Mitchell Avenue Interchange. The existing interchange is a standard spread diamond under I-75 with two lanes in each direction and short single lane left turn lanes. The interchange services large truck volumes destined for industrial facilities within the surrounding area. The southbound exit from I-75 is a 30 mph low-speed ramp resulting from poor sight distance. There is inadequate storage for left-turning vehicles on Mitchell Avenue at the I-75 entrance ramps. Mitchell Avenue has an advisory speed limit of 35mph.

Norwood Lateral Interchange. The Norwood Lateral interchange is an urban interchange that provides full movements to and from I-75. The configuration of the ramps is adequate, but there are insufficient acceleration and deceleration lengths, which is further complicated by the Norwood Lateral's close proximity to the Towne Street interchange. In addition, the super-elevation needs to be improved.

Towne Street Interchange. The Towne Street interchange is a partial interchange, with entrance and exit ramps in the northbound direction only. The proximity of the Towne Street ramps to adjacent interchanges at Paddock Road and the Norwood Lateral presents safety and congestion concerns. The northbound exit ramp is 35 mph from I-75. There is also restricted sight distance to the east on Towne Street due to grade. Towne Street is an east-west collector that terminates at Paddock Road to the east. West of the interchange Towne Street becomes Township Avenue in the Village of Elmwood Place. The advisory speed limit on both sections is 35mph.

Paddock Road Interchange. The Paddock Road interchange is approximately one mile north of the Towne Street interchange and about one mile south of the Ronald Reagan Highway (SR 126) interchange. The full diamond interchange allows all movements on and off I-75. The interchange was recently reconstructed and incorporates Summit Road at the I-75 NB exit ramp. The NB entrance ramp experiences merge issues at peak and non-peak travel times due to proximity of the Ronald Reagan Highway (SR 126).

Paddock Road is a north-south arterial linking older industrial and residential areas northwest and southeast of I-75. Paddock Road has two lanes in either direction and has a posted speed limit of 40mph.

PAVEMENT CONDITIONS

The following data is a summary of ODOT's Pavement Condition Ratings (PCRs). The ratings are based on a detailed visual inspection of the conditions of the pavement and range from 0 to 100. A PCR of 100 represents pavement considered in perfect conditions, while a PCR of 0 represents a pavement with all distress present at their high levels of severity and extensive levels of extent.

Table H: Study Area Pavement Condition Ratings

District	County Code	Route	Direction	Begin Mile	End Mile	PCR	Date
8	HAM	75	North	4.1400	6.5700	92	12/21/04
8	HAM	75	South	4.1400	6.5700	93	12/21/04
8	HAM	75	North	6.5700	8.5500	92	12/21/04
8	HAM	75	South	6.5700	8.5500	92	12/21/04
8	HAM	75	North	8.5500	9.7400	91	12/21/04
8	HAM	75	South	8.5500	9.7400	93	12/21/04
8	HAM	74	West	17.4100	19.4700	94	12/27/04
8	HAM	74	East	17.4100	19.4700	93	1/4/05

According to pavement standards, a rating below 65 is deficient, a rating between 65 and 75 is fair, a rating between 75 and 90 is good and a rating over 90 is very good. All mainline pavement in the study area rates as very good. Therefore, none of the sections in the study area are considered deficient and in need of pavement upgrades.

BRIDGE CONDITIONS

The following data is a listing of bridges within the study area collected from the ODOT Bridge Inventory and Bridge Inspection Reports:

Table I: Study Area Bridge Condition Ratings

County	Route-SLM	SFN	Deck Area (SF)	O/A Length (FT)	GA	Floor Rating	WS Rating	PCS Rating	Percent of Legal Load	Last Inspection Date
HAM	00004-0266	3100464	17588	145	8	1	1	9	150	1/10/2005
HAM	00074-1908 L	3115720	35026	562	6	2	1	3	150	5/8/2004
HAM	00074-1908 R	3115739	73120	946	6	2	1	3	150	5/9/2004
HAM	00074-1908 S	3109798	25414	838	7	2	1	4	150	5/8/2004
HAM	00074-1931 L	3115763	1195	75	5	2		2	0	11/30/2004
HAM	00074-1932 L	3115755	2217	114	7	1		8	0	11/30/2004
HAM	00075-0240 L	3109399	13713	160	7	1	1	6	150	11/8/2004
HAM	00075-0240 R	3109429	17567	160	8	1	1	6	150	11/8/2004
HAM	00075-0249 W	3109453	6760	221	7	2	1	5	150	11/8/2004
HAM	00075-0252	3105458	22540	370	7	2	3	8	150	11/15/2004
HAM	00075-0253 W	3109488	6211	203	7	2	1	5	150	11/8/2004
HAM	00075-0261 R	3109518	6243	204	7	2	1	8	150	11/15/2004
HAM	00075-0306	3109550	21722	148	6	2	1	6	150	11/15/2004

County	Route-SLM	SFN	Deck Area (SF)	O/A Length (FT)	GA	Floor Rating	WS Rating	PCS Rating	Percent of Legal Load	Last Inspection Date
HAM	00075-0346	3109577	11528	376	7	2	1	8	150	11/17/2004
HAM	00075-0356 L	3109631	5447	178	7	2	1	8	140	11/17/2004
HAM	00075-0368	3109666	13735	356	7	2	1	8	150	11/17/2004
HAM	00075-0385	3109690	9623	290	6	3	2	8	140	11/17/2004
HAM	00075-0415	3109720	1496	187	5	2		4	0	12/6/2004
HAM	00075-0440	3109755	19311	199	7	2	2	7	150	12/15/2004
HAM	00075-0605	3109879	17459	180	7	2	2	8	150	12/15/2004
HAM	00075-0646	3109909	1658	19	7				150	2/7/2005
HAM	00075-0647	3109933	16490	170	7	2	2	8	150	1/10/2005
HAM	00075-0739	3109968	15134	156	7	2	2	6	150	1/10/2005
HAM	00075-0772	3109992	3132	196	7	1		4	0	1/10/2005
HAM	00075-0788	3110028	1830	22	6				150	9/7/2000
HAM	00075-0791	3110036	12809	132	7	2	2	8	150	1/10/2005
HAM	00075-0823	3110087	14381	147	7	2	1	8	150	1/10/2005
HAM	00075-0828	3110117	1367	15	6				150	9/7/2000
HAM	00075-0834	3110141	1873	117	6	2		4	0	1/10/2005
HAM	00075-0857	3110176	16103	166	7	2	2	6	150	1/18/2005
HAM	00075-0992	3110133	2174	211	8	2		9	0	1/18/2005
HAM	00561-0701	3113728	15694	259	6	3	2	9	150	2/2/2005
HAM	00562-0004 L	3113779	6275	234	7	2	2	8	150	1/20/2005

Source: ODOT Bridge Inventory and Bridge Inspection Reports

A bridge's overall condition is measured by a sufficiency rating. This rating is based on regular required inspections and the rating is used to distinguish when a bridge is eligible for rehabilitation or replacement. A new bridge has a sufficiency rating of 100 and a bridge with a sufficiency rating of less than 50 qualifies for replacement using federal bridge funds. If a bridge requires immediate rehabilitation to remain open, has been restricted to light vehicles, or is closed then it is considered structurally deficient. If a bridge has deck geometry, load carrying capacity, clearance or approach roadway alignment that no longer meet the criteria for the system of which the bridge is a part then it becomes functionally obsolete.

General appraisal and operational status explains the general overall condition of the bridge and the operational status of the bridge. The general appraisal is based on the existing condition of the bridge compared to its condition immediately after being built.

The following tables describe General Appraisal and Operational Status codes used (*Bridge Inspection Manual*, 2001, Ohio Department of Transportation).

Table J: General Bridge Appraisal Codes and Operational Status

Code	Description
9	As built condition
8	Very Good Condition - no problems noted
7	Good condition - some minor problems
6	Satisfactory condition - structural elements show some minor deterioration.
5	Fair condition - all primary structural elements are sound, but may have minor section loss, cracking, or spalling. Secondary elements may have significant deterioration.
4	Poor condition - advanced section loss, deterioration, or spalling.
3	Serious condition - loss of section, deterioration, or spalling have seriously affected primary structural components. Local failures or cracks in concrete or both may be present.
2	Critical condition - advanced deterioration of primary structural elements. Fatigue cracks in steel or shear cracks in concrete may be present. Bridge should be closed or closely monitored, until corrective action is taken.
1	"Imminent" failure condition - major deterioration or section loss present structural components. Bridge is closed to traffic but corrective action may put back in light service.
0	Failed condition - out of service - beyond corrective action.

Code	Description
A	Open, no restriction.
B	Open, posting recommended but not legally implemented (all signs not in place).
D	Open, would be posted or closed except for temporary shoring, etc. to allow for unrestricted traffic.
E	Open, temporary structure in place to carry legal loads while original structure is closed and awaiting replacement or rehabilitation.
G	New structure, not yet open to traffic.
K	Bridge closed to all traffic.
P	Posted for load-carrying capacity restriction (may include other restrictions).
R	Posted for other than load-carrying capacity restriction (speed, number of vehicles on bridge, etc.).

7.0 Traffic Volumes and Levels of Service (2004 and 2030)

Data Collection. Traffic counts were collected within the I-75 Mill Creek Expressway study area on Tuesdays, Wednesdays and Thursdays during October and November 2004 to get an accurate representation of normal weekday traffic. Traffic for the at-grade intersections was collected using turning movement counts; while ramp traffic was collected using portable machine counters. Mainline volumes were determined from the HAM-75-10.10 (PID 76256) study and carried through the I-75 Mill Creek Expressway study area.

Capacity Analysis. Level of Service (LOS) is a tool that measures the quality of operations for different roadway types, features, and controls. The Highway Capacity Manual (HCM), published by the Transportation Research Board, is the standard of care for roadway operations analysis and level of service determination. The Level of Service is computed as the result of a multivariable logic and numeric equation in the form of a worksheet. The variables account for the factors found in the field that dictate capacity and represent the traffic flows that exist and/or are anticipated in the future. These variables often include speed, geometry and traffic volume.

There are six level of service grades that represent all of the possible operating conditions; these levels range from LOS A, representing optimum operation, to LOS F, representing congested or unstable flow. Each of the levels is represented by a range of delay or density values which are computed through completing the representative analysis worksheet. Typically, in urbanized areas, a roadway component is seen as adequate if the corresponding level of service is D or better, while LOS results E and F indicate near failure and failure, respectively.

McTrans, a federally sponsored transportation software group, developed an analytical tool titled Highway Capacity Software (HCS). The latest version, HCS2000™, is a software package that has incorporated many of the analyses included in the current HCM. The software follows the same method for level of service computation as the manual, and therefore is typically considered acceptable for LOS analysis. For this project, HCS2000™ Version 4.1e was used to analyze the freeway segments, the interchange ramp merge and diverge points, 31 signalized intersections and two unsignalized intersections within the study area.

2004 Existing Conditions

Freeway Segment Analysis. The 2004 AM and PM peak hour volumes were identified from the traffic counts and used in the 2004 analyses for the study area. The following tables present the results for the 2004 existing condition analyses performed on the freeway segments within the I-75 study corridor. To help illustrate the results, analyses resulting in a LOS of E or F were highlighted in red; furthermore, analyses resulting in a LOS of D were highlighted with orange, because they represent locations that are more likely to degrade to a LOS of E or F in the design year.

2004 Interstate 75 Northbound Freeway Segments							
Segment		AM			PM		
From	To	Volume	LOS	Density (pc/mi/ln)	Volume	LOS	Density (pc/mi/ln)
Paddock Road	Towne Street	4,397	D	28.5	4,475	D	29.1
Towne Street	SR 562 (Norwood Lateral)	4,415	C	21.5	4,026	C	19.6
SR 562 (Norwood Lateral)	Mitchell Avenue	4,087	D	26.5	3,857	C	25.0
Mitchell Avenue	I-74	3,974	C	25.8	3,311	C	21.5
I-74	Bates Avenue	3,431	B	16.7	6,186	D	30.2
Bates Avenue	Hopple Street	3,174	B	15.4	5,479	D	26.6
Hopple Street	Western Hills Viaduct	3,466	B	16.9	5,728	D	27.9
2004 Interstate 75 Southbound Freeway Segments							
Segment		AM			PM		
From	To	Volume	LOS	Density (pc/mi/ln)	Volume	LOS	Density (pc/mi/ln)
Paddock Road	SR 562 (Norwood Lateral)	5,748	E	42.1	4,829	D	31.7
SR 562 (Norwood Lateral)	Mitchell Avenue	5,108	D	34.2	4,528	D	29.4
Mitchell Avenue	I-74	4,201	D	27.2	4,533	D	29.5
I-74	Hopple Street	6,822	D	34.3	4,365	C	21.2
Hopple Street	Western Hills Viaduct	6,675	D	33.2	3,846	C	18.7
2004 Interstate 74 Westbound Freeway Segments							
Segment		AM			PM		

From	To	Volume	LOS	Density (pc/mi/ln)	Volume	LOS	Density (pc/mi/ln)
I-75 SB	Spring Grove/Elmore	2,318	A	11.0	5,433	C	25.8
Spring Grove/Elmore	Colerain Interchange	1,837	B	11.6	5,063	D	32.7
Colerain Interchange	Montana	1,506	A	9.5	4,857	D	31.0
2004 Interstate 74 Eastbound Freeway Segments							
Segment		**AM**			**PM**		
From	To	Volume	LOS	Density (pc/mi/ln)	Volume	LOS	Density (pc/mi/ln)
I-75 SB	Colerain Interchange	5,478	E	36.7	1,811	B	11.5
Colerain Interchange	Montana	4,513	D	28.6	1,500	A	9.5
2004 State Route 562 Freeway Segments							
Segment		**AM**			**PM**		
From	To	Volume	LOS	Density (pc/mi/ln)	Volume	LOS	Density (pc/mi/ln)
East bound: I-75	Paddock Road	2,819	D	26.8	3,318	D	32.0
Westbound: Paddock Rd	I-75	2,687	C	25.5	3,006	D	28.6

The daily peak hour traffic on all three freeways in the study area occurs during the 7:30-8:30 AM period. Southbound I-75, eastbound I-74 and eastbound SR 562 accommodate the highest volumes of traffic during the AM Peak period. The PM peak period appears to be spread out over several hours, thereby lessening its impact in one particular hour of the afternoon or evening. While no segment is currently operating at a LOS F, two are operating at a LOS E; southbound I-75 between Paddock and SR 562, and eastbound I-74 between the Colerain Interchange and I-75. Most of the southbound I-75 segments operate at a LOS D or worse in both the AM and PM Peak hours.

Ramp-Freeway Junctions. While many of the freeway components were calculated as independently acceptable, it is recognized that some of the congestion throughout the network is due to the merge and diverge locations at interchanges. The following table presents the results for each of these locations. Once again red and orange highlighting was used to indicate the locations of concern.

2004 Interstate 75 Northbound Ramps					
Ramp	Junction	AM		PM	
		LOS	Density (pc/mi/ln)	LOS	Density (pc/mi/ln)
Paddock Road Exit Ramp	Diverge	D	31.1	D	31.5
Towne Street Entrance Ramp	Merge	C	25.8	C	24.2
Towne Street Exit Ramp	Diverge	C	26.4	C	24.3
SR 562 (Norwood Lateral) Entrance Ramp	Merge	D	29.8	C	26.0
SR 562 (Norwood Lateral) Exit Ramp	Diverge	D	31.9	D	29.6
Mitchell Avenue Entrance Ramp	Merge	C	20.7	B	19.9
Mitchell Avenue Exit Ramp	Diverge	C	25.3	C	21.2
I-74 Eastbound Entrance Ramp	Merge	B	10.8	A	4.4
I-74 Westbound Exit Ramp	Drop Lane	B	15.1	E	43.7
Bates Avenue Entrance Ramp	Merge	C	22.3	B	13.6
Hopple Street Entrance Ramp	Merge	B	11.7	B	18.4
Hopple Street Exit Ramp	Diverge	B	18.2	D	28.5
Western Hill Viaduct Entrance Ramp	Merge	B	16.0	C	20.8
Western Hills Viaduct Exit Ramp	Diverge	B	19.4	C	26.5

2004 Interstate 75 Southbound Ramps					
Ramp	Junction	AM		PM	
		LOS	Density (pc/mi/ln)	LOS	Density (pc/mi/ln)
Paddock Road Entrance Ramp	Merge	D	33.8	C	27.7
SR 562 (Norwood Lateral) Exit Ramp	Diverge	D	34.5	D	30.5
SR 562 (Norwood Lateral) Entrance Ramp	Merge	D	33.0	D	30.2
Mitchell Avenue Exit Ramp	Diverge	D	32.5	F	32.5#
Mitchell Avenue Entrance Ramp	Merge	C	24.5	D	29.4
I-74 Westbound Exit Ramp	Diverge	C	27.1	D	30.6
I-74 Eastbound Entrance Ramp	Add Lane	D	33.8	B	13.3
Hopple Street Exit Ramp	Diverge	D	32.9	C	22.0
Hopple Street Entrance Ramp	Merge	C	23.8	B	14.0
Western Hill Viaduct Exit Ramp	Diverge	D	30.2	B	19.0
Western Hills Viaduct Entrance Ramp	Add Lane	D	31.3	B	16.1

 # - The flowrate of the ramp and/or freeway exceeds capacity for the merge/diverge area, resulting in LOS F.

2004 Interstate 74 Westbound Ramps					
Ramp	Junction	AM		PM	
		LOS	Density (pc/mi/ln)	LOS	Density (pc/mi/ln)
I-75 Southbound Entrance Ramp	Add Lane	B	14.8	D	30.0
I-75 Northbound Entrance Ramp	Add Lane	B	15.1	E	43.7
Colerain Ave. @ Spring Grove/Elmore	Diverge	B	14.5	D	30.3
Colerain Interchange Exit Ramp	Drop Lane	A	9.2	C	20.9
Colerain Interchange Entrance Ramp	Add Lane	A	8.6	C	25.9
Montana Avenue Exit Ramp	Drop Lane	A	6.9	C	24.1

2004 Interstate 74 Eastbound Ramps					
Ramp	Junction	AM		PM	
		LOS	Density (pc/mi/ln)	LOS	Density (pc/mi/ln)
I-75 Southbound Exit Ramp	Drop Lane	D	33.8	B	13.3
I-75 Northbound Exit Ramp	Drop Lane	C	24.2	A	7.8
Spring Grove Avenue Entrance Ramp	Merge	D	32.8	B	15.1
Colerain Interchange Entrance Ramp	Add Lane	F	*	A	10.6
Colerain Interchange Exit Ramp	Drop Lane	F	*	A	7.8
Montana Avenue Entrance Ramp	Add Lane	D	29.4	A	10.4

** - Capacity exceeds HCS calculations*

2004 State Route 562 Ramps					
Ramp	Junction	AM		PM	
		LOS	Density (pc/mi/ln)	LOS	Density (pc/mi/ln)
Paddock Rd to SR 562 EB Entrance Ramp	Merge	D	31.3	D	30.9
SR 562 EB to Paddock Rd Exit Ramp	Diverge	D	35.0	D	30.1
Paddock Rd to SR 562 WB Entrance Ramp	Merge	D	29.5	C	36.7
SR 562 WB to Paddock Rd Exit Ramp	Diverge	E	35.2	D	34.2

Along I-75, the southbound exit ramp at Mitchell Avenue and the northbound exit ramp at I-74 were found to be operating at an unacceptable LOS during the PM peak hour. Additionally, the Colerain Interchange