LOCATION	STATION ACCESS TYPES[a]	DAILY ONS + OFFS	DAILY 2-WAY LOADINGS
Pontiac Transportation Center	Auto, Walk, Bus	2,204	2,204
Square Lake Road	Auto, Walk, Bus	3,047	2,567
Long Lake Road	Auto, Walk, Bus	244	2,645
Big Beaver Road	Auto, Walk, Bus	674	2,747
Maple Road	Auto, Walk, Bus	1,533	3,586
14 Mile Road	Auto, Walk, Bus	2,339	4,675
13 Mile Road	Auto, Walk, Bus	3,968	6,517
12 Mile Road	Auto, Walk, Bus	3,511	7,254
11 Mile Road	Auto, Walk, Bus	1,252	7,428
10 Mile Road	Auto, Walk, Bus	1,312	7,902
9 Mile Road	Auto, Walk, Bus	5,217	8,933
M-102 (8 Mile Road)	Auto, Walk, Bus	4,395	12,016
7 Mile Road	Walk, Bus	3,892	13,594
McNichols Road	Walk, Bus	4,851	15,119
Woodland Avenue	Walk, Bus	1,693	15,914
Trowbridge Road	Walk, Bus	2,889	17,749
Hazelwood	Walk, Bus	4,243	19,508
Mount Vernon	Walk, Bus	4,661	21,169
Grand Boulevard	Walk, Bus	3,039	20,868
Antoinette	Walk, Bus	4,901	20,901
Warren	Walk, Bus	6,306	22,295
Alexandrine	Walk, Bus	3,841	22,258
Mack Avenue	Walk, Bus	511	22,237
Alfred	Walk, Bus	5,018	22,145
I-75	Walk, Bus	1,639	21,206
Grand Circus Park	DPM, Walk, Bus	4,884	16,376
Campus Martius	Walk, Bus	12,321	5,179
Jefferson Avenue	Walk, Bus	5,179	0

Source: The Corradino Group of Michigan, Inc.
[a] Stations north of 7 Mile Road have parking. All stations have walk and bus access. Walk access is much better in the south, where people live closer to stations. The DPM is the Detroit People Mover.

The section of I-75 between 8 Mile Road and I-696 would experience the greatest potential diversion of trips with a rapid transit system in the Woodward Corridor, about 100 vehicles in the peak hour. By comparison a single freeway lane can carry upwards of 2000 vehicles per hour. Thus, modeling indicates only a small diversion of trips from I-75. But, traffic demand is so strong these “diverted” auto users are replaced by others. The current status of rapid transit planning in the corridor is discussed in Section 4.2.3.

In summary, a rapid transit system along the Woodward Corridor clearly shows viability, at least as far north as 9 Mile Road, but it cannot meet the project purpose and need.

3.7 Build Alternatives

The “build alternatives” include adding a through travel lane between M-102 (8 Mile Road) and M-59 to bring the total to four lanes in each direction.[6] The lane could be implemented for

[6] During the 2000 Feasibility Study the concept of a reversible lane was considered. However, north-south travel demand is so balanced that a reversible lane was not reasonable.

general use by all vehicles all the time, or could be restricted to use by HOVs during peak travel periods. The lane addition supplements the planned major reconstruction of I-75. Both alternatives also include reconstruction of the 12 Mile and 14 Mile interchanges and braiding the ramps from I-696 to northbound I-75 with a relocated off-ramp to 11 Mile Road. Six pedestrian bridges would be reconstructed over I-75.[7] A sidewalk would be added along the service drive north-south through the I-696 interchange. Bridges in the depressed section would be replaced as the lane addition would require all these bridges to be longer. The bridges at the 12 and 14 Mile Road interchanges will be reconstructed along with the entire interchange. At 13 Mile Road, and all locations north of 14 Mile Road, bridges will be widened to the inside.

The following paragraphs describe the development of a general-purpose lane or an HOV lane. Then there is discussion of 10-foot inside (median) shoulders, the curve on I-75 at Big Beaver Road, special considerations at Square Lake Road, and ties to the separate I-75/M-59 project. Finally, there is discussion of proposed changes at the I-696, 12 Mile Road, and 14 Mile Road

3.7.1 I-75 Lane Addition for General Purpose Use – GP Alternative

Between M-102 (8 Mile Road) and a point south of 12 Mile Road, I-75 is in a "cut" section. Crossroads are at grade and I-75 passes under these roads. "Slip ramps" serve traffic entering and exiting the freeway from adjacent service drives (parallel, one-way, local roads adjacent to the freeway). Addition of a fourth through lane in this section would occur by cutting into the existing side slopes (Figure 3-2). In some cases, the adjacent service drives will be narrowed to prevent the need for acquisition of right-of-way from bordering properties. At each low point in I-75, under the crossroads, a pump station now exists in the embankment area. These pump stations move storm water up and away from the low points into receiving pipes that now flow to a combined sewer system (handling sewage and storm water in the same system). The pump stations will have to be relocated or modified. The proposed project will direct I-75 storm water away from the combined sewer system to improve water quality (see Section 4.10.2).

Six pedestrian bridges now provide access across I-75 in the depressed section south of 12 Mile Road. These would be reconstructed, because their supporting piers would be affected by the lane addition. The bridges are at: Bernhard Avenue, Harry Avenue, Highland Avenue, Orchard Avenue, Browning Avenue, and Bellaire Street. The underclearance of the bridges must be increased two to three feet[8] and reconstruction must conform to the Americans with Disabilities Act (ADA), which requires more gradually sloping ramps. Example layouts are provided in Figure 3-3. These would be subject to refinement during the design phase of the project. Note that the Harry Avenue pedestrian bridge could require relocation of three homes. An option is to eliminate this pedestrian bridge and have pedestrians use the Meyers Avenue crossing of I-75 (see Section 4.2.2).

I-75 is either at grade or elevated in the northern part of the project length. I-75 passes under Gardenia Avenue, then over 12 Mile Road, the next crossroad to the north. The lane addition in this section would be constructed in the existing median north as far as Square Lake Road (Figure 3-2). Because there is a left exit from northbound I-75 to westbound Square Lake Road, and a left entrance from eastbound Square Lake Road to northbound I-75, the northbound lane addition would have to be modified, as the median ends. The left exit and entrance interfere with the

[7] Reconstruction of the Harry Avenue pedestrian bridge would require relocation of three homes, so an option is not to replace this bridge.
[8] Pedestrian bridges have an extra-high under-clearance of 17'3" over the service drives to prevent bridges from being hit by vehicles passing underneath.

continuation of the additional lane on the median side. Therefore, a general-purpose lane addition northbound would have to transition from inside to outside through the interchange.

North of Square Lake Road to beyond M-59 there are already four through lanes. Two auxiliary lanes are planned with the I-75/M-59 project. These will form the exit lanes to M-59. The north limit of the I-75 lane addition project is north of South Boulevard where the two lanes (eastbound-to-northbound) from Square Lake Road join the four northbound lanes of I-75 to form the planned six lanes proceeding north.

On southbound I-75 five lanes now pass under South Boulevard. Two lanes exit to westbound Square Lake Road and three continue as southbound I-75. With the project, the three inside (median) lanes would maintain their current position under the South Boulevard bridge. The fourth lane (counting from the inside to the outside) would become a "decision lane." Drivers in that lane will be able to exit to westbound Square Lake Road or continue south on I-75 (see Section 3.7.3). As this fourth lane proceeds south, it would be a "new" lane, positioned on the outside of the three existing lanes. But, south of Square Lake Road, the new lane is to be on the inside (median side). This means I-75 will be reconstructed in this section to align the four southbound lanes properly.

The lane additions just described will almost entirely occur within existing MDOT right-of-way. Figure 3-4 has cross sections.

With the exception of the 9 Mile Road "S" curve discussed in the following paragraphs, the proposed project will bring I-75 up to full, modern, design standards. This will be accomplished by changing the roadway profile, increasing superelevations in curves, making compatible changes to curve radii and lengths (these need be very minor only), and changing ramp profiles and lengths. A 70 mph design speed is planned.

I-75 Lane Addition to Full Standards

The GP alternative would bring I-75 to full, modern standards, with the exception of the 9 Mile Road "S" curve. The south curve is designed for 70 miles per hour and meets standards. However, there is no tangent (straight) section between that curve and the return curve to the immediate north. And, the north curve is too sharp. An analysis was performed of adding the appropriate tangent section between the curves and redesigning the north section of the "S" curve. There is advisory signing to drive at 50 miles per hour through the curve today and the crash rate for northbound traffic in this curve is higher than for other sections of I-75 (see Table 2-8). Adding the appropriate transition length between the two curves and bringing the north curve up to standards would push I-75 into the adjacent neighborhood to the west. More than 150 parcels would likely be affected, including approximately 100 residential units, 20 business structures, a church, an elementary school, and vacant lots (Figure 3-5). The additional cost would exceed \$100 million. The safety benefit is marginal. In this confined driving environment benefits would come from a reduction in the non-fatal accident rate and the benefit/cost ratio would be only 0.44:1. Due to the significant social impacts and cost, this option is not considered practical. Short-term crash countermeasures are recommended in Section 2.2.6.

3.7.2 I-75 Lane Addition for HOV Use – HOV Alternative

The proposed fourth lane would be dedicated for use by high-occupancy vehicles only.

Based on the experience with HOV in other locations nationwide, a standard, 12-foot highway lane can be marked for HOV use (Figure 3-6). In the case of I-75, as is true in most every case nationwide, the designated lane would be on the inside, concurrent with the flow of other I-75 traffic. It would be designated by signing and pavement markings.

Three HOV options were initially considered.[9] Option A called for the HOV lane (one in each direction) to be added between M-102 and M-15, with modifications at each interchange in this section (except M-102) that would allow direct access to an HOV lane on the inside of the freeway. This means construction of flyovers or special ramps connecting directly to the HOV lane. This approach would require right-of-way acquisition because, wherever a ramp enters or exits, a space must be created between the general-purpose travel lanes and the HOV lane for the special access ramp to occupy (Figure 3-7). Option A extended to M-15 because the computer modeling indicated that the HOV would be at least moderately effective that far north. Option B took a similar approach (special access), but limited the extent of HOV to the section of I-75 between I-696 and M-59, which computer modeling found to be the most attractive for HOV. Option C called for only striping and signing of the HOV lane, from M-102 to M-15 and special construction northbound through the Square Lake interchange (Figure 3-8).

The result of the analysis found the differences among the options were significant (Table 3-2). Whereas Option C would not require relocation of homes or businesses, Option A, between M-102 and M-59, could result in impacts to 24 business structures, 78 single-family dwellings, 74 multi-family dwellings, 3 churches, 3 institutions and 8 acres of wetlands. Option A would also substantially increase the project's construction cost, adding an estimated $262 million that does not include right-of-way costs. These data are for the section of I-75 covered by this DEIS. Extending the concept of exclusive access further north to M-15 would add to the impacts and cost. If the full-access HOV concept were limited to the section between I-696 and M-59 (Option B) the impacts would be less: 9 businesses, 37 single-family dwellings, 74 multi-family dwellings, 2 churches, 3 institutions, and 8 acres of wetlands, at a construction cost of $179 million. Impacts of Options A and B are considered significant and so these options are not considered feasible.

Option C, the basic HOV concept which is shaded in Table 3-2, would have no additional impacts, with the exception of 0.4 acres of wetland, and a minimal additional cost compared to the GP Alternative. It would require special construction through the Square Lake Road interchange in the northbound direction. There the HOV lane would separate from the northbound through lanes to allow it to pass over the left exit to Square Lake Road and the left entrance from Square Lake Road. The bridges associated with this treatment would cost an estimated $2 million.

[9] Ibid.

Table 3-2
Impacts of HOV Options

TYPE OF IMPACT	OPTION A	OPTION B	OPTION C
Relocated Business Structures	24	9	0
Relocated Single-family Dwellings	78	37	0
Relocated Multiple-family Dwellings	74	74	0
Relocated Churches	3	2	0
Relocated Institutions	3	3	0
Wetlands Taken (acres)	8	8	0.4
Cost	$262,000,000	$179,000,000	$3,000,000

Source: The Corradino Group of Michigan, Inc.
Note: Option A is special access from M-102 to M-15. Option B is special access from I-696 to M-59. Option C is signing and striping only and is shaded, as it is the preferred option.

For any HOV option, capital costs related to signing and striping could amount to another $3 million. And, enforcement is essential for the proper functioning of the lane. Costs could range from $1 to $4 million, annually, depending on the level of stringency. The more enforcement, the greater the effectiveness of the HOV lane. Enforcement responsibilities would need to be discussed among the Michigan State Police and local jurisdictions.

The above analysis led to the conclusion that the costs and impacts of the full-access HOV lane make Options A and B infeasible, especially considering that special access ramps generated virtually no additional use of the HOV lane. The additional costs and impacts cannot be justified. Therefore, only the basic HOV concept (Option C) was advanced for consideration in this DEIS.

Four through lanes are already present on I-75 north of Square Lake Road to west of M-24. To carry the HOV lane north of Square Lake Road will require federal approval to convert the existing fourth through lane from a general-purpose lane to an HOV lane. Long-range planning calls for the fourth lane on I-75 to be constructed north to the Oakland / Genesee county line. Computer modeling indicates the portion of I-75 north to M-15 meets the criteria for HOV designation. So, if that section is built later, the HOV lane could extend to M-15.

The key to determining whether HOV should be pursued is how well it performs relative to development of a general-purpose (single-occupancy) lane and how well it may be received by institutions and the public. Enforcement is an important component of public acceptance.

Tests indicate an HOV lane as proposed under Option C would meet the following, generally accepted criteria for HOVs:[10]

- There should be at least 700 vehicles in the HOV lane during the peak hour.
- The HOV lane should carry more people than the adjacent general-purpose lane.
- The total freeway throughput should be greater with the HOV lane than without.

[10] SEMCOG's regional transportation computer model was used as a base. A "mode-choice" component was added to the model by The Corradino Group for the HOV analysis for this EIS. SEMCOG has developed peak hour factors that can be used for the afternoon peak hour, but there are no such factors for the morning peak, so all model runs are for the PM peak. More detailed model results are in *Technical Memorandum 2, Refined Analysis of Transit and HOV Concepts,* December 2002.

To test the HOV lane in a realistic manner, the assumption was made that "violators" - driver-only (single occupant) vehicles would try to take advantage of the reduced congestion and higher speed of the HOV lane. The violation rate in the computer model was set at 20 percent. This reflects real world experience when there is a moderate rate of enforcement. Option C meets all three criteria in the northbound direction with the 20 percent violation assumption (Table 3-3). The HOV lane, as noted previously, was assumed to extend to M-15 which modeling showed to be the northern limit of HOV viability. Also, the modeling was for 2+ HOVs. A test of three or more persons per vehicle did not satisfy any of the three criteria listed above.

An examination of the southbound HOV conditions found that even in the non-peak direction (the travel model represents peak afternoon conditions only) two of three criteria are met. But for M-102 to M-59, all three criteria are met and those are the limits of this project. This test was run with no violations to minimize the number of vehicles in the HOV lane (Table 3-4).

Table 3-3
HOV Tests -2025 PM Peak Hour – Northbound – 20% Violation Rate

Key Segment	Total HOV Lane Vehicles per Hour	Person Throughput per Lane		HOV Increase in Total Freeway Person Throughput	Passes Test
		HOV Lane	General Purpose Lane Average		
M-102 to I-696	1,660	3,630	1,920	30+	Yes
I-696 to 12 Mile	2,270	5,020	2,390	840+	Yes
12 Mile to 14 Mile	2,020	4,480	2,080	410+	Yes
Square Lake to M-59	2,140	4,710	2,170	660+	Yes
Sashabaw to M-15	1,110	2,340	1,540	240+	Yes

Source: The Corradino Group of Michigan, Inc.

Table 3-4
HOV Tests - 2025 PM Peak Hour – Southbound – No Violators

Key Segment	Total HOV Lane Vehicles per Hour	Person Throughput per Lane		HOV Increase in Total Freeway Person Throughput	Passes Test
		HOV Lane	General Purpose Lane Average		
M-102 to I-696	1,450	3,620	1,820	180+	Yes
I-696 to 12 Mile	2,150	5,350	2,410	1,190+	Yes
12 Mile to 14 Mile	1,780	4,420	1,950	370+	Yes
Square Lake to M-59	1,540	3,800	1,970	80+	Yes
Sashabaw to M-15	320	770	1,050	10+	No

Source: The Corradino Group of Michigan, Inc.

Because the test was for the non-peak direction, the viability of an HOV lane all the way to M-15 is still supported. However, this result highlights a common problem with the implementation of HOV lanes - the "empty lane" syndrome. For an HOV lane to function properly, it must carry fewer vehicles than the adjacent general-purpose lane. Some motorists feel that the lane is "not being used" and "taxpayer's money is being wasted," when in fact, the lane should be somewhat "empty" since the real test of HOV is whether the overall throughput of the road is increased.

An examination of traffic data available from two MDOT permanent traffic count recorder stations assisted in a determination that operation of HOV lanes should be in both directions during both the morning and afternoon peak periods, likely from 7 to 9 AM and 4 to 6 PM. This scenario will be subject to review at the time of HOV implementation, should the HOV alternative be recommended. Further, if HOV becomes the Recommended Alternative, the development of additional carpool lots and park-and-ride facilities will be examined as a part of the alternative.[11]

In conclusion, this DEIS examines the impacts of an HOV lane between M-102 and M-59, with the underlying assumption that the lane can ultimately be developed to M-15 in the future.

3.7.3 Specific Design Issues

This section documents consideration of several specific design elements that were considered for inclusion in the built alternatives.

10-Foot Inside (Median) Shoulders

Ten-foot inside shoulders meet modern design standards, but 12-foot inside (median) shoulders are preferred to 10-foot shoulders when more than 250 trucks are present in the peak travel hour, as would be the case on I-75. I-75 is now designed with 10-foot shoulders. To add the two additional feet would require total reconstruction of all the bridges from 12 Mile Road north to the north project limit. With 10-foot shoulders the bridges could be widened. Ten-foot median shoulders are considered practical. Twelve-foot shoulders are not, for the following reasons:

- Consistency/Safety: The Square Lake interchange improvements constructed in 2002 included a 10-foot median shoulder. The designs for I-75 at its interchanges with M-59 and Crooks/long Lake roads call for a 10-foot median shoulder. And, the sections of I-75 south of M-102 and north of M-59 have a 10-foot median shoulder.
- "Gapping out," meaning limiting 12-foot median shoulders to those locations where they fit, would limit its use to about half of the project's 18 miles between M-102 and M-59. Changing the median shoulder width to 12 feet in some sections of I-75 will negatively affect driver expectation and, potentially, safety.
- Community Relocations: There would be impacts to four church and four residential parcels (no more than 0.1 acres total of land purchased from frontages over the 10-foot median condition), plus the likely relocation of Our Savior Lutheran Church.
- Cost: Development of a 12-foot median shoulder would lead to an increase in project costs on the order of $100 million.

Redesigning the Big Beaver Road Curve

The curve at the Big Beaver interchange does not conform to the rural standards to which it was designed, but the area is now urbanized. It does meet urban standards. Redesigning the curve to the rural standard would require reconstruction of the interchange. The interchange could be shifted to smooth the curve, but a motel and buildings of the City of Troy government complex, which are located on the inside of the curve, would be affected. Therefore, this option is not considered practical.

[11] Carpool lots are managed by MDOT. SEMCOG assists in management of park-and-ride facilities, which include transit service. So lots along I-75 could be served by SMART – the Suburban Mobility Authority for Regional Transportation.

Eliminating the Left Exit/Entrance on Northbound I-75 at Square Lake Road

The policy of the American Association of State Highway and Transportation Officials is that "left-hand entrances and exits are contrary to the concept of driver expectancy when intermixed with right-hand entrances and exits."[12] To convert the left exit and entrance to a right exit and entrance on northbound I-75 at Square Lake Road would require the construction of flyovers, one for a right exit, another for a right entrance (Figure 3-10). Both would require new right-of-way acquisition or realignment of the northbound lanes of I-75.

Shifting the left exit to the right, would affect an estimated nine single-family homes and a noise wall, which would have to be reconstructed. The construction cost would be in the range of $3.2 million, plus another $800,000 for noise wall relocation, for a total of about $4 million. Right-of-way acquisition would add millions more. In order to shift the left entrance to the right, an estimated 30 apartment units would be affected and additional noise wall would have to be relocated. The construction cost would be in the range of $2.5 million, plus another $500,000 for noise wall relocation. Again, right-of-way acquisition would add millions more. So in total, there could be $7 million for construction alone and impacts to nine single-family and 30 multi-family dwelling units. Shifting the mainline lanes of I-75 would avoid right-of-way impacts but would be very costly, as much of the geometry of the interchange would be affected.

An analysis based on data from the computer travel model found that those vehicles entering northbound I-75 from eastbound Square Lake Road generally want to go north on I-75, rather than weaving over to the right to get to M-59 (Figure 3-9). And, the number of vehicles northbound on I-75 that want to go to M-59 is greater than the number from eastbound Square Lake Road that want to go to M-59. So, the analysis supports leaving the left exit and entrance where they are.

Crash data in Table 4-8 do not indicate a problem at the Square Lake interchange. Potential relocations, cost, and the examination of travel patterns support leaving the left exit and entrance. Therefore, this is the recommendation.

[12] *A Policy on Geometric Design of Highways and Streets*, Chapter 10, p. 845, American Association of State Highway and Transportation Officials, 2001.

Auxiliary Lane, Southbound I-75 from M-59 to Square Lake Road

The M-59 interchange with I-75 is to be reconstructed as a separate project. When that interchange is rebuilt, a collector-distributor road that carries local traffic southbound through the interchange and the ramps from M-59 will merge, successively, with southbound I-75 (Figure 3-11). Discussion with M-59 designers indicates that an auxiliary lane should be carried south all the way to the Square Lake Road interchange. The successive southbound merges from the I-75/M-59 interchange will reduce, in the end, to one. That lane will continue as an auxiliary lane to become an exit-only lane at the Square Lake Road interchange. So, the proposed project will tie to the separate I-75/M-59 interchange project to the north of South Boulevard.

Auxiliary Lane, Northbound I-75 from Square Lake Road to M-59

Northbound, two lanes from Square Lake Road now join the three lanes of I-75 to form the five-lane section that proceeds north to M-59. In the future, an additional northbound lane will be added, either as a general-purpose lane or an HOV lane. Six lanes will then carry under the South Boulevard bridge and continue north to the I-75/M-59 interchange. At that point, two lanes will exit (to eastbound and westbound M-59) and four lanes will continue through the interchange.

I-696 Interchange

Traffic exiting eastbound I-696 to northbound I-75 backs up frequently, blocking through-movements on I-696. Reconstruction of the entire four-level interchange linking these interstates is not practical, because of significant impacts and costs. The primary cause of backups at this location is an inability to merge into the northbound traffic flow on I-75. Increasing the length of the merge will help alleviate this situation. The recommendation is to braid the northbound ramp from I-696 and the relocated off-ramp to 11 Mile Road (Figure 3-12). This safety and operational improvement could require relocation of eight single-family dwellings. The ramps from eastbound I-696 and from westbound I-696 would merge first, as they do today. Then, this merged ramp would pass over the off-ramp to 11 Mile Road. The two-way crossover bridge at Dallas Avenue would be removed to accomplish the braiding. Its function would be replaced by a new bridge just south of Lincoln Avenue serving the north-to-south movement. The south-to-north traffic now served at the existing Dallas Avenue bridge is light and would be served by the Lincoln Avenue bridge.

12 Mile Road Interchange

The I-75 Feasibility Study suggested the interchange at 12 Mile Road should be reconstructed as a Single-Point Urban Interchange (SPUI) (Figure 3-13a). The SPUI design brings ramp ends together at a single point and provides for a three-phase traffic signal operation. The three phases control: 1) left turns from the ramps ends; 2) left turns to the entrance ramps; and, 3) the through movement of the cross road (12 Mile Road). The SPUI proposed for 12 Mile Road would reduce the footprint of the interchange, releasing the land for other uses.

More detailed analysis for this DEIS found that the existing interchange could be modified to serve traffic adequately (Figure 3-13b), as volumes at this interchange are relative low. Backups on 12 Mile Road from Stephenson Highway block vehicles exiting the southbound off-ramp. To remedy this situation, the loop ramp in the northwest quadrant could be eliminated to allow the end of the southbound off-ramp to be shifted east, away from Stephenson Highway. The substitute for the loop ramp would be a left turn from westbound 12 Mile Road to the existing southbound on-ramp in the southwest quadrant of the interchange. 12 Mile Road and the southbound on-ramp would be modified. The necessary widening of 12 Mile Road under this option would require reconstruction of the I-75 bridges over 12 Mile Road. The signalized intersection at the end of the southbound off ramp would also control the westbound to southbound left turn from 12 Mile Road. The overall 2025 PM peak hour level of service of this intersection would be C, but the left turn would be E. The LOS of the intersection at the end of the northbound off ramp would be C. These compare to a LOS with the SPUI of C (Table 3-5).

Table 3-5
Level of Service – 12 and 14 Mile Road Interchange Options

Signalized Intersection			2025 AM Peak Hour	2025 PM Peak Hour
12 Mile	SPUI	Central Signal	C	C
	Modification	West	C	C
		East	B	C
14 Mile	SPUI	Central Signal	D	F
	Modification	Southbound Off	C	C
		Southbound On	B	B
		Northbound Off	C	D
		Northbound On	A	A

Source: URS Corporation

Both options will provide sidewalks along both the north and south sides of 12 Mile Road (see the orange lines in Figures 3-13a and 3-13b). The SPUI can provide better protection to pedestrians and bicyclists than the partial cloverleaf option, which would continue to have one loop ramp. With the SPUI, most ramp traffic is stopped at some point by signals. (The exceptions are right turns from off-ramp ends and right turns to entrance ramps.) Reducing the speed of vehicles at crossing points helps pedestrians and bicyclists. The speed of vehicles in the

14 Mile Road Interchange

The I-75 Feasibility Study made a preliminary determination that the 14 Mile Road interchange would be reconstructed as a SPUI. More detailed analysis for this DEIS found that modification of the existing interchange would serve traffic better than the SPUI design. SPUIs operate well in situations where the turn movements are relatively balanced (i.e., opposing left turns or through movements have similar volumes). This is not the case at 14 Mile Road. With the SPUI the LOS of the single intersection would be F (Table 3-5). Modifying the existing configuration would result in a LOS of C at the terminus of the southbound off ramp and D at the terminus of the northbound off ramp. The intersections that control entrance to the on ramps would operate at LOS B (west) and A (east).

The Oakland Mall and associated developments draw travel to the east of I-75. This attraction is much stronger than it is to the west. This unbalanced situation will continue and is better served by adding capacity to the existing interchange (Figure 3-14). In particular, through capacity will be added on 14 Mile Road, and left-turn capacity from 14 Mile Road to I-75 will be increased. These changes will necessitate the reconstruction of the I-75 bridges over 14 Mile Road.

Substantial improvement in traffic flow in the vicinity of the 14 Mile Road interchange can only be realized if improvements are made to 14 Mile Road at the Oakland Mall. MDOT has sponsored meetings on this subject with the Road Commission for Oakland County, the cities of Troy and Madison Heights, and representatives of the Oakland Mall. Dialogue is expected to continue beyond this project.

Sidewalks will be provided along both the north and south side of 14 Mile Road through the interchange. Workers and shoppers at the Oakland Mall walk to and from the transit service provided on Stephenson Highway. There is a sidewalk only on the north side. A similar sidewalk will be provided on the south side. Sight distance is critical to the safety of pedestrians and bicyclists where they cross the loop ramps. These areas should be kept clear of landscaping materials.

3.8 Practical Alternatives

Several key impacts of the potential build alternatives are noted in Table 3-6. Construction of the lane addition to full standards or one of the special access HOV options has significantly greater impacts and cost than the GP Alternative or the basic HOV (Option C) Alternative. Therefore, the practical alternatives carried forward through this DEIS are:

- No Build – Continued regular maintenance with no capacity improvements.
- Addition of a general-purpose travel lane between M-102 and north of Square Lake Road to bring the number of through travel lanes to four in each direction.
- Addition of an HOV lane in the same manner as the general-purpose lane, but signed and striped for HOV use during the peak hours (Option C). The HOV lane is carried through the Square Lake Road interchange.

Table 3-6
Build Alternatives Impact Summary

Alternative	Cost (millions 2003)	Wetlands (acres)	Relocations		
			Dwelling Units	Businesses	Institutions
General Purpose	$530	0	11	2	0
Lane Addition - Full Standards[a]	$630	0	100	22	2
HOV - Option A - Special Access M-102 to M-15	$792	8	152	24	6
HOV - Option B - Special Access I-696 to M-59	$709	8	111	9	5
HOV - Option C - Signing & Striping	$536	0.4	11	2	0

Source: The Corradino Group of Michigan, Inc.
[a]Totals to the right do not include 30 vacant lots.

The GP and HOV practical alternatives would be accompanied by:

1. Replacement of all bridges in the depressed section from north of M-102 to south of 12 Mile Road, as all need to be lengthened.
2. Widening of all I-75 bridges north of 14 Mile Road (plus the I-75 bridge over 13 Mile Road) to accommodate the lane addition.
3. Improvements at the 12 Mile Road interchange (two options) and 14 Mile Road interchange;
4. Ten-foot, rather than 12-foot inside (median) shoulders;
5. The ramp braiding north of I-696 (with the relocation of the Dallas Avenue crossover bridge to south of Lincoln Avenue);
6. Reconstruction of the pedestrian bridges over the depressed section of the freeway (with option of not building Harry Avenue bridge due to relocations), and addition of a sidewalk through the I-696 interchange on the east side of I-75;
7. Construction of a new storm water system in the south part of the corridor; and,
8. New storm water retention in the north section of the corridor.

Computer modeling finds that mass transit is viable in the Woodward Corridor, but clearly shows that, even under the best-case scenario, a Mass Transit Alternative cannot eliminate the need for four travel lanes in each direction through the project length on I-75. Nevertheless, the transit concept has been included in the background system, along with the roadways in the cost-feasible *Regional Transportation Plan*. TSM, TDM, and ITS are also incorporated into all alternatives.

The practical alternatives would tie to auxiliary lanes planned with the separate I-75/M-59 project. The interchanges of I-75 with M-59 and Crooks/Long Lake Road, while not part of this project and DEIS, are considered part of the background system. The designs of the three projects will be integrated with each other, even though each has independent utility.

These practical alternatives will be carried to the public hearing. A Recommended Alternative will not be determined until after the public hearing and comment period are concluded and all comments have been considered.