2.4 Condition of Existing Roadway and Bridges

The condition of the existing roadway and bridges contributes to the need for the project. This section describes these needs.

2.4.1 Roadway Deficiencies

Although built to meet the design standards in the current (i.e., 1960s), the existing roadway does not meet today's standards. Table 2-3 identifies locations where I-75 does not meet modern standards based on a review of specific features including:

- Horizontal alignment
- Vertical clearance and alignment
- Stopping sight distance
- Cross section
- Ramp exit and entrance design
- Ramp spacing

In most instances the proposed improvements will upgrade I-75 to meet modern standards. However, it is understood that straightening curves at several points in the corridor is not reasonable (see next section).

2.4.2 Horizontal Alignment

The horizontal alignment of a road encompasses the radii of curves (i.e., how "sharp" a curve is), their length, and superelevation (i.e., the vertical distance between the heights of the inner and outer edges of the road or how the freeway is "banked"). There are 19 locations in the study area where I-75 does not meet modern standards for superelevation rates, superelevation transition lengths, length of curves, and radius of curvature (Table 2-3). These inadequacies reduce travel efficiency and contribute to traffic congestion. Curves in the south corridor at 9 Mile Road, Gardenia, 12 Mile Road, and Livernois/Big Beaver are in heavily built-up areas. Flattening the curves to meet a 70 mph design speed would result in significant relocations. At Big Beaver, flattening the curve would require reconstruction of the interchange.

2.4.3 Vertical Clearance and Alignment

Vertical clearance is defined as the distance between the surface of the roadway and the bottom of a bridge structure. Poor (substandard) bridge clearances occasionally result in trucks crashing into bridge beams and require some larger trucks to take alternate routes. Modern standards require a vertical clearance for bridges over I-75 of 16'3". The proposed I-75 reconstruction will meet this standard north of I-696. South of I-696, clearance could be 14'9" as the interstate system in the core of Detroit is gauged to that earlier standard.

The vertical alignment includes vertical grade (i.e., how steep hills are), the length of vertical curves (i.e., hills and dips), and vertical sight distance. These issues affect travel efficiency, traffic congestion, and safety.

Table 2-3
I-75 Roadway Features that Do Not Meet Modern Standards

Issue	Locations Not Meeting Modern Standards	Deficient Features	Comments*
Horizontal Alignment	I-75, south of John R. bridge (between Meyer & Highland)	■ Superelevation rate	Existing superelevation @ 5% is insufficient for 70 mph design speed (req'd 7%).
	I-75, south of John R. bridge (between Highland & Rhodes)	■ Superelevation transition length	Existing transition length between superelevated sections not to standard.
	I-75, north of John R. bridge (between Rhodes & 9 Mile Rd.)	■ Superelevation rate ■ Length of curve ■ Radius of curvature	Existing superelevation @ 5% is insufficient for 70 mph design speed (req'd 7%); radius of curve and length of curve not to standard.
	I-75, north of 11 Mile Rd. bridge (between Mace and E. University)	■ Superelevation rate ■ Length of curve	Existing superelevation @ 5% is insufficient for 70 mph design speed (req'd 7%); length of curve not to standard.
	I-75 northbound roadway, north of Stephenson Hwy. bridge (between 11 Mile Rd. and Gardenia)	■ Superelevation rate ■ Length of curve ■ Radius of curvature	Existing superelevation @ 6% is insufficient for 70 mph design speed (req'd 7%); radius of curve and length of curve not to standard.
	I-75 southbound roadway, north of Stephenson Hwy. bridge (between 11 Mile Rd. and Gardenia)	■ Superelevation rate ■ Length of curve	Existing superelevation @ 6% is insufficient for 70 mph design speed (req'd 7%); length of curve not to standard.
	I-75, bridge over 12 Mile Rd.	■ Superelevation rate ■ Length of curve ■ Radius of curvature	Existing superelevation @ 5.7% is insufficient for 70 mph design speed (req'd 7%); radius of curve and length of curve not to standard.
	I-75, north of 15 Mile Rd. thru Rochester Rd.	■ Superelevation rate	Existing superelevation @ 5% is insufficient for 70 mph design speed (req'd 6.3%).
	I-75, Livernois Rd. thru north of Big Beaver Rd.	■ Superelevation rate ■ Radius of curvature	Existing superelevation @ 5% is insufficient for 70 mph design speed (req'd 6.3%); radius of curve is not to standard.
	I-75, north of Big Beaver Rd. thru Squirrel Rd.	■ Superelevation rate	Existing superelevation @ 5% is insufficient for 70 mph design speed (req'd 6.3%).
	I-75, under Squirrel Rd.	■ Superelevation rate	Existing superelevation @ 2% is insufficient for 70 mph design speed (req'd 7%).
	I-75, bridge over Clinton River	■ Superelevation rate	Existing superelevation @ 5% is insufficient for 70 mph design speed (req'd 6.1%).
	I-75, Squirrel Rd. thru South Blvd.	■ Superelevation rate	Existing superelevation @ 5% is insufficient for 70 mph design speed (req'd 6.3%).

*Most deficiencies in this table will be rectified, but several curves will not be improved to meet that required for a 70 mph design speed due to cost and impacts.

Table 2-3 (continued)
I-75 Roadway Features that Do Not Meet Modern Standards

Issue	Locations Not Meeting Modern Standards	Deficient Features	Comments
Vertical Clearance and Alignment	All locations along I-75 from 8 Mile Road to M-59	■ None.	All locations meet minimum and maximum criteria for longitudinal grades (min 0.3%, max 3.0%)
	I-75, under John R. Rd. bridge I-75, under 9 Mile Rd. bridge	■ Length of vertical curve (sag) at these two locations.	Two consecutive sag vertical curves, existing length of either curve are less than standard for 70 mph design speed.
	I-75, north of Meyer Rd. I-75, north of John R. Rd. bridge I-75, north of 9 Mile Rd. on-ramps I-75, at 4th Rd.	■ Length of vertical curve (crest) at these four locations.	Crest vertical curve, existing length of curve are less than standard for 70 mph design speed.
Stopping Site Distance	I-75, north of 8 Mile Rd., south of Meyer Rd. I-75, under Meyer Rd. bridge I-75, north of Meyer Rd. bridge I-75, under John R. Rd. bridge I-75, north of John R. Rd. bridge I-75, under 9 Mile Rd. bridge I-75, north of 9 Mile Rd. bridge I-75, south of Woodward Hts. bridge I-75, at Woodward Hts. bridge I-75, at Middlesex Rd. I-75, under 11 Mile Rd. bridge I-75, under Squirrel Rd. bridge	■ Stopping sight distances are not met at these 12 locations.	Stopping sight distance for crest curve is less than standard for 70 mph design speed.
	I-75, at merger of 9 Mile Rd. on-ramps I-75, at 4th road (11 Mile Rd. ramp mergers)	■ Stopping sight distances and decision sight distances are not met at these two locations.	Stopping sight distance for crest curve is less than standard for 70 mph design speed. Decision sight distance for merging ramp traffic below standard.
Cross Section	Eight Mile to Twelve Mile	■ None.	Existing pavement width and shoulder width meet modern standards.

Table 2-3 (continued)
I-75 Roadway Features That Do Not Meet Modern Standards

Issues	Locations Not Meeting Modern Standards	Deficient Features	Comments
Ramp Exit and Entrance Design	Westside of I-75, north of Eight Mile Road Westside of I-75, south of John R. Road Westside of I-75 , north of Nine Mile Road Eastside of I-75, north of Nine Mile Road Westside of I-75, south of Eleven Mile Road Eastside of I-75, south of Eleven Mile Road Westside of I-75, north of Eleven Mile Road Eastside of I-75, north of Eleven Mile Road 12 Mile Rd. 14 Mile Rd. Rochester Rd. Adams Rd	■ Ramp exits and entrances do not meet modern standards at these 12 locations.	Profile grades, vertical curves, decision sight distances, and transition lengths do not meet modern standards
Ramp Spacing	Eight Mile to Twelve Mile	■ None	Ramp spacing meets modern standards.

Source: The Corradino Group of Michigan, Inc., OHM, and Rowe, Inc. based on MDOT Design Plans (1960s).

All locations on I-75 in the study area meet the modern standards for vertical grade and vertical sight distance. However, there are six locations where the crests and sags (hills and dips) on I-75 do not meet the modern standards for the length of vertical curves (Table 2-3).

2.4.4 Stopping Sight Distance

Stopping sight distance is the distance a motorist must be able to see in order to safely stop should an object or other threat require that. As speeds increase, stopping sight distance requirements also increase. Obstructed views (i.e., inadequate stopping sight distance) can contribute to crashes when motorists do not have sufficient time and distance to reduce speeds. There are 14 areas where stopping sight distances to not meet modern standards. Two of these also do not meet the standard for decision site distance for merging ramp traffic (Table 2-3).

2.4.5 Cross Section

The cross section of a road includes travel lane width, shoulder width (both inside and outside shoulders), median width, the cross slope of the travel lanes, shoulder slope, cut/fill slopes, and the ditch slopes (Table 2-3). In the project area, the I-75 cross section generally meets modern standards.

2.4.6 Ramp Exit and Entrance Design

At 12 locations, the ramp entrance and exit designs do not meet modern standards. Here, the decision sight distance (the distance that motorists have to make decisions about lane changes) and/or ramp taper lengths for acceleration and deceleration are inadequate (Table 2-3). In these situations, vehicles traveling on I-75 need to slow down and/or change lanes to allow other motorists to enter or exit the freeway. These problems cause inefficient freeway operations and may contribute to crashes.

2.4.7 Ramp Spacing

In urban settings, such as the project area, interchanges are typically spaced at least one mile from each other. This spacing is required to provide adequate distance for motorists to safely and efficiently perform merges and exits at interchanges. Inadequate interchange separation can create “weaving” conflicts between motorists entering and exiting the freeway. These conflicts result in traffic congestion and may contribute to crashes, in some situations. I-75 interchange ramp spacing meets modern standards in the project area (Table 2-3).

2.5 Physical Condition of Bridges

See Table 2-4 for the physical conditions of existing bridges.

Table 2-4
Bridge Conditions

Structure Number	Bridge Location	Year Constructed/ Reconstructed	Overall Bridge Rating	Vertical Clearance Rating
B02 of 63174	I-75 NB and SB over Red Run Drain in Madison Heights	1963	fair	NA
B04 of 63174	I-75 NB & SB over Clinton River 0.6 miles south of M-59	1964	good	NA
P01 of 63174	Pedestrian Over-Pass at Bellaire Ave.	1963	fair	poor
P02 of 63174	Pedestrian Overpass at E. Bernhard	1966	fair	poor
P03 of 63174	Pedestrian Overpass at East Harry	1966	fair	poor
P04 of 63174	Pedestrian Overpass at Highland Ave.	1966	fair	poor
P05 of 63174	Pedestrian Over-Pass at W. Browning	1969	fair	poor
P06 of 63174	Pedestrian Overpass at Orchard St.	1966	poor	poor
P07 of 63174	Wattles Rd Pedestrian over I-75	1983	good	good
S01 of 63103	Structures of I-75/696 Interchange	1982	fair	poor
S02 of 63103	Structures of I-75/696 Interchange	1982	*	good
S03 of 63103	Structures of I-75/696 Interchange	1982	good	poor
S04 of 63103	Two-Way Cross-Over at W. Shelvin - NB to SB and SB to NB	1971	good	fair
S05 of 63103	I-696 Bridge over I-75	1971	good	fair
S06 of 63103	Two-Way Cross-Over at Dallas Ave.- NB to SB and SB to NB	1971	fair	good
S07 of 63103	Structures of I-75/696 Interchange	1971	good	poor
S08 of 63103	Structures of I-75/696 Interchange	1971	poor	poor
S09 of 63103	Structures of I-75/696 Interchange	1971	fair	poor
S01 of 63172	I-75 NB & SB over M-59	1963/1988	poor	poor
S01 of 63174	Gardenia Ave. Bridge	1963	poor	good
S02 of 63174	NB Stevenson Bridge	1963	poor	good
S03 of 63174	I-75 Bridge over 12 Mile	1963	poor	poor
S04 of 63174	I-75 NB & SB over 13 Mile Rd	1963	poor	poor
S05 of 63174	I-75 NB & SB over 14 Mile Rd	1963/1970	fair	poor
S06 of 63174	I-75 NB & SB over M-150	1964	fair	poor
S08 of 63174	I-75 NB & SB over Livernois Rd	1964	poor	poor
S09 of 63174	I-75 NB, SB, NB CD, & SB CD over Big Beaver Rd	1964, 1983	fair	poor
S10 of 63174	Wattles Rd over I-75	1964	fair	poor
S11 of 63174	I-75 NB & SB over East Long Lake Rd	1964	fair	poor
S12 of 63174	Ramp Connector to Chrysler over I-75	1964	fair	good
S13 of 63174	Crooks Rd over I-75	1990	good	good
S14 of 63174	I-75 NB & SB over Coolidge Rd	1964	fair	poor
S15 of 63174	I-75 NB & SB over Square Lake Rd	1964	good	poor
S16 of 63174	I-75 NB & SB over Adams Rd	1964	good	poor
S17 of 63174	Squirrel Rd over I-75	1964	poor	fair
S18 of 63174	I-75 BL Ramp and SB O Ramp	1964/1988	fair	good
S19 of 63174	South Blvd over I-75	1964	fair	fair
S20 of 63174	I-75 NB & SB over Auburn Rd	1964/1988	good	poor
S21 of 63174	I-75 NB & SB over 15 Mile Rd (Maple Rd)	1963	fair	poor
S22 of 63174	Meyers Ave. Bridge	1966	fair	fair
S23 of 63174	One-Way Cross-Over for SB to NB Service Dr.	1966	poor	fair
S24 of 63174	John R. Bridge	1966	fair	fair
S25 of 63174	One-Way Cross-Over for NB to SB Service Dr.	1966	fair	fair
S26 of 63174	One-Way Cross-Over for SB to NB Service Dr.	1966	poor	fair
S27 of 63174	9 Mile Road Bridge	1966	fair	fair
S28 of 63174	Woodward Heights Blvd. Bridge	1971	fair	fair
S30 of 63174	Lincoln Ave. (10 ½ Mile Road) Bridge	1971	good	good
S31 of 63174	11 Mile Road Bridge	1966	good	good
S32 of 63174	SB Crooks Rd over I-75	1990	good	good
S33 of 63174	Crooks Rd Connection over I-75	1993		

Source: MDOT Bridge Ratings

2.6 Safety

From January 1995 to the end of 1997, there were 3,989 crashes from 8 Mile Road to M-59 on I-75 for an average of 1,330 crashes per year (Table 2-5). There were nine fatal crashes, or three per year. The rear-end crash was the most common type in every segment of the road. Overall, rear-end crashes accounted for 57 percent of the incidents in the study area and for up to 73 percent of the crashes in some segments. Single-vehicle crashes were the second most typical type at 18 percent of total crashes; and, sideswipe/same-direction crashes were the third most typical type of crashes at 13 percent of the incidents in the study area.

Table 2-5
Average Annual Crashes by Segment for I-75

Segment	Average Number of Annual Crashes	Main Crash Type	Length Miles	AADT	Crash Rate*
8 Mile to 9 Mile	113	35% Rear End	1.0	169,000	184
9 Mile to I-696	127	63% Rear End	1.0	178,000	195
I-696 to 11 Mile	130	73% Rear End	1.0	181,000	197
11 Mile to 12 Mile	118	67% Rear End	1.0	170,000	191
12 Mile to 14 Mile	165	58% Rear End	2.0	161,000	140
14 Mile to Rochester Road	198	60% Rear End	2.3	134,000	176
Rochester Road to Big Beaver	112	61% Rear End	1.7	110,000	164
Big Beaver to Crooks	131	49% Rear End	2.6	117,000	118
Crooks to Adams	45	45% Rear End	2.7	110,000	42
Adams to Square Lake	58	64% Rear End	1.3	113,000	109
Square Lake to M-59	132	49% Rear End	2.0	143,000	127
Totals	1,330	57% Rear End	18.6	137,059	143

*Crashes per 100 million vehicle miles

The overall crash rate for the study area was 143 crashes per 100 million vehicle miles traveled. This is less than the state average for urban freeways of 177 crashes per 100 million vehicle miles.[5] However, the first four segments of I-75, covering the section from 8 Mile Road to 12 Mile Road, have a higher crash rate than the state average.

[5] Source: *Comparison of Crash Rates and Characteristics in Eight States by Roadway Class*; Transportation Research Board, Paper Number 97, 1997.

3. Alternatives Under Consideration

The I-75 Corridor Feasibility Study in Oakland County sponsored by MDOT, the Southeast Michigan Council of Governments (SEMCOG), the Road Commission for Oakland County (RCOC) and the Traffic Improvement Association of Oakland County (TIA) was completed in 2000. That study analyzed existing and future traffic needs within the entire I-75 corridor within Oakland County; sought input from local municipal officials and citizens; developed illustrative then practical alternatives for roadway improvements; and, made recommendations.

The study concluded that widening I-75 by adding one lane in each direction, where needed to provide four through lanes in each direction, was the single most productive element in addressing congestion with the fewest impacts. To further improve the performance of I-75, the study recommended reconfiguring seven interchanges, improving arterials, and expanding Intelligent Transportation Systems (ITS). (Note that interchange improvements were made in 2001 at Rochester Road and are under way as separate projects at Crooks/Long Lake Roads and at M-59.)

The alternatives under consideration in this next phase, the environmental phase, include: (1) no build; (2) mass transit; (3) transportation system management[6] and/or transportation demand management techniques;[7] (4) proposed lanes for use during all or parts of the day by high occupancy vehicles (carpools, vanpool, and buses) only; and, (5) general purpose, unrestricted freeway travel lanes (one more lane in areas where there are currently three through lanes in each direction).

3.1 The No Build Alternative

This alternative would include normal maintenance of the existing roadway laneage only, although it should be noted that even without the proposed improvements, a major reconstruction of the road is required. The anticipated increase in traffic volume will result in a continued worsening of the level of service and delays, and congestion will occur over longer periods of the day.

3.2 Mass Transit

The generic transit concept evaluated is a high performance system running on Woodward Avenue from downtown Detroit (Jefferson Avenue) to Pontiac. It included 28 stations/stops and assumed the following:

[6]Transportation System Management (TSM) techniques focus on improving the efficiency of the transportation system through improved signalization, turn lane additions and the like, rather than more capital-intensive solutions that require more right-of-way and result in more impacts.

[7]Transportation Demand Management (TCM) techniques are designed to reduce demand where such demand exceeds available capacity, causing congestion. Mandatory carpooling for larger businesses and shifting travel to non-peak periods are examples of such measures.

- 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 of 3 minutes during peak periods;
- Short dwell times of 15 seconds or less, based on pre-paid fares at platforms to reduce boarding times;
- Timed transfers with intersecting bus routes;
- Communication between buses to avoid missed transfers;
- Park-and-ride lots at stops north of, and including, the State Fairgrounds (at 8 Mile Road); and,
- Fare integration with intersecting transit service to permit a single fare for all segments of a trip.

Results of analysis indicate that rapid transit is viable in the Woodward Corridor south of 9 Mile Road.[8] However, it does not eliminate the need to add a lane to I-75 because it does not relieve congestion; riders on rapid transit who may be diverted to I-75 are quickly replaced on I-75; Oakland County residential development is too dispersed to support a high level of transit service; and, many I-75 trips are intra-Oakland County and not easily diverted to transit.

3.3 Transportation System Management and/or Transportation Demand Management

Analysis will be conducted on applicable Transportation System Management (TSM) and/or Transportation Demand Management (TDM) techniques. TSM and TDM techniques are constantly being reviewed in the Southeast Michigan region and include a strong ITS component. Oakland County, for example, is a nationwide leader in use of FAST-TRAC, a sophisticated, computerized network of traffic signals that senses traffic flow and adjusts signal timing on a dynamic basis to maximize green time to approaching vehicles. The Road Commission for Oakland County (RCOC) has also just announced a program to retime 1,200 traffic signals in the County to improve travel efficiency. TSM and ITS will be components of any recommended alternative. TDM strategies will be examined, particularly in light of the potential application of HOV lanes. However, it is recognized these techniques have proven difficult to implement in the past because they are under the control of institutions/organizations beyond the state and federal governments.

3.4 High-Occupancy Vehicle (HOV) Lane

At a minimum, the HOV alternative consists of limiting the use of the proposed new lanes to vehicles carrying 2 or more people. For all or part of the day, only carpools, vanpools and buses could use the lane. Effective use of the lanes requires that enforcement be strict, thus there is an ongoing operating cost associated with HOV lanes.

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

[8] *I-75 Oakland County Planning Environmental Study Analysis of Transit and HOV Concepts* by The Corradino Group of Michigan, Inc. for the Michigan Department of Transportation, December 2002.

Several criteria for lane designation can be examined to test the viability of HOV implementation. The first is whether the HOV lane in operation carries more persons than the adjacent, general purpose lanes. Preliminary tests of the effectiveness of an HOV lane from 8 mile Road to the north Oakland County line indicate this criterion would be met from 8 Mile Road north to M-15.

Another test is whether I-75 would carry more people overall, with the HOV lane. This test is also met.

A final test is whether an HOV would carry 700 vehicles in one direction in the peak hour. This test is also met.

The estimated benefits to travelers due to a reduction in travel time for those using the HOV lane over a 20-year design analysis period would be modest (net present value in 2002 dollars of $7 to $8 million).

These results indicate the HOV will be carried forward in the EIS document. One key issue is the right-of-way need associated with development of HOV, particularly in association with special ramps that would service the HOV users. Analysis finds that special flyover ramps and similar special access would result in significant impacts and possibly double the project's construction cost. Therefore, the proposed HOV would be a conventional 12-foot lane, with special signing and striping.

3.5 I-75 Improvements

3.5.1 Lane Additions

This alternative consists of adding a general purpose lane in each direction to create four through lanes, where four lanes do not already exist. The lane addition supplements the planned major reconstruction of I-75 and includes modifying several interchanges in the corridor to improve traffic flow, remove backups on ramps, and improve safety. The lane additions will almost entirely occur within existing MDOT right-of-way.

The roadway section in the southern part of the corridor is "cut" below grade with crossroads being at grade (Figure 3-1). "Slip" ramps serve traffic entering and exiting the freeway from adjacent service drives. Addition of a fourth through lane in these depressed/below-grade sections will occur by cutting into the existing side slopes. In some cases the "cut" could extend under service drives. Engineering analysis will determine whether the service drives can be cantilevered over the freeway lanes to minimize right-of-way acquisition. This construction technique has been used successfully on the Lodge Freeway in Detroit.

A number of stormwater pump stations occupy the embankment areas needed for use by the new lanes. These will have to be modified or moved.

The roadway is at-grade or elevated in the northern part of the corridor, beginning just south of 12 Mile Road. The lane additions in this section will be constructed in the existing median north as far as Square Lake Road (Figure 3-1). Because there are left exits both northbound and southbound at Square Lake Road, adding a lane through the interchange will present a challenging situation. In addition, there is no median available for use north of Square Lake Road. This means through the