TRAFFIC VOLUMES AND LEVELS OF SERVICE

Goals of Traffic Study

A detailed traffic planning study was conducted on the study area with an emphasis on the routes that handle the US 23 through movements. The purpose of this traffic study was to accomplish the following five goals.

1. Determine the routes that are heavily utilized by through traffic. Identify the traffic loadings on each.
2. Identify existing congestion on each route for both mainline links and signalized intersections.
3. Identify design year congestion for the no build alternative.
4. Provide a traffic database that will allow traffic assignments to be made on proposed alternatives.
5. Provide traffic data that will allow calculations of benefit cost ratios for any build alternative.

The results of the traffic study are summarized below.

Capacity Analysis

Traffic counts (24-hour) and turning movement counts were taken at strategic locations on the six through routes within the Study Area. The purpose of these counts was to establish existing and design year (2025) levels of service on the existing facilities. This information provides the database for calculations of benefits on proposed alternatives.

Existing and projected traffic volumes were used to calculate Level of Service (LOS) on each of the fourteen links. Level of Service is a qualitative measure of the level of congestion on a highway. It is defined in the *Highway Capacity Manual*, ranging from A to F. LOS A is the best rating, indicating free flow conditions. LOS B represents essentially free flow. LOS C indicates nearly free flow speeds, but freedom to maneuver is beginning to be restricted. At LOS D, travel speeds are reduced and the ability to maneuver is limited. At LOS E, the roadway is near capacity and traffic flow is unstable. At LOS F, the traffic volumes exceed the roadway's capacity, which may result in queues and stop-and-go conditions. Improvements are typically designed to achieve LOS C or better for the design year in rural areas.

Table I-3 shows the current level of service for each of the fourteen links. It also shows the US 23 through traffic and total through traffic on each link. Table I-3 shows the same data expanded for the 2025 design year. The design year projections use a 0.50% growth factor for internal-internal and external-internal trips. A 1.0% growth factor is used for external-external trips. The results from Table I-3 are also mapped on Figure I-4. The mainline capacity analysis shows that traffic is distributed over the six through routes, resulting in no substantial congestion on any one of the links. For design year 2025, only two links experience worse than LOS C. Links A-1 and D-2 operate at LOS D, with no links operating at LOS E or F. It should be noted that this mainline analysis does not consider the influence of intersections.

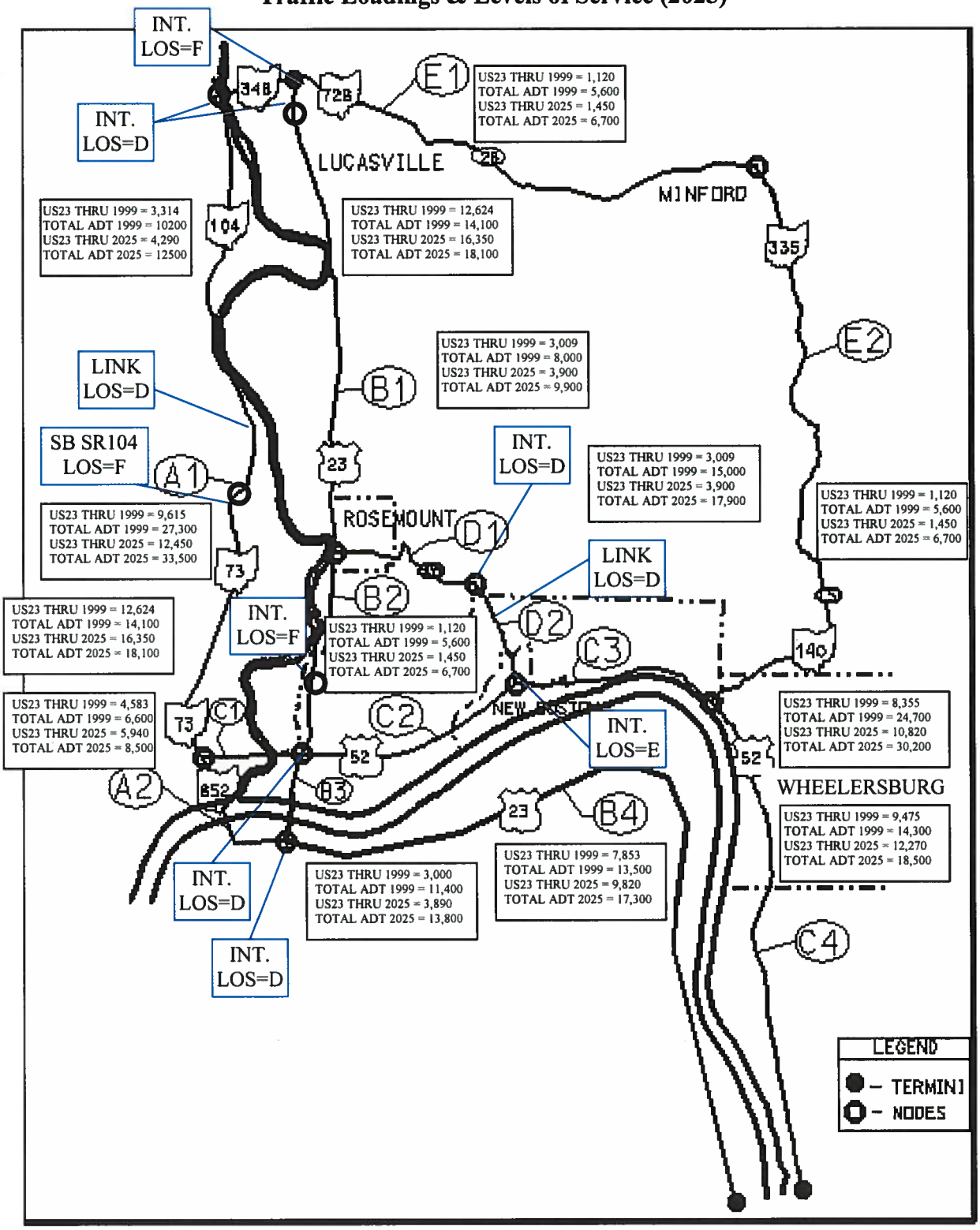
When the intersections are examined, it yields a different result. The signalized intersections are listed in Table I-4. The levels of service for both the current year and the 2025 design year are indicated for each intersection. The intersection capacity analysis shows that one intersection, SR 104 at SR 73, is at Level of Service F with existing traffic volumes. This intersection is not signalized and has poor geometrics. An additional nine intersections, all signalized, will be at Level of Service D, E or F by 2025. The locations of these 10 intersections are shown on Figure I-4. These results show that the maximum efficiency of the six route network will be exceeded.

Table I-3: Traffic Volume and Mainline Level of Service

Link	1999 Link ADT	Total US 23 E-E Traffic Volumes	All Other E-E Traffic Volumes	Total E-E Traffic Volumes	2025 Link ADT	2025 Total US 23 E-E Traffic	1999 Link LOS	2025 Link LOS
A-1	10,200	3,314	2,011	5,325	12,500	4,290	C	D
A-2	6,600	4,583	2,780	7,363	8,500	5,940	A	B
B-1	14,100	12,624	0	12,624	18,100	16,350	A	A
B-2	27,300	9,615	5,833	15,448	33,500	12,450	B	C
B-3	11,400	3,000	1,820	4,820	13,800	3,890	C	C
B-4	13,500	7,583	4,601	12,184	17,300	9,820	A	A
C-1	16,900	1,269	770	2,039	19,600	1,640	B	B
C-2	32,000	5,346	3,243	8,589	37,800	6,920	B	C
C-3	24,700	8,355	5,069	13,424	30,200	10,820	B	B
C-4	14,300	9,475	5,748	15,223	18,500	12,270	A	A
D-1	8,000	3,009	1,826	4,835	9,900	3,900	B	C
D-2	15,000	3,009	1,826	4,835	17,900	3,900	C	D
E-1	5,600	1,120	679	1,799	6,700	1,450	B	B
E-2	4,000	1,120	679	1,799	4,900	1,450	B	B

Source: Gannett Fleming, 1999

Figure I-4: Existing Route Through Linkage
Traffic Loadings & Levels of Service (2025)



Source: Gannett Fleming, 1999

Table I-4: Level of Service by Intersection

#	Route	Intersection	1999 Peak Hour		2025 Peak Hour	
			Delay (sec)	LOS	Delay (sec)	LOS
1	SR 104	SR 348/SR 728	22.7	C+	46.0	D
2	US 23	SR 348/SR 728	38.6	D+	95.6	F
3	US 23	Scioto St.	34.9	C	49.6	D
4	US 23	Coles Blvd.	17.8	B	201.7	F
5	US 23	Kinneys	17.1	B	23.0	C+
6	US 23 N	US 52 E	16.6	B	24.7	C+
7	US 23 S	US 52 W	14.7	B+	17.1	B
8	US 23 S	US 52 E	45.0	D	57.7	E+
9	US 23 N	US 52 W	30.3	C	67.9	E
10	US 23 S	10th/Washington	11.5	B+	12.4	B+
11	US 23 S	2nd St.	16.2	B	17.9	B
12	SR 139	Rosemount Rd.	21.3	C+	45.1	D
13	SR 139	US 52 W	18.8	B	59.5	E+
14	Rosemount Rd.	Scioto Trail	10.7	B+	15.1	B
15	US 52 E	West	9.2	A	18.0	B
16	US 52 W	West	6.4	A	6.7	A
17**	SR 104	SR 73	64.0	F	196.5	F
18*	CR 28	SR 335	10.7	B	12.1	B
19*	SR 335	SR 139	16.3	C	23.9	C
20	Gallia St.	SR 140 N	17.5	B	28.5	C
21	US 23	Houston Hollow	6.3	A	5.9	A
22	SR 139	York-Monroe	8.5	A	11.1	B+
23	SR 852	KY 10	11.6	B+	11.9	B+
24	US 23	KY 10	22.0	C+	37.8	D+
25	SR 253	US 23	11.4	B+	11.9	B+
26	US 23	SR 73/SR 104	11.4	B+	11.8	B+

* Unsignalized intersection analysis
** Unsignalized intersection analysis, westbound approach only

Source: Gannett Fleming, 1999

Origin-Destination Survey

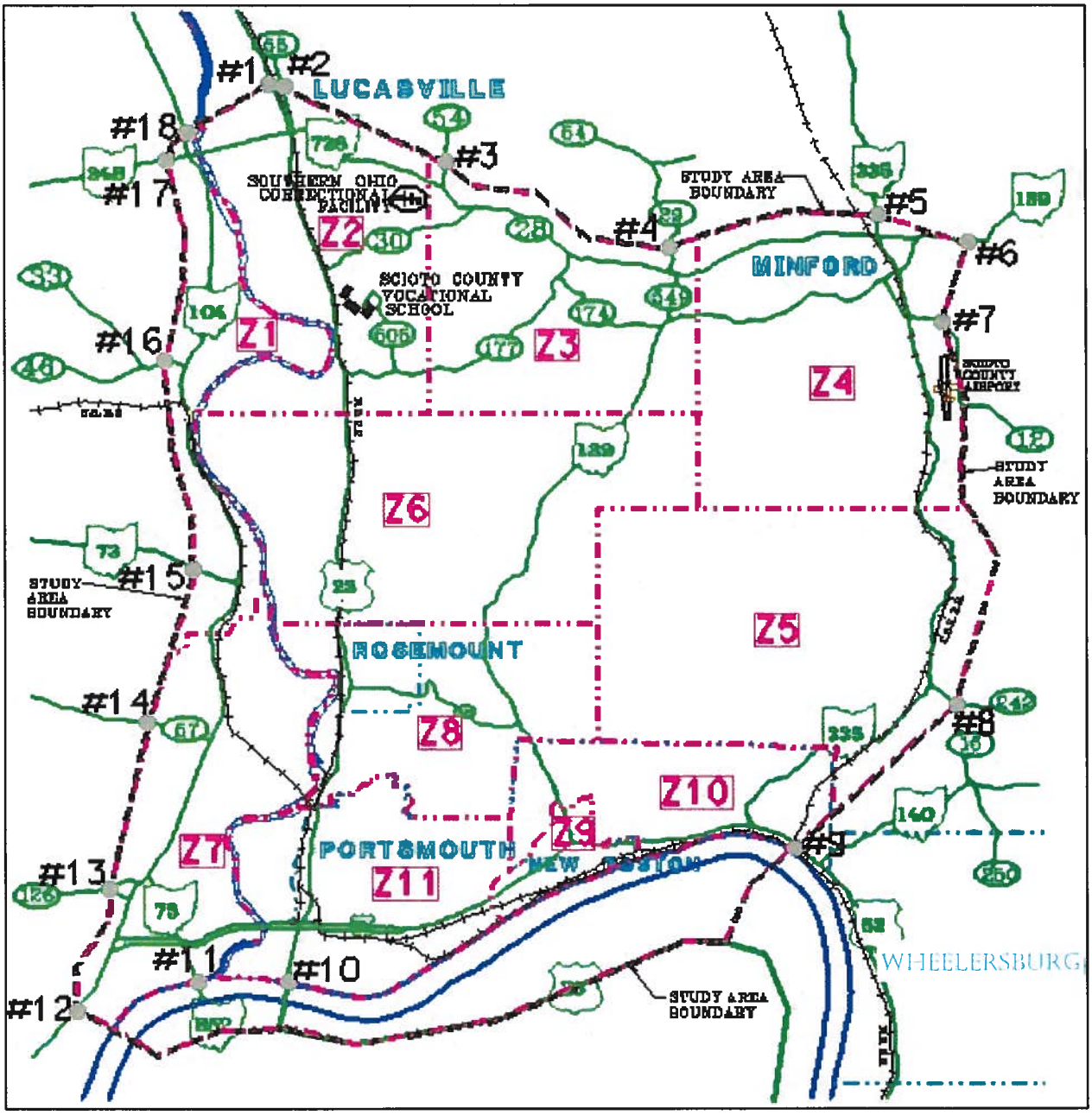
To accomplish goals one and five of the traffic study, origin-destination surveys were conducted around the perimeter of the study area. Eighteen external entry stations were identified. The study area itself was divided into eleven zones. These stations and zones are presented in Figure I-5. Stations 3, 4 and 13 were not surveyed due to negligible traffic volumes. The remaining sites were surveyed for outbound traffic during July and August, 1999.

Motorists were asked a series of questions. Two questions were most important for traffic purposes. The first was, "Where did the trip originate?" The motorists would answer by indicating a location within one of the eleven internal zones or indicate an external station on the far side of the study area. A map was shown to the motorist to help them identify their origination point. The second question (for through trips only) asked which route the motorist took through the study area.

The results of the origin-destination surveys are presented in Table I-5. This table has been edited so that a given pair of sites such as Site 1 to Site 10 equals the total from Site 10 to Site 1. In general, small traffic volume sites give more accurate results as a destination. Motorists tend to have difficulties in identifying small volume sights when they are stopped on the opposite side of the study area. These matrices show that there are 27,400 through trips through the study area each day.

From Table I-5, the pairs that accommodate the US 23 through movement can be identified. These pairs are shown in the first column of Table I-6. Tables I-6 and I-7 show the processing of this data into an itemization of US 23 through traffic. Table I-6 further sorts this US 23 traffic into those trips that follow US 23 in Kentucky and those that follow US 52 in Ohio. Of the 17,343 US 23 through trips, 6,697 use US 23 in Kentucky and 10,645 use US 52 in Ohio. There are two special considerations on this figure. The first is the adjustment factor used on SR 335. This indicates that 33% of the through trips heading north of Minford on SR 335 are trips to such locations as the Piketon Atomic Plant, Waverly, Chillicothe, and other locations along US 23. Zone 2 (the Lucasville area) was found to function as an external area for traffic purposes. Therefore, trips from outside the study area (such as Wheelersburg) to Lucasville are counted as US 23 through trips. Some of the O-D pairs have multiple choices for routings. For example, a 1-9 trip could follow the Airport, Rosemount, or the US 23/US 52 through routes. Table I-7 distributes the traffic over possible routings based upon data provided by motorists.

Figure I-5: O/D Survey Traffic Survey Stations and Zones



Source: Gannett Fleming, 1999

Table I-5: O/D Survey Results, Weighted and Expanded

Origin Zone As Reported By the Motorists	Destination Zone: These are the external sites where motorists were interviewed															Grand Total
	1	2	5	6	7	8	9	10	11	12	14	15	16	17	18	
1		36	72	156	76	185	2899	1136	943	106	63	75	45	235	14	**6,043**
2	36		7	23	19	52	94	64	20	23	17	49	11	80	45	**540**
5	72	7		157	97	814	218	48	14	14		6	5	26	3	**1,481**
6	156	23	157		22	102	141	24	13	19	2	9		51	8	**727**
7	76	19	97	22		49	62	5	2	10				2	14	**358**
8	185	52	814	102	49		7			12	1	5		30	15	**1,272**
9	2899	94	218	141	62	7		349	223	755	0	255	16	252	152	**5,423**
10	1136	64	48	24	5	0	349			133	0	34	3	7	28	**1,831**
11	943	20	14	13	2	0	223			480	93	700	19	40	612	**3,158**
12	106	23	14	19	10	12	755	133	480		44	73	29	9	133	**1,840**
13																
14	63	17		2	0	1			93	44		66	2	6	56	**350**
15	75	49	6	9		5	255	34	700	73	66		6	6	64	**1,348**
16	45	11	5	0		0	16	3	19	29	2	6		4	81	**222**
17	235	80	26	51	2	30	252	7	40	9	6	6	4		419	**1,167**
18	14	45	3	8	14	15	152	28	612	133	56	64	81	419		**1,647**
Subtotal	**6,042**	**540**	**1,482**	**728**	**358**	**1,273**	**5,423**	**1,832**	**3,158**	**1,840**	**351**	**1,348**	**221**	**1,167**	**1,644**	**27,407**
Z1	135	52	20	3	5	29	53	17	175	96	94	153	271	392	739	**2,233**
Z2	1,933	1,000	260	372	210	360	1,032	272	304	282	92	112	260	1,141	669	**8,297**
Z3	48	55	151	68		71	172	3	12	14	6	8	11	29	28	**676**
Z4	542	156	2,044	1,080	452	1,269	277	153	52	100	32	56	53	195	124	**6,586**
Z5	13	3	96	74	5	650	31	43	52	13	16	35	5	40	9	**1,084**
Z6	87	19	54	45	7	32	25	55	3	27		4	11	34	9	**412**
Z7	541	125	35	29	5	15	824	148	1,126	1,394	573	466	186	36	354	**5,855**
Z8	162	49	57	27	10	4	578	114	42	116	10	6	12	161	56	**1,405**
Z9	210	46	197	123	10	33	3,582	343	252	280	59	112	22	74	63	**5,406**
Z10	142	59	150	46	15	28	197	106	8	163	7	30	11	5	14	**982**
Z11	4,965	556	1,080	501	230	81	11,722	7,687	1,352	5,017	973	1,845	671	1,027	1,289	**38,995**
Subtotal	**8,778**	**2,120**	**4,145**	**2,367**	**947**	**2,571**	**18,493**	**8,942**	**3,378**	**7,501**	**1,863**	**2,827**	**1,512**	**3,133**	**3,354**	**71,932**
Grand Total	**14,820**	**2,660**	**5,626**	**3,095**	**1,306**	**3,844**	**23,916**	**10,774**	**6,536**	**9,341**	**2,214**	**4,175**	**1,733**	**4,300**	**4,998**	**99,339**

Source: Gannett Fleming, 1999

Table I-6: Through Traffic on US 23 through Portsmouth, Ohio, by O/D Pair

O-D Pair	One way 24 hour Total	Two way 24 hour Total	Adjustment Factor	1999 Traffic Total	US 23 Near Lucasville	
					to US 52, Wheelersburg and Beyond	to US 23, South Shore and Beyond
1-8	185	370	1	370	370	
1-9	2899	5798	1	5798	5798	
1-10	1136	2272	1	2272		2272
1-11	943	1886	1	1886		1886
Subtotal				10326		
18-8	15	30	1	30	30	
18-9	152	304	1	304	304	
18-10	28	56	1	56		56
18-11	612	1224	1	1224		1224
Subtotal				1614		
2-8	52	104	1	104	104	
2-9	94	188	1	188	188	
2-10	64	128	1	128		128
2-11	20	40	1	40		40
Subtotal				460		
5-8	814	1628	0.33	537	537	
5-9	218	436	0.33	144	144	
5-10	48	96	0.33	32		32
5-11	14	28	0.33	9		9
Subtotal				722		
Z2-8	360	720	1	720	720	
Z2-9	1032	2064	1	2064	2064	
Z2-10	272	544	1	544		544
Z2-11	304	608	1	608		608
Subtotal				3936		
Grand Total				**17058**	**10259**	**6799**

Source: Gannett Fleming, 1999

Note: Through traffic includes as a minimum a Lucasville/Wheelersburg trip or a Lucasville/South Shore trip.
SR 104 trips are also included.
Zone 2 is considered external to the Study Area.

Table I-7: Through Traffic Distribution over Six Routes

O-D Pair	One way 24 hour Total	Two way 24 hour Total	Adjustment Factor	1999 Traffic Total	U.S. 23	US 23/ US 52	U.S. 23/ Truck Route	Rosemont Road	Airport	SR 104
1-8	185	370	1	370					370	
1-9	2899	5798	1	5798		4349		1450		
1-10	1136	2272	1	2272	2272					
1-11	943	1886	1	1886			954			931
Subtotal				10326						
18-8	15	30	1	30					30	
18-9	152	304	1	304		225		79		
18-10	28	56	1	56	56					
18-11	612	1224	1	1224						1224
Subtotal				1614						
2-8	52	104	1	104						104
2-9	94	188	1	188		68		120		
2-10	64	128	1	128	128					
2-11	20	40	1	40			15			25
Subtotal				460						
5-8	814	1628	0.33	537						537
5-9	218	436	0.33	144						144
5-10	48	96	0.33	32						32
5-11	14	28	0.33	9						9
Subtotal				722						
Z2-8	360	720	1	720					720	
Z2-9	1032	2064	1	2064		704		1360		
Z2-10	272	544	1	544	544					
Z2-11	304	608	1	608			300			308
Subtotal				3936						
Grand Total				17058	3000	5346	1269	3009	1120	3314

Note: Zone 2 is considered external to study area.

Source: Gannett Fleming, 1999

From the data in Tables I-6 and I-7, the US 23 trips were further sorted into the fourteen links that make up the six routes used by US 23 traffic. These results are shown in Table I-8.

Table I-8: Through Traffic on US 23 through Portsmouth, Ohio, by Through Route

Link	U.S. 23	US 23/US 52	U.S. 23/ Truck Route	Rosemount Road	Airport	S.R. 104	Total US 23 Traffic By Link
A-1						3314	3314
A-2			1269			3314	4583
B-1	3000	5346	1269	3009			12624
B-2	3000	5346	1269				9615
B-3	3000						3000
B-4	3000		1269			3314	7583
C-1			1269				1269
C-2		5346					5346
C-3		5346		3009			8355
C-4		5346		3009	1120		9475
D-1				3009			3009
D-2				3009			3009
E-1					1120		1120
E-2					1120		1120

Source: Gannett Fleming, Traffic Survey, 1999

The origin-destination survey shows substantial diversions away from the signed US 23 route. For example, on US 23 from Lucasville to Rosemount (link B-1) there are 12,624 through trips. Farther south at the U. S. Grant Bridge, this number drops to 3,000. This means that 9,624 trips per day choose different routings than the signed US Route 23.

It should be noted that Portsmouth is located also on major east-west corridors. The external nodes of this movement are Cincinnati, Ohio, and Huntington, West Virginia. The origin-destination survey shows this movement to be approximately 2000 vehicles per day utilizing several routes, including US 52 and SR 73 to US 52. This relatively low volumes suggest that a substantial diversion of long distance east-west traffic may have occurred when Kentucky opened its A-A Highway that provides a direct connection from Cincinnati to I-64. The east-west movement is not further considered in this action.

Diversions of Through Traffic

The Scioto County Engineer expressed concerns that county roadways were subjected to large volumes of through traffic that diverted from US 23 through Portsmouth. The results of the origin-destination survey, shown in Table I-9, quantify this problem.

Table I-9: Through Trips on Alternative Routes

Study Name of Route	Type of Facility	Link	Route	Through Trips Current ADT	Through Trips Design Year ADT
Airport	County Road	E1	CR 28	1120	1450
Rosemount	County Road	D1	CR 337	3009	3900
SR 104	Secondary State Highway	A1	SR 104	3314	4290
SR 335	Secondary State Highway	E2	SR	1120	1450
Airport	County Road	E2	CR 15	1120	1450

Source: Gannett Fleming, 1999

The traffic study concludes that considerable volumes of through traffic utilize alternative routes to US 23 through the Study Area, including county roads and poor quality state highways. To determine if this situation is unique, the Study investigated areas with existing or proposed bypasses on non-interstate routes for towns smaller than MPO size since the Interstate Highway Program began in Ohio. Based upon a review of available alternative routes and traffic volumes in these areas, no evidence could be found to suggest that diversions from the signed through route of 1000-3000 ADT occur elsewhere in the State of Ohio.

Based upon the substantial volume of through traffic that diverts to alternative routes, drivers perceive impediments to mobility along existing US 23. To quantify this, travel time was measured along each of the through routes.

Table I-10: Non-Peak Travel Times for Passenger Cars Through Portsmouth

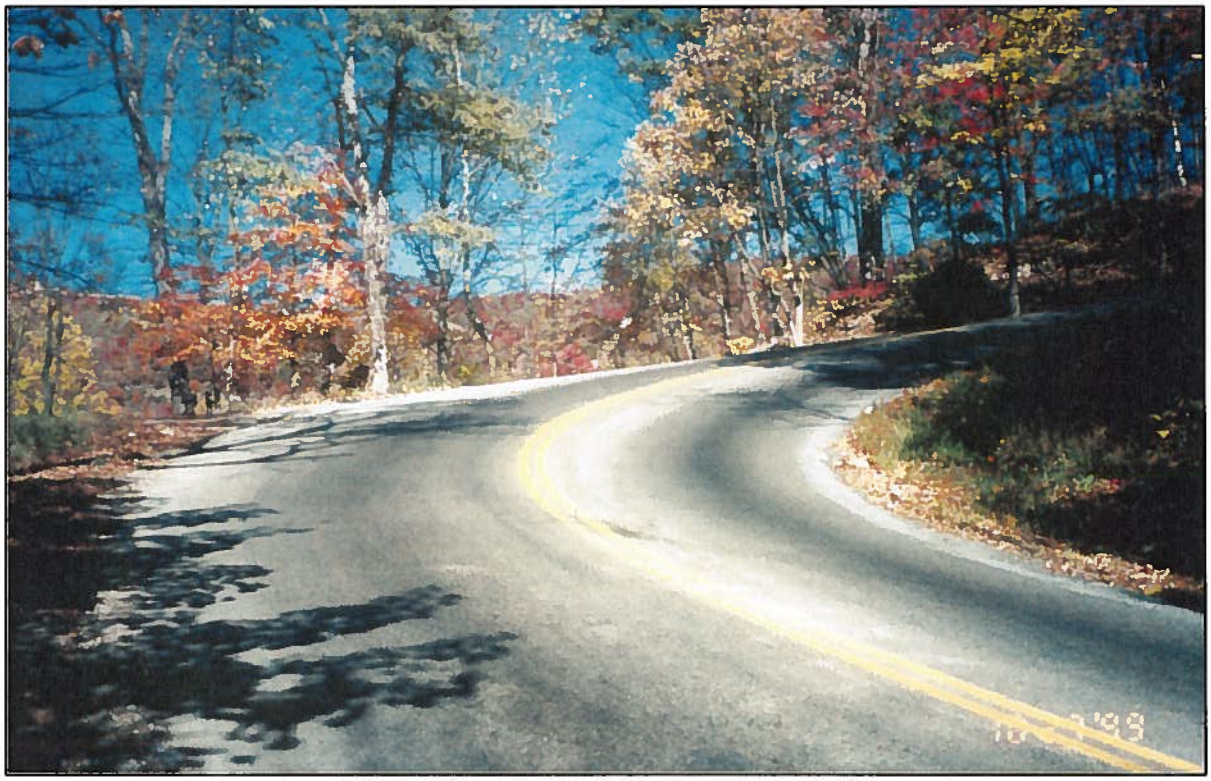
Routing	Mileage (Greenup Dam to Lucasville)	Travel Time (Minutes : Seconds)
US 23	23.60	33:20
SR 104	26.27	32:55
US 23/US 52	24.62	34:37
Rosemount	22.17	28:14
Airport	25.78	33:13

Note: US 23/Truck Route was not measured.

Source: Scioto County Engineer, 1999

The times shown in Table I-10 were measured during off-peak hours to assess mobility when traffic volumes are not heavy. This informal study demonstrates that the signed US 23 route through Portsmouth does not offer a substantial travel time savings over other available routes even in off-peak hours. This simple exercise indicated that the US 23 route takes longer than three other available options, and over five minutes longer than the Rosemount route that uses poor quality county roads.

Rosemount Road is an ideal site for interviewing motorists to find out perceptions of mobility needs for through traffic. Rosemount Road has grades exceeding 10%, and has a genuine mountain quality switchback. (Switchbacks occur where a roadway must climb a steep grade by zig-zagging up the mountainside.) It is not shown on any commercial or state issued road maps. It is clearly inferior to the signed state routes through Portsmouth; yet over 3,000 of the 10,529 through trips on the east side of Portsmouth use it daily.



Rosemount Road - Excessive horizontal curves and steep grades make this route undesirable for truck traffic and impassable in severe weather.

Source: Gannett Fleming, 1999.

An additional origin-destination type traffic survey was conducted on Rosemount Road. At this site several questions were asked of motorists to ascertain why they chose this route instead of the higher quality routes. The conclusions from these questions were as follows:

I. Rosemount Road was chosen by most respondents because of the five or more minutes of time savings gained compared to the signed state routes.

II. Motorists would only divert to one of the other five through routes if they were improved to take a shorter time. This is also true for a new alignment alternative.

III. Time savings concerns appeared to be much more important than any concerns about poor geometrics and safety hazards.

IV. Most of the through trips are regional commuters who are forced to travel through Portsmouth. Longer trip motorists seem to have not discovered Rosemount Road.

V. Even with acceptable levels of service, the thirty signals on the signed route are perceived as a mobility hindrance.

Based upon observed travel times for alternative through routes and results of the origin-destination survey at Rosemount Road, traffic cannot be diverted to US 23 (or another route) unless it is improved to provide a travel time savings over the local road system.