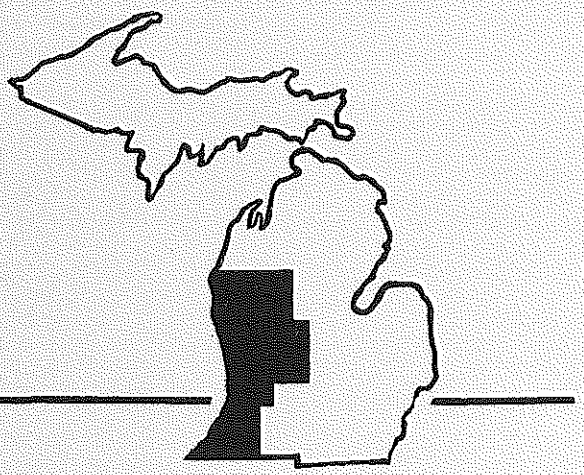
Michigan Department of

STATE HIGHWAYS AND TRANSPORTATION

US-31 and US-10

MASON COUNTY

PROJECT JUSTIFICATION REPORT



Bureau of

TRANSPORTATION PLANNING

MICHIGAN DEPARTMENT

OF

STATE HIGHWAYS AND TRANSPORTATION

US-31 and US-10

MASON COUNTY

PROJECT JUSTIFICATION REPORT

May, 1978

This report represents the findings and/or professional opinions of the Michigan Department of State Highways and Transportation staff and is not an official opinion of the State Highway Commission.

MICHIGAN DEPARTMENT OF STATE HIGHWAYS AND TRANSPORTATION

In Cooperation with:

U.S. Department of Transportation
Federal Highway Administration

US-31 and US-10

MASON COUNTY

PROJECT JUSTIFICATION REPORT

Sam F. Cryderman, Deputy Director
Bureau of Transportation Planning

R. J. Lilly, Acting Administrator
Multi-Regional Planning Division

West Section

West Section Manager Ralph M. Merrill

Regional Coordinator David Geiger

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SUMMARY

US-10 and US-31 are statewide arterials of national and statewide importance. US-10 extends from Detroit to Spokane Washington while US-31 reaches from the the Straits of Mackinac to Mobile, Alabama. Within Michigan, US-10 provides access to the Cities of Detroit, Pontiac, Flint, Saginaw, Bay City, Midland, Clare, Reed City and Ludington. US-31 connects Niles, St. Joseph/ Benton Harbor, Holland, Muskegon, Ludington, Manistee, Traverse City, Petoskey and Mackinac City.

US-31 is scheduled for reconstruction as a freeway facility into Mason County. to US-10 near the City of Ludington. It is at this point where US-10 and US-31 are combined along the same two lane highway between the Cities of Ludington and Scottville. Currently, traffic volumes along this segment are at the practical capacity of the roadway and are anticipated to exceed this capacity once the freeway is completed to US-10/31 in the early 1980's.

An area where traffic congestion already occurs is at the intersection of US-10 and US-31 in the City of Scottville. Traffic conflicts between turning movements and through movements has caused traffic back-ups and delays. This situation becomes even more dramatic when vacation and recreation vehicles are mixed with the normal daily traffic.

Traffic projections reveal that portions of US-31 north and US-10 east of Scottville will also exceed the practical capacity of the roadway by the year 2000. This situation indicates that several alternative actions may be needed in order to solve the traffic problems along US-10 and US-31 in Mason County.

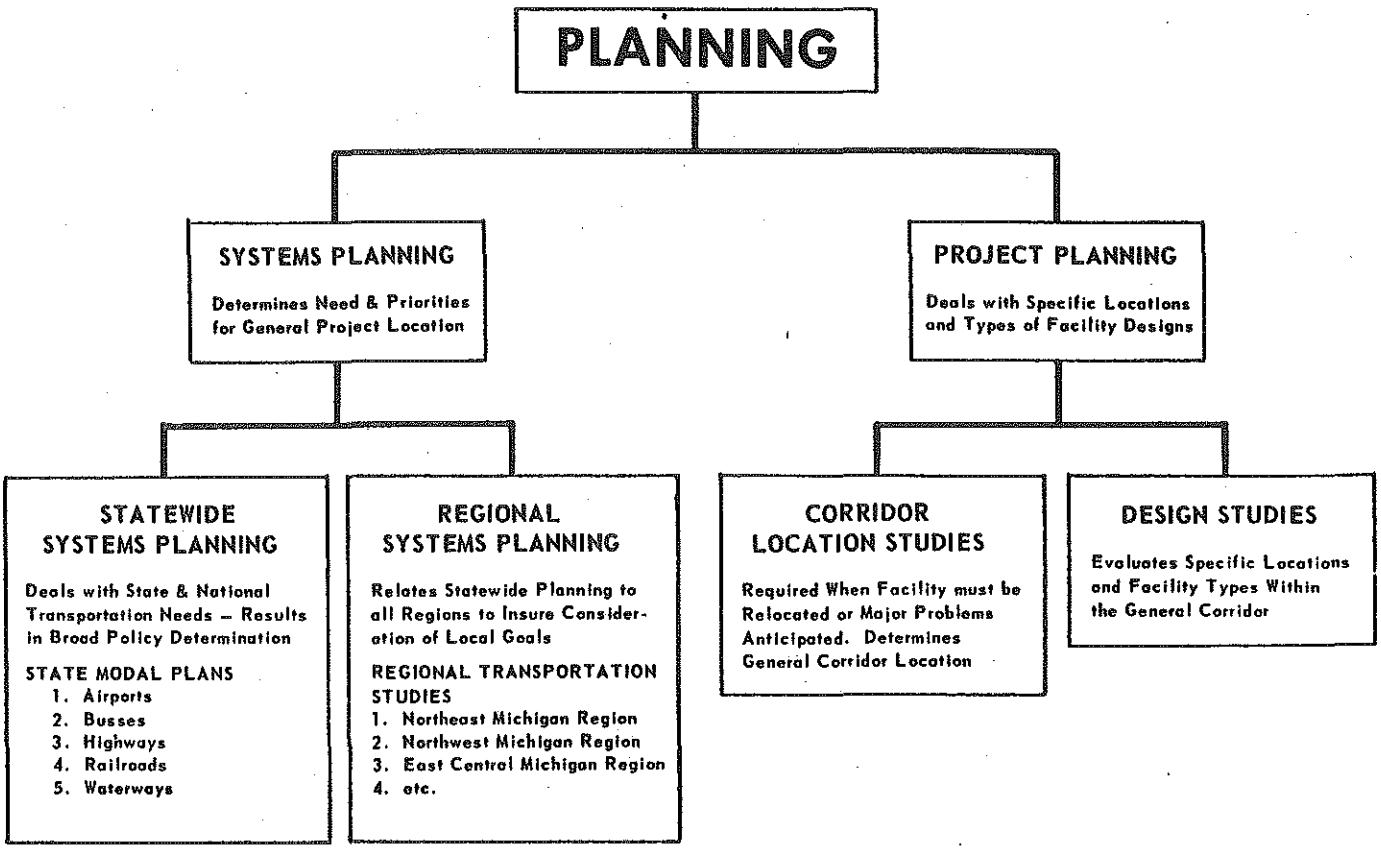
Preliminary evaluation of public transportation service indicates that expansion of dial-a-ride service to the entire Mason County area accompanied by improved inter-city bus service will only have a marginal effect upon current and future traffic volumes.

IT IS EVIDENT THAT THERE IS DEFINITE JUSTIFICATION FOR HIGHWAY IMPROVEMENTS ALONG US-10/31 BETWEEN THE CITIES OF LUDINGTON AND SCOTTVILLE. IN ADDITION, JUSTIFICATION ALSO EXISTS TO CONSIDER SOLUTIONS TO SOME APPARENT LONG-RANGE TRAFFIC PROBLEMS ON US-31 NORTH AND US-10 EAST OF THE CITY OF SCOTTVILLE.

INTRODUCTION

It is the responsibility of the Michigan Department of State Highways and Transportation to provide a safe, direct, and efficient highway system to all motorists using these facilities in Michigan. The motoring public, however, place different demands on the system based upon their trip purpose and length. The Michigan Action Plan outlines the planning process that is carried out by the Department from the statewide plan down to a project plan.

The responsibility for developing a statewide plan for highways has been assigned to the Bureau of Transportation Planning while specific corridor and project studies are developed through multidisciplinary location teams. In order for a project to be approved for design, right-of-way purchase, and construction, it must proceed from the Statewide Trunkline planning process down to the project location team.



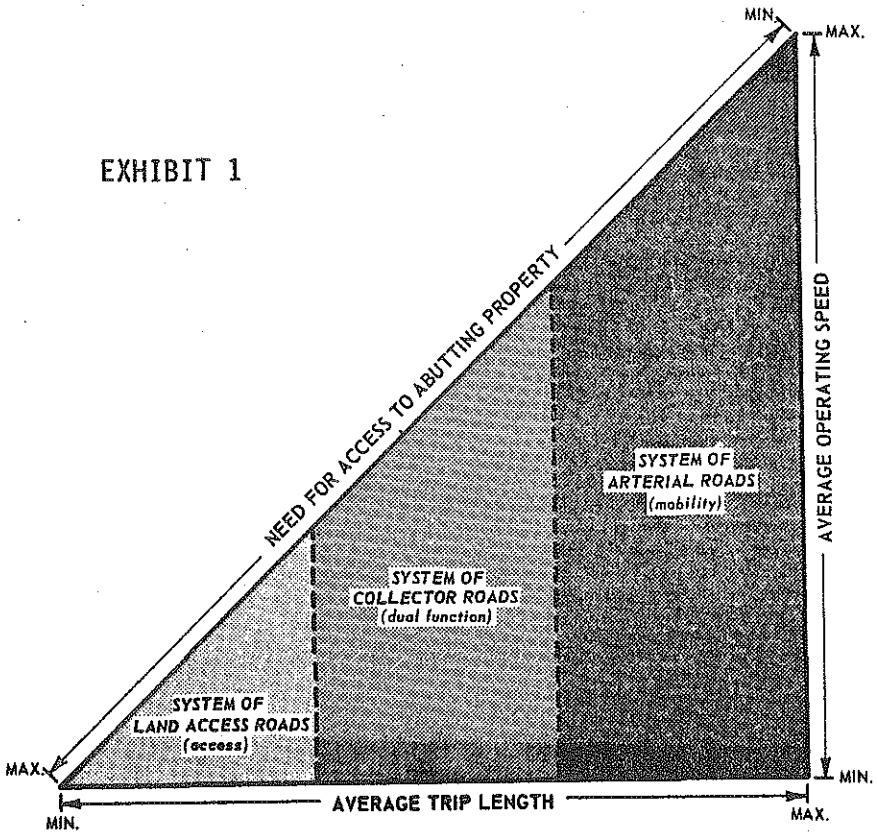
The following paragraphs will outline the background of planning activities that have lead to the study of US-10/31 between Ludington and Scottville, along with the examination of US-31 and US-10 north and east of Scottville, respectively.

BACKGROUND OF THE STATE TRUNKLINE PLAN

The Michigan Department of State Highways and Transportation initiated the statewide highway needs study in 1948. This study has been periodically updated with the most recent update covering the period from 1974 to 1994. A Transportation Needs Study covering the period 1978-1990 of all modes is presently being conducted. Emanating from this study has been an assessment of the statewide needs and the financial requirements to satisfy those needs. These needs studies are based on the State Trunkline Highway Plan.

The plan was developed upon the philosophy that there are numerous urban places throughout the state that provide varying intensities of socio-economic activities. In turn, trips to and from these urban places are of differing lengths and place differing demands on access to lands abutting the highways. To properly assess these trip making characteristics and to determine how the statewide system should provide adequate service, a process of route classification and urban place classification has been established. Exhibit 1 illustrates how access and trip length are used to determine the functional hierarchy of the State Trunkline System.

EXHIBIT 1



Arterial highways have been classified into three primary functional categories; 1) Statewide Arterial, 2) Regional Arterial, and 3) Local Arterial.[1]

[1] See Appendix A for the definition of each Functional Classification.

The geographic distribution of the statewide highway system is based upon the location and classification of the urban places in Michigan. The State Highway Plan is determined by five classes of urban places which deserve direct or proximity service. The five classes[2] are:

1. Metropolitan Center,
2. Regional Center,
3. District Center,
4. Area Center,
5. Special Interest Center.

An evaluation of the relative levels of socio-economic data for all places in the state indicates there are 147 places which warrant state trunkline service. Classes 1 through 4 are considered of sufficient importance from a statewide viewpoint to warrant direct state trunkline service, while the fifth classification is considered as warranting proximity service and, therefore, does not require direct connection to a bypassing route.

The inventory from the 1974 Michigan Highway Needs Study indicates that there are 9,282 miles (14,935 kilometers) of classified state trunkline routes. Statewide arterials comprise 3,954 miles (6,362 kilometers) or 42.6 percent of the trunkline system while carrying 16.3 billion vehicle miles (26.2 billion kilometers) of travel or 61.4 percent of the total State Trunkline vehicular travel in Michigan. The State Needs Study also indicates that there are 3,224 miles (5,187 kilometers) of the statewide arterial system which are, or will become deficient before 1994 in base, surface, or capacity. This mileage constitutes 81.5 percent of the statewide arterial system.

RELATIONSHIP OF US-10/31 TO THE STATE TRUNKLINE PLAN

Both US-10 and US-31 are classified as statewide arterials. US-10 is a statewide arterial from the Chesapeake and Ohio Carferry docks in the City of Ludington to I-375 in the Detroit metropolitan area, a total of 249.9 miles (402.1 kilometers).[3] The 249.9 miles (402.1 kilometers) of US-10 in Michigan is 12.0 percent of the total US-10 mileage in the United States. US-10 begins in Detroit and extends westward to Spokane, Washington.[4]

US-31 is a statewide arterial extending from the Indiana State line to I-75 south of the Mackinac Bridge, a total of 364.6 miles (586.6 kilometers). The Michigan portion of US-31 is 22.9 percent of the total route in the U.S. which begins at US-43 in Mobile, Alabama, and extends northerly to the Mackinac Bridge.

2 See Appendix B for the definition of each urban place, classification.

3 Source of Mileage Figures: Mileage Log of State Highway Routes, Report #29, MDSH&T, July, 1977.

4 Source of Mileage Figures: U.S. Numbered Highways, 1974 Edition American Association of State Highway and Transportation Officials.

These figures indicate that US-10 and US-31 have both national and statewide significance within Michigan. Exhibit 2 illustrates the geographical relationship of US-10 and US-31 to the remainder of the State Trunkline System. As a statewide arterial, US-10 provides direct access to the urban places of Ludington, Reed City, Clare, Midland, Bay City, Saginaw, Flint, Pontiac, and Detroit. US-31 connects Niles, St. Joseph/Benton Harbor, Holland, Muskegon, Ludington, Manistee, Traverse City, Petoskey and Mackinac City.

Presently there are approximately 133 miles (214 kilometers) or 53.1 percent of US-10 that are deficient in base, surface, or capacity, while US-31 has 217 miles (349 kilometers) or 59.5 percent deficient in one or all of these three categories. The deficient mileage of these two routes constitutes 10.9 percent of the 3,224 miles (5,187 kilometers) of the current and projected deficiencies on the statewide arterial system in Michigan.

CONSIDERATION OF US-10/31 WITHIN THE WEST CENTRAL MICHIGAN TRANSPORTATION SYSTEM STUDY

The Michigan Department of State Highways and Transportation (MDSH&T) has embarked upon a program to examine and plan for all modes of transportation at a regional level. Within Michigan there are 14 multi-county regions which have been created under the provision of State of Michigan Public Act 281 of 1945 - the Regional Planning Commission Act. The establishment of these regions resulted from an Executive Order of the Governor. Regional systems planning was established in order to provide a mechanism through which statewide planning could be evaluated in terms of regional and local social, economic, and environmental conditions and values.

Mason County is within the boundaries of the West Michigan Regional Planning Commission, (Region 8). On February 18, 1976, the Region 8 Systems Planning Study was initiated with a team meeting to discuss the study approach. Subsequent to this meeting, the Region 8 Study was combined with the Region 14 Study, or that for the West Michigan Shoreline Planning and Development Commission. These combined regions, shown on Exhibit 3, account for 12 of Michigan's 83 counties and the study has been entitled The West Central Michigan Transportation System Study.

One of the main objectives of this study is to identify and rank modal deficiencies that exist within these regions. One means to help identify deficiencies, public concern, or issues relative to transportation is through public pre-study meetings. Prior to the conduct of these meetings, the West Michigan Regional Planning Commission and the Scottville City Planning Commission[5] filed resolutions with the Michigan Department of State Highways and Transportation requesting immediate action on the US-10/31 traffic problems. Since these agencies, and especially Region 8, are participants in the regional transportation study, the resolutions indicated the local need and urgency for a study in this corridor.

[5] See Appendix C for the West Michigan Regional Planning Commission and City of Scottville resolutions.

State Trunkline Highway Plan

MICHIGAN DEPARTMENT OF STATE HIGHWAYS AND TRANSPORTATION

PLACE CLASSIFICATION

Metropolitan Centers

1 — DETROIT METROPOLITAN AREA

1a — URBANIZED POPULATION OVER 200.000

1b — URBANIZED POPULATION 100.000-199.999

1c — URBANIZED POPULATION LESS THAN 100.000

Regional Centers

2 — URBANIZED POPULATION OVER 50.000

2a — URBANIZED POPULATION LESS THAN 50.000

3 — District Centers

4 — Area Centers

5 — Special Interest Centers

LEGEND

SYSTEM CLASSIFICATION	EXISTING OR APPROVED	EXISTING OR PROPOSED 1/	MILES
INTERSTATE	———		1182
OTHER STATEWIDE ARTERIALS	———	·····	3619
TOTAL STATEWIDE ARTERIALS			4801
REGIONAL ARTERIALS	———	·····	4061
LOCAL ARTERIALS			371
TOTAL STATE TRUNKLINE SYSTEM			9233

1/ NEED, LOCATION, AND DESIGN TO BE DETERMINED BY DETAILED STUDY

APPROVED BY STATE HIGHWAY COMMISSION 11-77

LAMBERT CONFORMAL CONIC PROJECTION

SCALE IN MILES

DETROIT METROPOLITAN AREA

LEVEL OF SERVICE
DEFINITIONS

LEVEL OF SERVICE A

A condition of free flow traffic with low volumes and high speeds. Traffic density is low, with speeds controlled by driver desires. There is little or no restriction in maneuverability due to the presence of other vehicles, and drivers can maintain their desired speeds with little or no delay.

LEVEL OF SERVICE B

A stable flow of traffic with operating speeds beginning to be restricted by traffic conditions. Drivers still have reasonable freedom to select their speed and lane of operation. Reductions in speed are not unreasonable, with low probability of traffic flow being restricted.

LEVEL OF SERVICE C

A stable flow of traffic, but speeds and maneuverability are more closely controlled by the higher volumes. Most of the drivers are restricted in their freedom to select their own speed, change lanes, or pass. A relatively satisfactory operating speed is still obtained, with service volumes perhaps suitable for urban design practice.

LEVEL OF SERVICE D

An unstable flow of traffic with tolerable operating speeds being maintained though considerably affected by changes in operating conditions. Fluctuations in volume and temporary restrictions to flow may cause substantial drops in operating speeds. Drivers have little freedom of maneuverability, and comfort and convenience are low, but conditions can be tolerated for short periods of time.

LEVEL OF SERVICE E

Cannot be described by speed alone, but represents operations at low speeds. Flow is unstable and there may be stoppages of momentary duration.

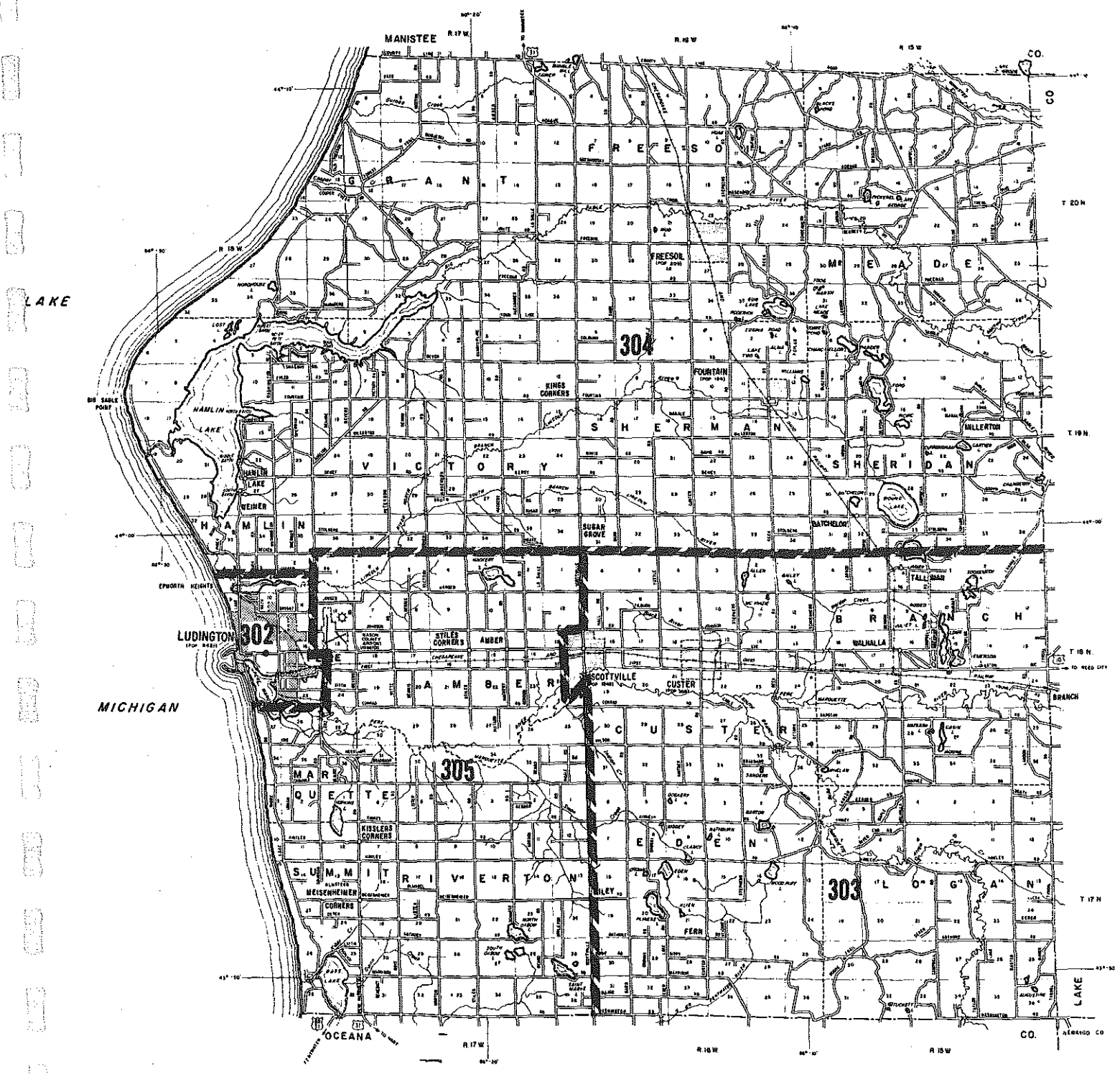
LEVEL OF SERVICE F

A forced flow operation at low speeds, where volumes are below capacity. These conditions usually result from queues of vehicles backing up from a restriction downstream. Speeds are reduced substantially and stoppage may occur for short or long periods of time because of downstream congestion. In the extreme, both speed and volume can drop to zero.

APPENDIX F

STATEWIDE TRANSPORTATION MODEL

TRAFFIC ZONES IN MASON COUNTY


MANISTEE
R.17 W.
R.16 W.
R.15 W.
CO.
LAKE
MICHIGAN
LUDINGTON
OCEANA
FREESOIL
GRANT
MEADE
304
KINGS CORNERS
FOUNTAIN
SHERMAN
MILLERTON
VICTORY
SHERIDAN
HAMLIN
LAKE
WEINER
SUGAR GROVE
BATCHELOR
EPWORTH HEIGHTS
BRANCH
WALHALLA
STILES CORNERS
AMBER
SCOTTVILLE
CUSTER
302
AMBER
CUSTER
305
MARQUETTE
KISSLERS CORNERS
EDEN
SUMMERTON
MEISENHEIMER CORNERS
RILEY
FERR
303
LOGAN
T 20 N
T 19 N.
T 18 N.
T 17 N
TO REED CITY
OCEANA CO
MECOSTA CO

APPENDIX G

PUBLIC TRANSPORTATION IN MICHIGAN

MICHIGAN DEPARTMENT OF STATE HIGHWAYS AND TRANSPORTATION

MICHIGAN PUBLIC TRANSPORTATION NEEDS SUBCOMMITTEE

USER, OPERATING AND FINANCIAL CHARACTERISTICS OF PUBLIC TRANSPORTATION IN MICHIGAN

AS OF

JANUARY 1, 1977

Prepared by:

Mass Transportation Planning Section
Modal Planning Division
Bureau of Transportation Planning

DETAILED NOTES FOR EXISTING PUBLIC TRANSPORTATION USERS AND SERVICE TABLES

(1) "Population Served" is the 1970 Census population. For the Metropolitan and Small Metropolitan communities, the figures correspond to those used in allocating State General Transportation Fund "formula" monies and are usually urbanized area population figures. Michigan's 1970 Census population was 8,875,068.

(2) "Number of Elderly (65+)" is the 1970 Census figure for those 65 or over. Michigan's 1970 elderly population was 755,098 or 8.5 percent of the total population. Of this elderly population, 140,802 (18.6 percent) have a mobility limiting handicap.

(3) "Number of College Students" consists of those residents enrolled in college between 1 February 1970 and the time of the 1970 Census enumeration. For the Metropolitan and Small Metropolitan communities, urbanized area enrollment figures have been used. The number of college students residing in Michigan in 1970 was 317,448. This comprises 3.6 percent of Michigan's total population.

(4) "Households With No Autos" is the 1970 Census figure for those households reporting zero cars in their households. For the Metropolitan and Small Metropolitan communities, urbanized area figures have been used. The number of households in Michigan in 1970 with no cars was 322,589, or 12.2 percent of Michigan households.

(5) "Families Below Poverty Level" is the 1970 Census figure for those households reporting incomes below the poverty level. The number of families below poverty level in Michigan in 1970 was 160,034 which is 7.3 percent of all Michigan families.

(6) "Median Family Income" is the 1970 Census figure for all reported family incomes. The 1970 median family income for Michigan residents was $11,032.

(7) "Number of Handicapped (0-64)" is a combination of U.S. Bureau of the Census work disability data for those 18 to 64 and Michigan Department of Education data for those under 18. The Census definition is "a serious illness that has lasted or is likely to last for a relatively long time, or a serious physical or mental impairment or handicap." The Michigan Department of Education figures include all handicapped school children under 18 regardless of handicap as determined from the annual fourth Friday of September count. In Michigan, the total number of handicapped (0-64) according to the above definition is 643,772. Of this total, 160,951 (25.0 percent) have a handicap which limits mobility. This group consists of those having trouble in getting around alone (90,640), those needing help in getting around (39,809) and those confined to their homes (30,502). The handicapped population under 65 was determined for each community using county totals obtained from Census and Department of Education figures and presented in "Interim Findings and Recommendations of the Governor's Interagency Transportation Coordinating Council," dated January 1976. Figures for those transit service areas less than countywide were derived by assuming the proportion of handicapped under 65 to be the same as the total population. The SEMTA figure was determined using countywide totals for Wayne, Oakland and Macomb counties.

(8) Daily ridership, vehicle miles, vehicle hours, operating costs and revenues were determined by dividing October-December 1976 quarterly figures reported by transit system operators to the Michigan Department of State Highways and Transportation, Bureau of Urban and Public Transportation by the number of equivalent operating days in the quarter. As no vehicle miles figure was reported for Lake County, an average running speed of 17 mph was used together with the reported vehicle hour figures to determine vehicle miles. As no vehicle hours for SEMTA and Pontiac were reported, average running speeds of 17 and 14 mph respectively were used together with vehicle mile figures to determine vehicle hours.

(9) Quarterly ridership, vehicle miles, vehicle hours, operating costs and revenues are those reported by transit system operators to the Michigan Department of State Highways and Transportation for the October-December 1976 quarter.

10) Annual ridership, vehicle miles, vehicle hours, operating costs and revenues are estimated figures determined by multiplying the October-December 1976 quarterly figures by four.

11) "Service Area" figures are those reported by the transit system operators when available. When not available, the areas were map measured or obtained from the Michigan Department of State Highways and Transportation Local Governments Division.

12) Number of transit vehicles is divided into large buses (36 or more seats), medium buses (26-35 seats), small buses (25 or less seats) and vans (16 or less seats). Lift-equipped vehicles are included in the figures for each vehicle type and total number of vehicles.

13) "Vehicle Hours/1,000 Population" is daily vehicle hours divided by population served (in thousands).

14) "Net Operating Costs/Passenger" is quarterly operating costs minus quarterly revenues divided by quarterly ridership.

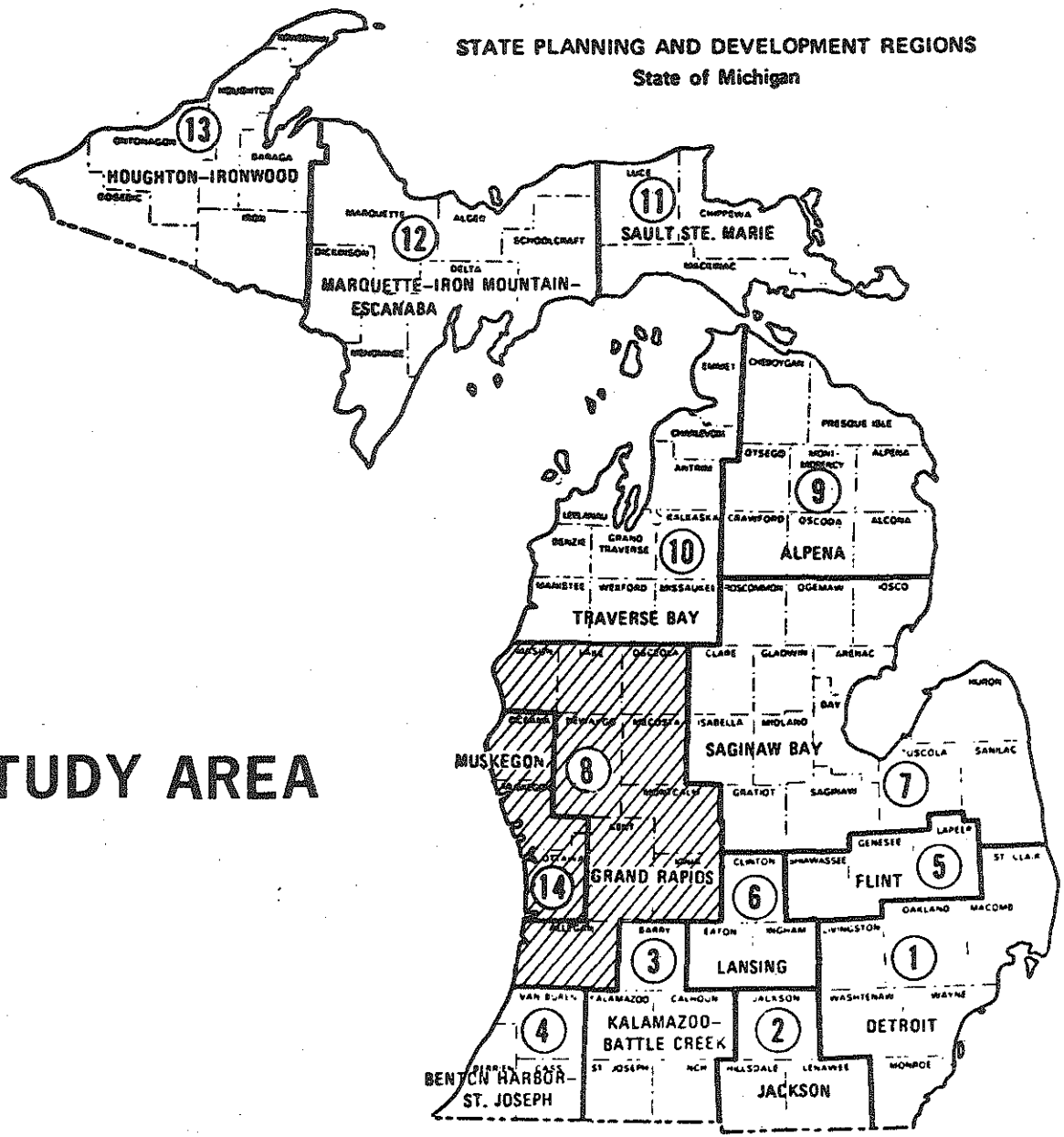
15) "Farebox Recovery Rate" is quarterly revenues divided by quarterly operating costs times 100.

SOCIO-ECONOMIC CHARACTERISTICS OF EXISTING PUBLIC TRANSPORTATION USERS BY COMMUNITY, 1 JANUARY 1977

COMMUNITY	POPULATION SERVED (1)	NUMBER OF ELDERLY (65+) (2)	NUMBER OF COLLEGE STDNTS (3)	HSEHLDS WITH NO AUTOS (4)	FAMILIES BELOW POVERTY LEVEL (5)	MEDIAN FAMILY INCOME (6)	NUMBER OF HANDICAPPED (0-64) (7)	RIDERSHIP DAILY (8)	RIDERSHIP QUARTERLY (9)	RIDERSHIP ANNUAL (10)	DAILY PASS/ 1000 POP	ANNL PASS PER CAP	SERVICE AREA (SQ.MI) (11)
URBAN													
ADRIAN	23,382	2,185	1,581	763	295	$ 9,759	423	332	24,324	97,296	14.2	4.2	5.4
ALMA	9,790	1,074	1,256	298	136	$ 9,352	185	225	15,243	60,972	23.0	6.2	4.6
ALPENA	19,805	1,398	538	469	283	$ 9,039	379	233	18,177	72,708	11.8	3.7	10.4
BELDING	5,121	595	109	200	92	$ 9,486	90	116	7,750	31,000	22.7	6.1	4.7
BENTON HARBOR-ST JOSEPH	46,557	3,284	441	2,063	922	$10,322	853	556	39,213	156,852	11.9	3.4	41.3
BIG RAPIDS	11,995	740	5,370	395	217	$ 8,140	243	314	22,670	90,680	26.2	7.6	5.1
CADILLAC	10,490	1,253	117	514	219	$ 8,474	184	327	23,044	92,176	31.2	8.8	6.1
DAVISON	5,259	292	317	106	29	$13,400	100	226	16,082	64,328	43.0	12.2	1.6
DOWAGIAC	6,583	689	113	360	148	$ 9,668	101	107	6,515	26,060	16.3	4.0	4.1
GRAND HAVEN	17,074	1,332	290	530	154	$10,610	290	372	26,347	105,388	21.8	6.2	7.5
HILLSDALE	7,728	938	856	359	104	$ 9,791	142	179	13,052	52,208	23.2	6.8	4.3
HOLLAND	27,137	2,919	2,376	816	349	$10,135	462	283	18,377	73,508	10.4	2.7	14.2
LUDINGTON	9,521	1,378	98	478	210	$ 8,811	140	232	16,402	65,608	24.4	6.9	4.3
MARQUETTE	41,299	1,791	4,448	836	410	$ 9,252	708	368	25,407	101,628	8.9	2.5	39.1
MARSHALL	7,253	835	159	325	82	$11,304	156	166	11,562	46,248	22.9	6.4	4.6
MIDLAND	35,176	1,761	1,458	499	327	$13,428	554	428	30,221	120,884	12.2	3.4	24.9
MOUNT PLEASANT	20,504	1,107	8,239	417	230	$ 9,213	228	313	23,724	94,896	15.3	4.6	5.1
NILES	12,988	1,538	219	754	316	$10,621	238	285	19,914	79,656	21.9	6.1	5.2
SAULT STE MARIE	15,136	1,612	776	952	512	$ 8,033	255	323	23,568	94,272	21.3	6.2	15.7
TRAVERSE CITY	26,321	2,453	515	646	287	$10,143	477	257	18,302	73,208	9.8	2.8	17.8
TOTAL	359,119	29,174	29,276	11,780	5,322	$10,069	6,208	5,642	399,894	1,599,576	15.7	4.5	226.0

SOCIO-ECONOMIC CHARACTERISTICS OF EXISTING PUBLIC TRANSPORTATION USERS BY COMMUNITY, 1 JANUARY 1977

COMMUNITY	POPULATION SERVED (1)	NUMBER OF ELDERLY (65+) (2)	NUMBER OF COLLEGE STDNTS (3)	HSEHLDS WITH NO AUTOS (4)	FAMILIES BELOW POVERTY LEVEL (5)	MEDIAN FAMILY INCOME (6)	NUMBER OF HANDICAPPED (0-64) (7)	RIDERSHIP DAILY (8)	RIDERSHIP QUARTERLY (9)	RIDERSHIP ANNUAL (10)	DAILY PASS/ 1000 POP	ANNL PASS PER CAP	SERVICE AREA (SQ.MI) (11)
SMALL URBAN													
EATON RAPIDS	4,494	502	84	127	74	$10,210	73	44	3,139	12,556	9.8	2.8	2.7
GLADWIN	2,071	270	56	80	91	$10,185	47	126	7,793	31,172	60.8	15.1	1.6
TOTAL	6,565	772	140	207	165	$10,202	120	170	10,932	43,728	25.9	6.7	4.3
RURAL													
ANTRIM COUNTY	12,612	1,753	96	367	319	$ 8,043	224	121	2,483	9,932	9.6	0.8	475.5
CHIPPEWA/LUCE/MACKINAC	33,725	4,693	1,104	1,830	1,618	$ 7,793	891	88	5,431	21,724	2.6	0.6	3,511.0
CRAWFORD COUNTY	6,482	709	93	195	208	$ 7,930	144	62	1,569	6,276	9.6	1.0	561.4
ISABELLA COUNTY	24,090	2,851	9,507	782	875	$ 9,207	496	94	6,122	24,488	3.9	1.0	568.2
LAKE COUNTY	2,647	545	50	254	343	$ 6,000	151	42	2,806	11,224	15.9	4.2	120.3
LAKE/MECOS/NEWAY/OSCEOLA	61,841	8,642	6,588	2,159	2,424	$ 7,496	1,636	20	1,423	5,692	0.3	0.1	2,561.0
MANISTEE COUNTY	12,371	2,710	115	257	623	$ 8,365	294	159	11,115	44,460	12.9	3.6	408.0
TOTAL	153,768	21,903	17,553	5,844	6,410	$ 7,937	3,836	586	30,949	123,796	3.8	0.8	8,205.4
GRAND TOTAL	6,309,383	537,896	293,389	273,836	295,952	$11,173	121,954	393,584	28,154,894	112,619,576	62.4	17.8	9,568.8



STUDY AREA

EXHIBIT 3

It is important to note that the Region 8/14 Transportation Study has not completed the deficiency identification stage, however, the Northwest Regional Transportation Study (Region 10) has extended its analysis into contiguous counties which includes Mason County. The analysis in this region considered the effects of varying population levels and varying levels of energy supply.[6] Preliminary results of this analysis indicates that US-10/31 and portions of US-31 and US-10 will have capacity deficiencies under all future conditions that were considered.

The above events are the factors that have triggered the detailed examination of the US-10/31 corridor as to the traffic problems that exist or are anticipated.

THE NEED FOR IMPROVED TRANSPORTATION SERVICE IN THE US-10/31 CORRIDOR

This section provides detailed data which should be considered before the final decision is made as to alternative courses of action. Exhibit 4 outlines the general study area that is under consideration for this study. The specific facilities that are being examined in this study area are US-10/31, from US-31 east to US-10 in the City of Scottville; US-31, from US-10 to the north Mason County line; and US-10, from US-31 to the east Mason County line.

US-10/31 is a two lane, 22 foot, bituminous surface roadway that has eight foot graveled shoulders. It is located within 120 feet of right-of-way, except within the City of Scottville where there is only 66 feet of right-of-way. This facility was resurfaced in 1968.

US-31, from US-10 to Hoague Road approximately two miles south of the north county line, is a two lane, 22 foot, bituminous surface highway with eight foot graveled shoulders. It was resurfaced in 1973. From Hoague Road to the north Mason County line the roadway is 24 feet in width, however, it last received surfacing in 1966. This entire section of US-31 is located within 66 feet of right-of-way.

There are three structures along US-31. These bridge the south and north branch of the Lincoln River and the Big Sable River. The Lincoln River crossings are concrete structures that were built in 1925 and are considered to be in fair and poor condition, respectively. The Big Sable River structure, also concrete was constructed in 1959, and is considered in good condition.

US-10, from US-31 in Scottville to Jack Pine Road is a two lane, 24 foot, bituminous surfaced highway with primarily eight foot shoulders. This segment was last surfaced in 1958 with the exception of the portion in Scottville that was surfaced in 1973. Right-of-way widths vary from 66 feet in Scottville to 120 feet along the rural portions of this segment. The segment of US-10 from Jack Pine Road to the east Mason County line is 22 feet in width, has eight foot graveled shoulders, was surfaced in 1970, and is within 66 feet of right-of-way.

[6] See Appendix D for, "Strategy for Developing Alternative Transportation Networks," a documentation paper on the population and energy supply levels used in the Northwest Regional Analysis.

CORRIDOR STUDY AREA

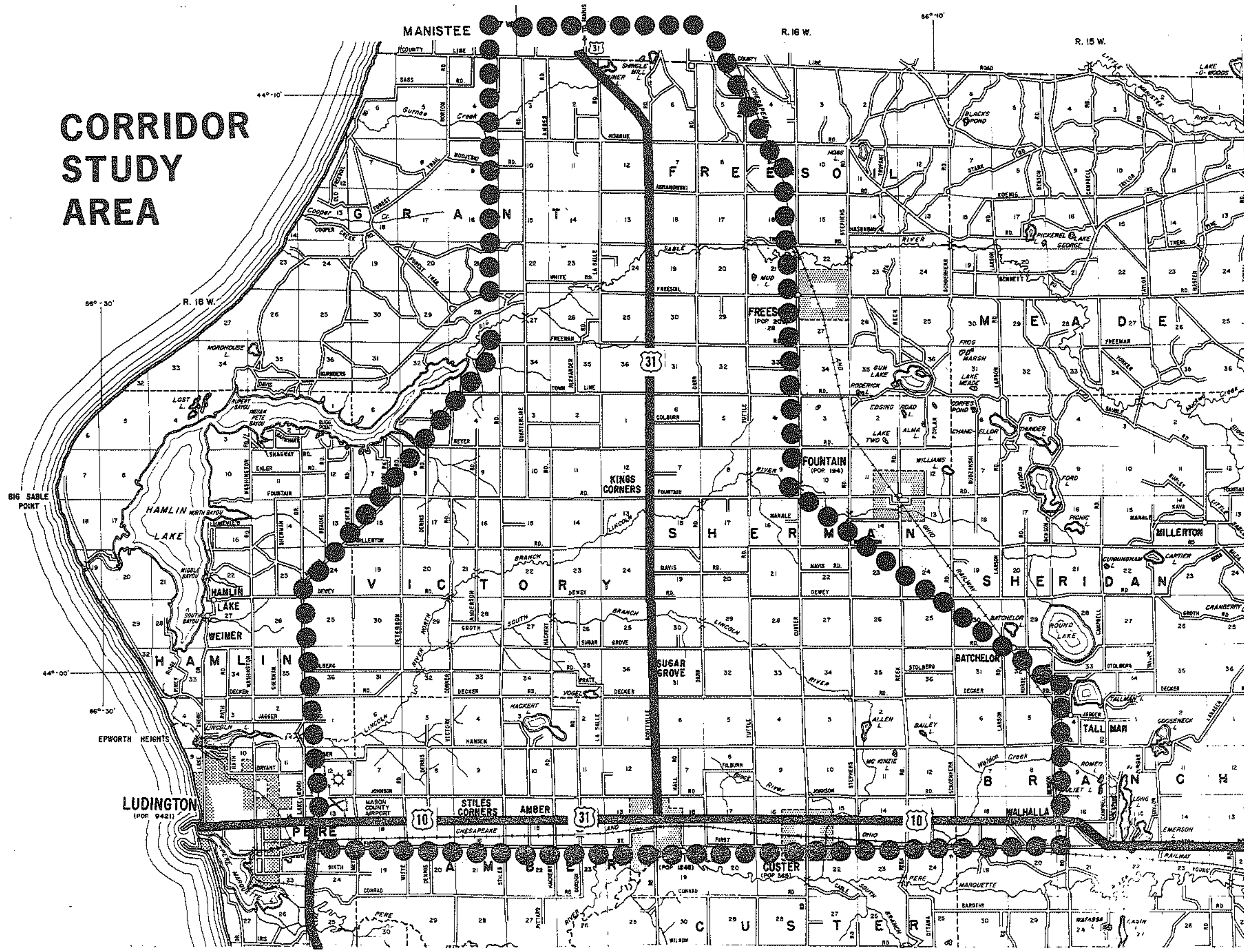


EXHIBIT 4

The one structure located along US-10 is at Weldon Creek. It was constructed of concrete in 1938 and is rated in good condition.

The following section include discussions about the detailed sufficiency rating of the existing roadways, traffic survey studies; traffic volume trends and projections; accident analysis; and current public transportation service to the area.

Sufficiency Rating

The Michigan Department of State Highways and Transportation has conducted research in an effort to develop an impartial method of identifying highway deficiencies. The method currently used by the department is a sufficiency rating.

The Highway Sufficiency Rating Report compiled by the Highway Needs and Sufficiency Section, Bureau of Transportation Planning, MDSH&T is published biennially. This report graphically portrays the routes, indicates federal-aid systems, the control section and the critical deficiencies. This information indicates which highway sections will require attention within a given time period and their relative urgency. A completely adequate section of a highway rates 100. All road sections that have deficiencies in structural condition, effectiveness in serving traffic or safety are marked down from 100.

The sufficiency rating is comprised of four categories: Capacity, surface, base and safety. The maximum and critical rating scores for each category for statewide arterial routes are as follows:

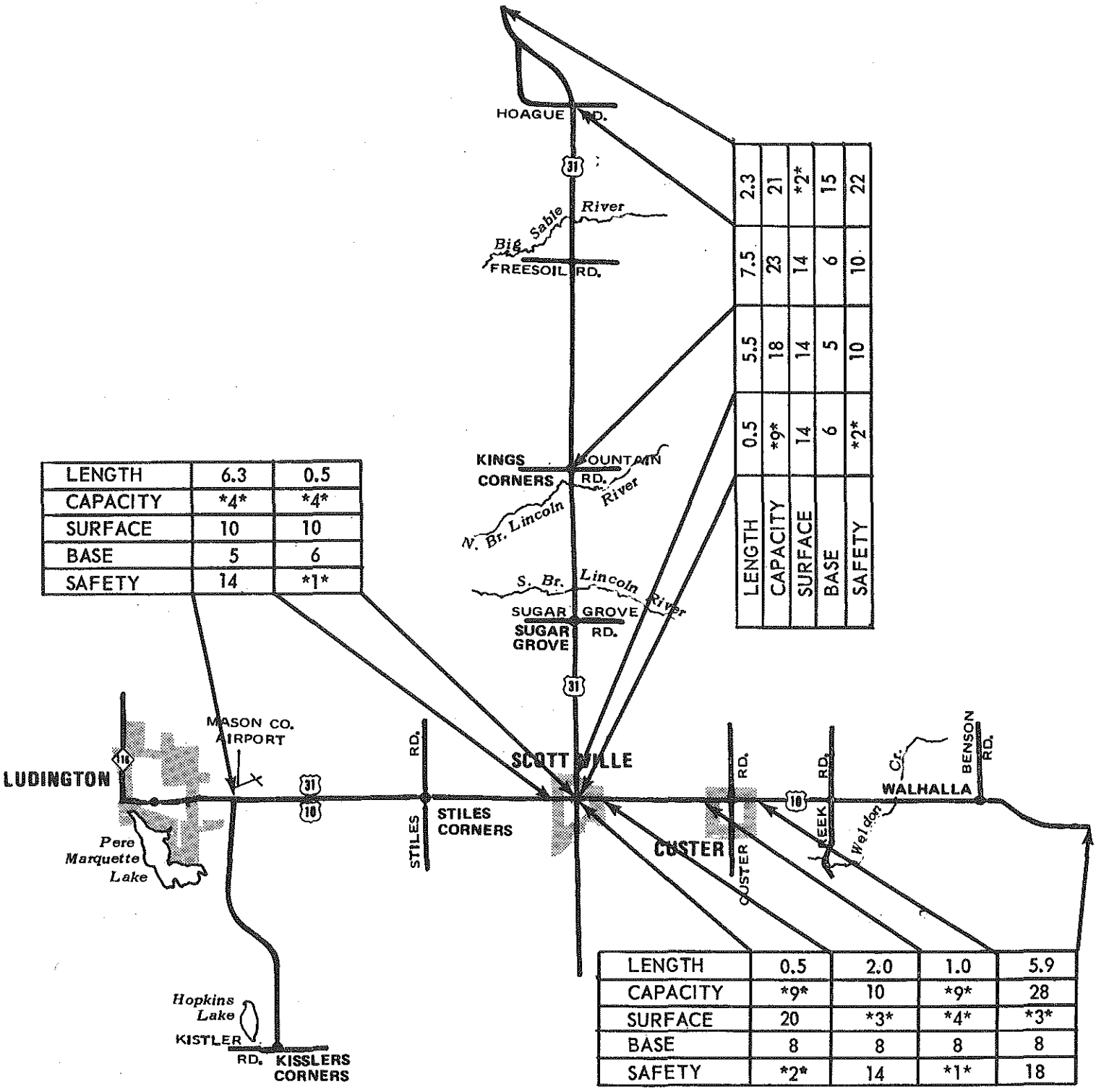
MAXIMUM SCORES	CRITICAL RATINGS	
30 Capacity	Capacity Rating	(7-9) or less
20 Surface	Surface Rating	5 or less
20 Base	Base Rating	5 or less
30 Safety	Safety Rating	8 or less

1. The Capacity Rating represents the ability of a section of highway to carry existing volumes of traffic. The capacity index for the highway section is determined by utilizing the following variables.

    a. Practical hourly capacity
    b. Factor based upon percent sight restriction
    c. Factor for lane width less than 12 feet
    d. Factor based upon percent commercial traffic
    e. 30th high hour, which is the optimum design hour traffic volume that was exceeded by 29 hourly volumes.

    Exhibit 5 indicates that a critical capacity deficiency exists along the entire 6.8 miles (10.9 kilometers) segment of US-10/31 east of Ludington.

1976 SUFFICIENCY RATING



LENGTH	2.3	7.5	5.5	0.5	6.3	0.5
CAPACITY	21	23	18	*9*	*4*	*4*
SURFACE	*2*	14	14	14	10	10
BASE	15	6	5	6	5	6
SAFETY	22	10	10	*2*	14	*1*

LENGTH	0.5	2.0	1.0	5.9
CAPACITY	*9*	10	*9*	28
SURFACE	20	*3*	*4*	*3*
BASE	8	8	8	8
SAFETY	*2*	14	*1*	18

* * DENOTES CRITICAL DEFICIENCY

US-31 is critically deficient in capacity within the city limits of Scottville, while US-10 has critical capacity deficiencies in Scottville and in Custer.

2. The Surface Rating represents the adequacy of the surface and shoulders or curbs. Several factors are considered in determining the surface rating:

   a. The year of construction or improvement, width and surface type
   b. The surface deterioration and width and shoulder or curb condition.
   c. The remaining surface life.

   There are no portions of US-10/31 within the study area that have a critical surface rating. US-10 has a critical surface rating from the east city limits of Scottville to the east Mason County line, a total of 8.9 miles (14.3 kilometers). US-31, north of Scottville, has 2.3 miles (3.7 kilometers) of deficient surface from Hoague Road to the north Mason County line.

3. The Base Rating represents the adequacy of everything under the surface to support the surface. This rating is determined by the average base and soil condition factors and the average drainage condition factor. This information is furnished by District personnel, annual field inspections, and available records.

   There are no portions of US-10/31, US-10, or US-31 within the study area that have a critical base factor.

4. The Safety Rating calls attention to excessive or extraordinary conditions warranting consideration for improvement. The safety rating is determined by the following:

   a. Safety and subjective evaluation provided by District personnel, by information from available records and by field inspections.

   b. Accident frequency factor.

   US-10/31, US-10, and US-31 have critical safety factors within the city limits of Scottville. In addition, US-10 has also received a critical rating within the Village of Custer. This is not an uncommon situation for highly traveled routes to have safety deficiencies as they enter urban areas.

Traffic Data

1. Traffic Surveys

   Several traffic surveys have been conducted along the US-10/31 Corridor which provide some insight as to the travel patterns that occur along this route.

The first study was conducted in 1958 and consisted of a simplified origin and destination survey of travel between the cities of Ludington and Scottville. Interview stations were located on US-10 in Ludington and east of Scottville while US-31 stations were established south of Ludington and north of Scottville. Exhibit 6 illustrates the results of this survey.

The largest through movement occurred between US-31 south and US-10 west into Ludington. There were 2,360 vehicles that made this movement which represents of 67.0 and 34.9 percent of the traffic at these two stations, respectively. Travel between US-10 at Ludington and US-10 east of Scottville was the second largest movement with 1,185 vehicles crossing these survey stations. Two other major movements occurred between US-31 north of Scottville to US-10 into Ludington, and between US-31 south of Ludington to US-31 north of Scottville. These two movements involved 710 and 575 vehicles, respectively.

One of the critical aspects in evaluating the US-10/31, US-10, and US-31 traffic situation is the traffic conflict that occurs in the City of Scottville. Examination of the through traffic which traveled US-10/31 reveals that 42.9 percent of the vehicles originated or were destined for US-31 north of Scottville while 45.7 percent had originated or was destined for US-10 east of Scottville. The remaining 11.4 percent was attributable to Stiles and Scottville Road.

Although the traffic in 1958 was not of a magnitude that it caused the congestion problems that are being experienced today, an important item to note is that nearly 50 percent of the traffic made a turning movement between US-10/31 and US-31. This change in direction causes a conflict in movement and when combined with the land use and physical limitations of this intersection, severely restrains the practical capacity of the intersection.

The above figures provide an indication as to the distribution pattern of traffic, however, the results of another traffic survey in the summer of 1972 provide further insight as to the type of trips occurring in the US-10/31 corridor. The survey taken in 1972 was an external origin and destination survey which focused on the traffic patterns in the Ludington area. Although the surveys in 1958 and 1972 are not identical in scope, there are several interesting comparisons that can be made.

In both surveys, an interview or traffic count station was established on US-31 south of US-10. In 1958, 22.7 percent of the trips through this station also passed through the US-10/31 station to the northeast. In 1972 a similar percentage, 24.6 percent, followed this same traffic movement. This would indicate that some basic travel patterns remained the same over time.

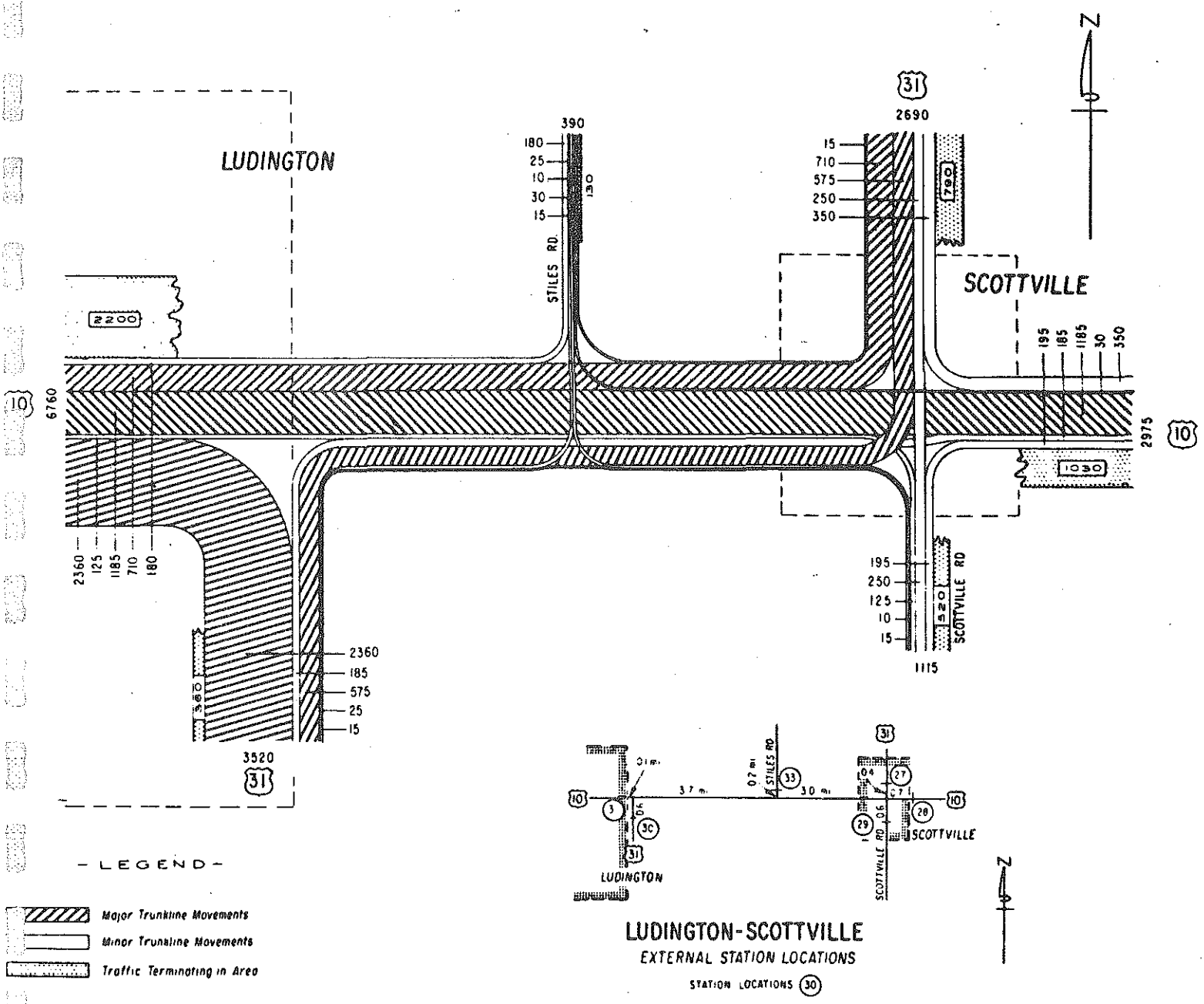
The predominant trip purpose of the US-31 through traffic was the vacation trip. Of the 2,778 through trips, 40.8 percent or 1,134 were made for vacation purposes. Work trips comprised the second

EXHIBIT 6

LUDINGTON-SCOTTVILLE

DISTRIBUTION OF TRUNKLINE TRAFFIC

1958 A.D.T.



MICHIGAN STATE HIGHWAY DEPARTMENT
JOHN C. MACKIE - COMMISSIONER

OFFICE OF PLANNING

JULY 1959

largest through trip movement with 730 trips (26.3 percent) while socio-recreational purposes accounted for 606 trips (21.8 percent).

The US-10/31 station recorded a total of 10,551 trips. Nearly one-third of these trips or 3,464 trips were through trips which did not stop in the Ludington area. The predominant through trip movement was to US-31 south with 2,517 trips or 23.9 percent of the total through trips. The composition of the US-10/31 through trips were divided among vacation trips at 34.6 percent, work trips at 34.7 percent, and other socio-recreational trips at 18.8 percent.

The 7,087 terminal trips, trips which originated from or were destined for Ludington, greatly effect the travel patterns in the US-10/31 corridor. Nearly 35 percent of the terminal trips were work trips while shopping and other social-recreational trips comprised 22.7 percent and 18.4 percent of the terminal trips, respectively.

Two aspects should be noted relative to the 1972 Origin and Destination Survey. First, work trips, which are normally a regular daily trip comprises a high percentage of the through and terminal trips at the US-10/31 interview station. In addition, the survey was taken on summer weekdays and does not reflect the weekend "mini" vacation trips which are predominant in this area.

2. Traffic Trends

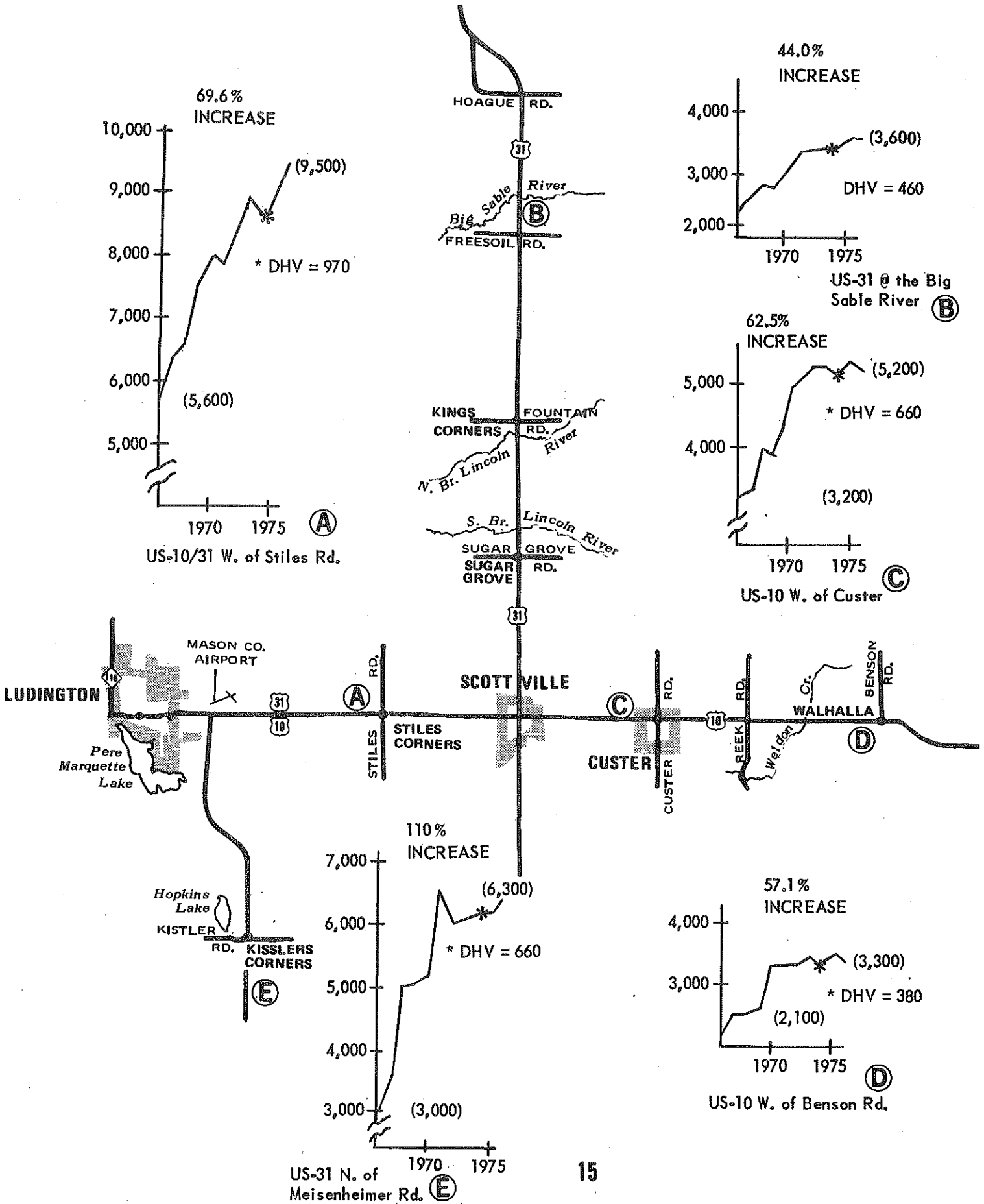
Traffic Volumes must be reviewed from two aspects; average daily traffic (ADT) and design hour volume (DHV). Average daily traffic is the traffic that occurs on a roadway during an average weekday during the year. Design hour volume is the hourly volume the roadway is designed to carry. In many instances the design hour volume capacity is exceeded before the roadway reaches the more generalized daily volume capacity; however, average daily traffic is a barometer for traffic growth trends and illustrates generalized capacities for the roadway.

Average Daily Traffic (ADT): In order to place the growth of traffic along US-10/31 in a proper perspective it is also important to examine the growth rate on US-31, both north and south of US-10/31, along with US-10 traffic east of Scottville. Exhibit 7 illustrates the traffic increases experienced along these routes. US-31, south of US-10/31 has experienced the highest ten year growth rate with an increase of 110 percent or 7.7 percent annually. US-10/31 has had the second largest growth rate with a ten year increase of 69.6% or 5.4 percent annually. This segment is followed by US-10, east of Scottville and finally, by US-31 north of Scottville.

It is important to note that US-10/31 has had the largest absolute ten year increase with 3,900 vehicles per day and presently volumes exceeds US-31, south of Ludington, by 3,000 vehicles per day. From this information it is evident the US-10/31 has reached or is nearing the practical daily capacity of the roadway.

AVERAGE DAILY TRAFFIC TRENDS
1966–1976
WITH 1974 DESIGN HOUR VOLUMES (DHV)

EXHIBIT 7



A means of visualizing the practical daily capacity of a roadway can be illustrated through the yearly traffic plots from permanent traffic recorders (PTR). Exhibits 8 and 9 are the 1976 traffic plots for PTR's located on US-10 at Sears, in Osceola County, and US-31 at Pentwater, in Oceana County. The straight solid line across these plots indicates the average daily traffic recorded at these locations. In this instance US-10 at Sears had a 1976 ADT of 2,923 while US-31 at Pentwater had 4,287 vehicles per day.

The dotted lines that extend across the exhibits denote the range or level of service that each roadway can provide. Level of service is a qualitative measure that represents the collective factors of speed, travel time, traffic interruptions, freedom to maneuver, safety, and driving comfort provided by a highway facility under a particular volume condition.* Level of Service is depicted in six ranges beginning at Level of Service A and extending to Level F.[7] Level of Service C is the daily practical capacity at which traffic is able to maintain a stable flow; however, the travel speeds may be lower than those posted for the roadway.

It is important to note from both exhibits that the volumes that can be accommodated within each level of service, between the two roadways, is different due to variances in sight distance, lane width and the percent commercial traffic. It is also noteworthy to recognize that there are several high volume days each year where the daily volume is twice the average daily traffic while low volume days may only reach one-half the average daily traffic volume. This indicates that a rural statewide arterial may experience a great fluctuation in daily volumes.

Utilizing US-10 at Sears and US-31 at Pentwater as illustrations of the relationship between level of service and ADT, it is then possible to envision the generalized level of service on US-10/31, US-10 east of Scottville and Custer, and US-31 north of Scottville. Exhibit 10 depicits the generalized level of service that existed along these routes during 1976. US-10/31 is operating within Level of Service C, however, it is very near Level of Service D. If the yearly fluctuations on US-10/31 follow a similar pattern as the PTR's that were illustrated, then several daily volumes may extend into Level of Service F. In all probability these volumes would occur on the Memorial, Independence, and Labor Day weekends and would involve travel speeds less than 30 miles per hour (48.3 kilometers per hour) with intermittent stopping.

US-31 north of Scottville and US-10 east of Scottville and Custer present a different situation. The average daily volumes of 3,600, 5,200, and 3,300, respectively, represent volumes within Level of Service B. If these volumes were doubled, to reflect the high volume day, then US-31 would reach Level of Service D operations while US-10 would reach Level of Service D between Scottville and Custer, and Level of Service C east of Custer.

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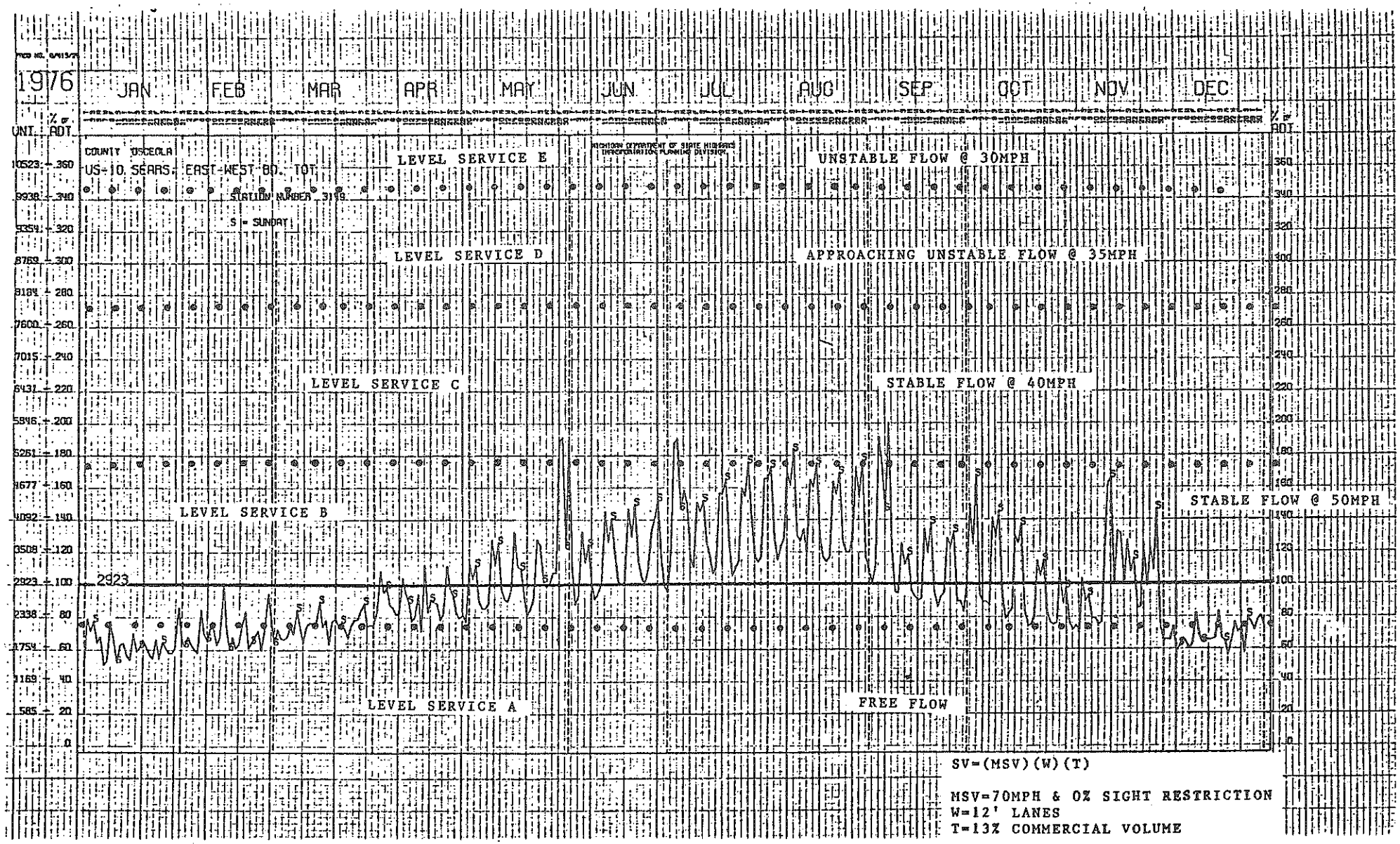
* Source of definition: Transportation and Traffic Engineering Handbook, Institute of Traffic Engineers, 1976.

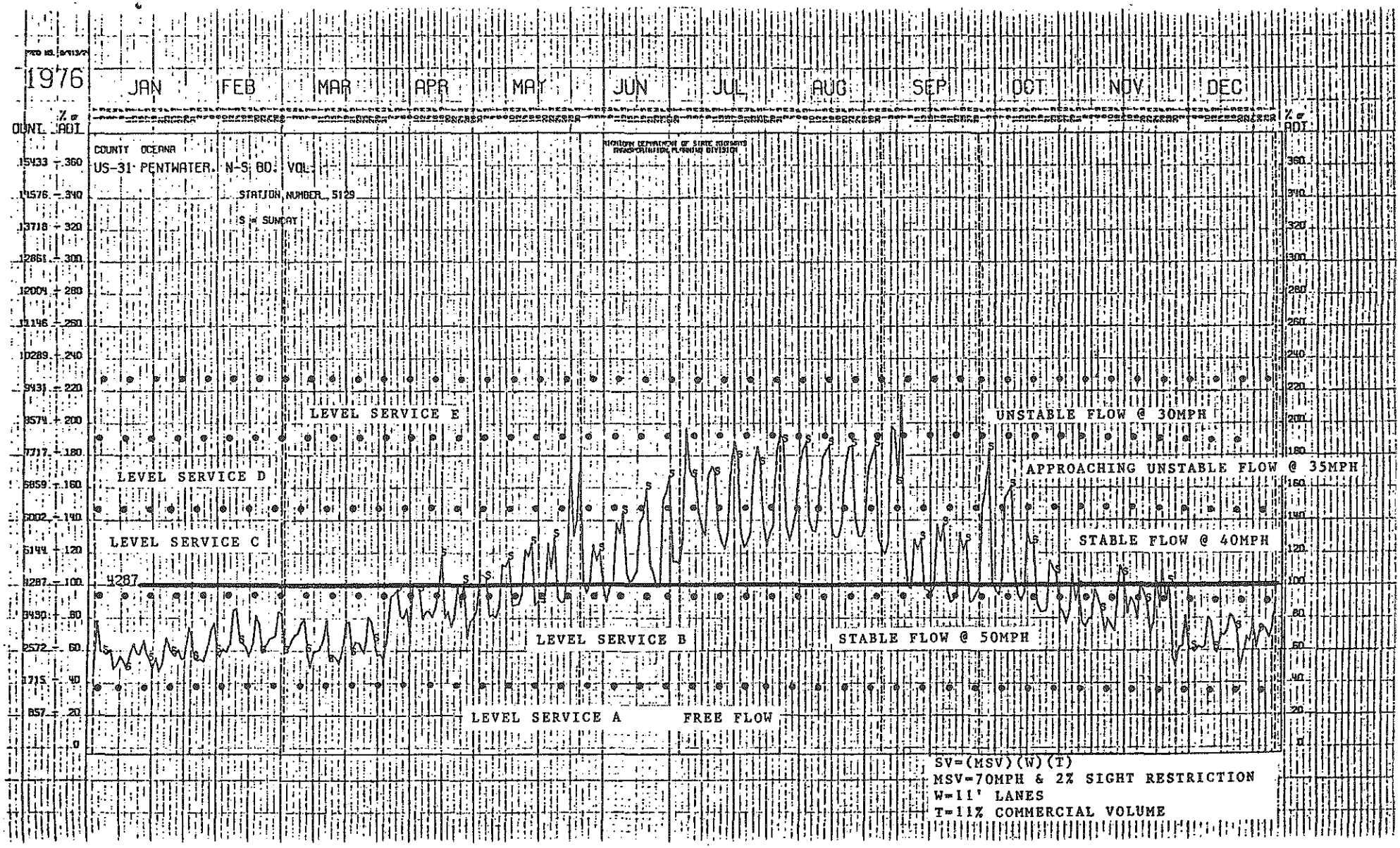
7 See Appendix E for the definition of each Level of Service.



US-10 SEARS, EAST - WEST BOUND VOLUME

Source: 1976 Annual Volume Graphs from Permanent Traffic Recorders
* Level of Service formula from Traffic & Transportation Engineering Handbook, Institute of Traffic Engineers, Third Edition, 1976.

EXHIBIT 8



US-31 PENTWATER, NORTH - SOUTH BOUND VOLUME

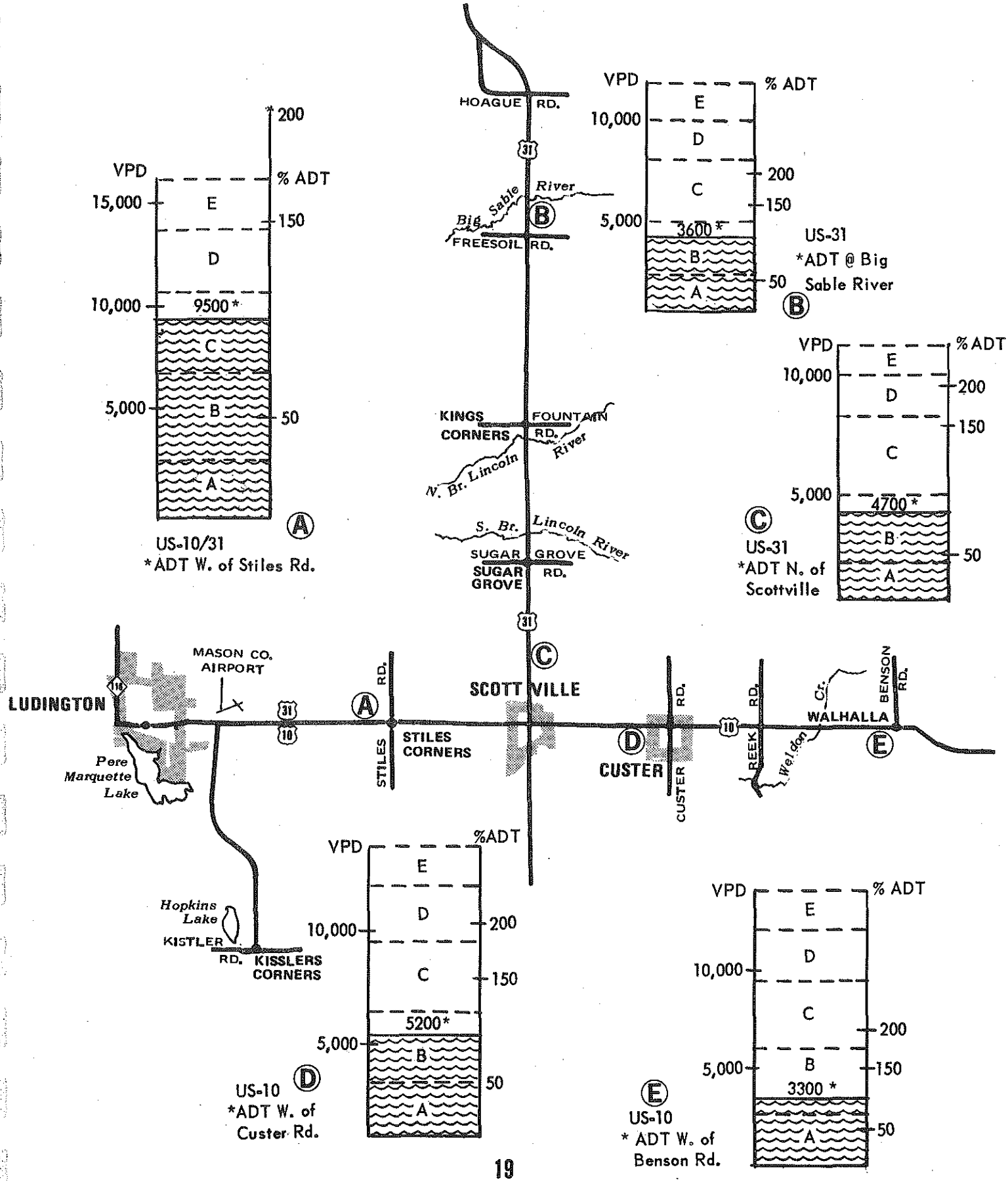
Source: 1976 Annual Volume Graphs from Permanent Traffic Recorders
* Level of Service formula from Traffic & Transportation Engineering Handbook, Institute of Traffic Engineers, Third Edition, 1976

EXHIBIT 9

EXHIBIT 10

GENERALIZED LEVEL OF (TRAFFIC) SERVICE ALONG US-10/31, US-31, US-10

* Volume Per Day – VPD



This traffic information indicates that daily traffic conflicts occur along US-10/31 between Ludington and Scottville, but that traffic north or east of Scottville should be operating without major or extended interruptions.

3. Design Hour Capacity

The ultimate hourly capacity of a two lane rural free access highway is 2,000 passenger cars per hour. The ultimate hourly capacity, however, is attained only when there is no side interference (driveways, or closely spaced and/or signalized intersections), traveling speeds are constant, no truck traffic, and lane widths are 12 feet (3.7 meters).

These ideal conditions do not exist along US-10/31, US-10 east of Scottville or US-31 north of Scottville; therefore, the maximum level of service is not attainable along these roadway segments. In Michigan, the design hour volume is based on the 30th highest volume that the roadway is projected to experience. Exhibit 11 illustrates the relationship of the 30th high hour to average daily traffic. In general, the 30th high hour volume ranges from 12 to 18 percent of the ADT for roadways like US-10 and US-31.

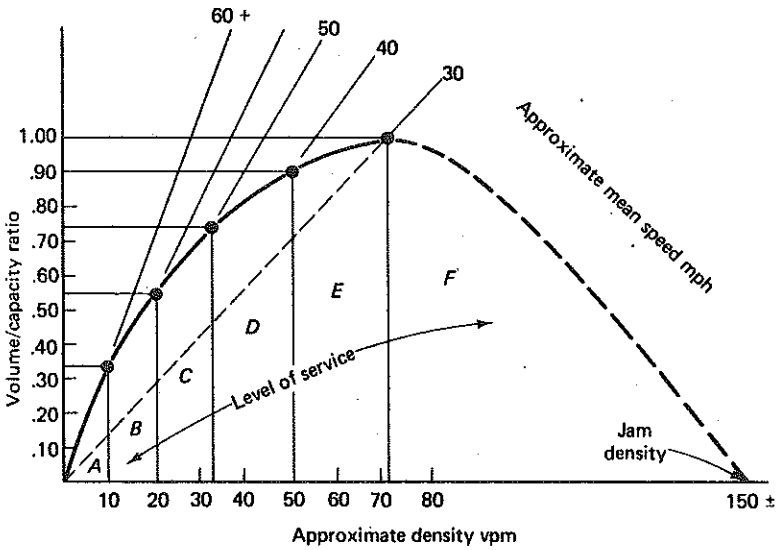
The Michigan Highways Sufficiency Rating Manual utilizes practical hourly capacities to determine the capacity rating of a roadway. The generalized practical hourly capacity for a rural two lane highway is 900 vehicles per hour. The practical hourly capacity must be reduced due to factors which influence traffic flow. These factors include, but are not limited to, roadway alignment, pavement width, the percentage of truck volume, and turning movements.

US-10/31 is presently experiencing hourly volumes that exceed the hourly volumes for which the roadway was designed. Table 1 indicates several peak hour traffic counts that were taken during 1976. While these volumes indicate that a peak hour problem exists on US-10/31, a concurrent peak hour problem does not occur on US-31 north or US-10 east of Scottville and Custer.

4. Traffic Projections - Year 2000

Traffic projections were developed for US-10/31, US-10, and US-31 for the years 1985 and 2000. Several projection methods were utilized in order to establish a range within which future traffic may reasonably be expected to occur. In developing a range of projections the roadway capacity can be assessed as to whether the entire projection range exceeds capacity, straddles the capacity level, or is below the capacity of an existing roadway.

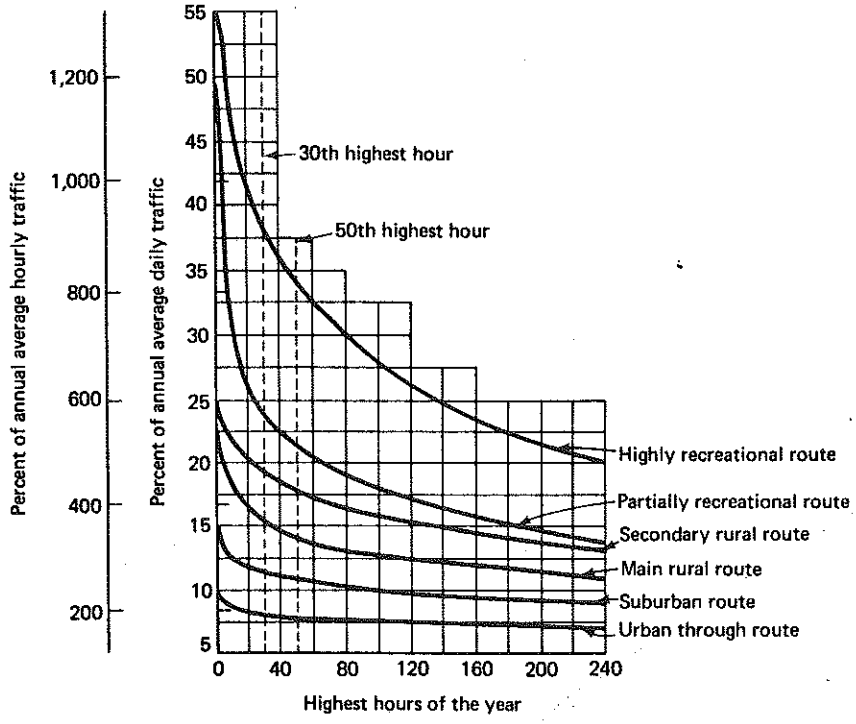
The methods used to establish future traffic projections are through use of the trend line (least squares) projection from the 1966-1976 recorded volumes, use of the Statewide Transportation Model, and a combination of these two methods modified through the use of local road traffic count distributions and turning movements.



Conceptual relationship of level of service to volume and capacity

Source: Traffic and Transportation Engineering Handbook, Institute of Traffic Engineers, Third Edition, 1976.

Relationship of hourly volume to route function



PEAK HOUR VOLUMES
1976

US-10

LOCATION	DAY	DATE	HOUR	TOTAL
.01 MILE E. OF SCOTTVILLE	THR	5-20	3-4p	466
			4-5	433
	FRI	5-21	3-4	486
			4-5	488
	MON	5-24	3-4	413
			4-5	486
	THR	8-26	3-4p	642
			4-5	690
	FRI	8-27	3-4p	660
			4-5	723
	SAT	8-28	10-11a	653
			11-12	743
			12-1	674
			1-2	667
	WED	10-13	3-4p	508
			4-5	450
	THR	10-14	3-4	508
			4-5	488
	FRI	10-15	3-4	495
			4-5	559

US-10/31

LOCATION	DAY	DATE	HOUR	TOTAL
.01 MILE E. OF US-31 S.	FRI	5-21	12-1p	931
			1-2	902
			2-3	907
			3-4	937
			4-5	1064
	MON	5-24	3-4	927
			4-5	995
	SAT	5-22	10-11a	940
			11-12	1073
			12-1	1017
			1-2	909
			2-3	910
	THR	7-8	3-4p	1119
			4-5	1082
	FRI	7-9	11-12	1030
			12-1p	1103
			1-2	1100
			2-3	1112
			3-4	1117
			4-5	1115
	THR	8-26	11-12	911
			12-1	876
			1-2	901
			2-3	909
			3-4	989
			4-5	939
.01 MILE W. OF US-31 N.	WED	8-25	11-12p	1176
			12-1	1033
			1-2	1091
			2-3	1110

US-31

LOCATION	DAY	DATE	HOUR	TOTAL
.1 MILE N.OF SCOTTVILLE	TUE	8-24	2-3p	400
			3-4	420
			4-5	402
			5-6	547
	WED	8-25	2-3	429
			3-4	429
			4-5	422
			5-6	368
	TUE	8-24	2-3p	330
			3-4	370
			4-5	341
			5-6	322
	WED	8-25	2-3	438
			3-4	391
			4-5	340
			5-6	311

TABLE 1

The first method utilizes past traffic trends and assumes their growth rate will continue into the future. The weakness of this approach is that the factors which affect the trip making characteristics of an area are not taken into account. Some of these factors include population growth, leisure time, and energy availability.

The Statewide Transportation Model is capable of accounting for many of the factors that trend line projections cannot. Two sub-models provide the basis for this accountability; these are the trip generation model and the trip distribution model. The trip generation model simulates the number of trips produced within the traffic analysis zones. To accomplish this, the model utilizes a mathematical formula derived from the statistical relationship between a zone's population and the generated trips that are recorded from selected origin and destination studies. Future traffic figures are determined by projecting a zone's population to a specified year and then assigning the generated trips to the State trunkline system.

The Trip Distribution Model is a mathematical expression which states that the number of trips distributed between zones is proportional to their population size and inversely related to the distance between them. The minimum highway path between zones has been calculated in terms of travel times, distance, or cost.

Currently, one of the shortcomings of the Statewide Model is the fact that micro analysis for traffic flows can not be accomplished. The distribution of trips, as stated above, is based partially on the distance between zones, however, trips can not be distributed internally within a zone. This feature, combined with the fact that the model utilizes large traffic zones, prohibits any micro analysis. In Mason County, there are four traffic zones, one of which is the City of Ludington.[8]

The final method of projecting future traffic utilizes the Statewide Model as a base for through trips and terminal trips originating or destined for Mason County. The refinement of the projection comes from past traffic surveys which indicate the percent of local trips as well as trips turning off and onto state trunklines from county roads.

Exhibit 12 lists the range of projected (1985 and 2000) volumes that were derived from the three methods of projections. The largest deviation in these three methods occurs at US-10/31 west of Stiles Road with nearly a 5,500 vehicles per day difference. The smallest deviation occurs west of Benson Road where the difference in projections is only 300 vehicles per day. The remainder of the projections ranges vary from 1,200 to 3,500 vehicles per day.

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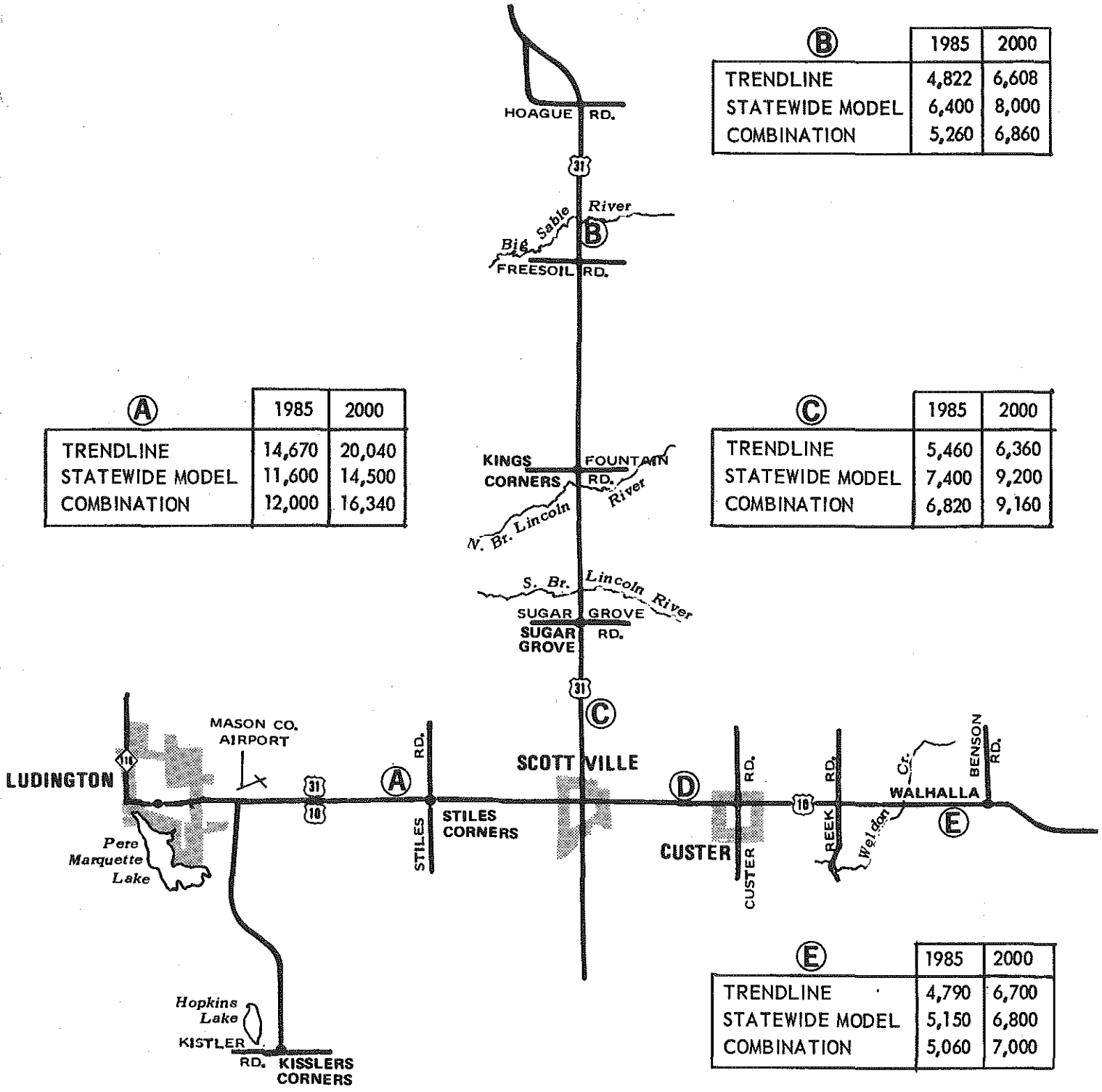
8 See Appendix F for Statewide Transportation Model zones in Mason County.

FUTURE TRAFFIC PROJECTIONS FOR 1985 AND 2000



Ⓐ	1985	2000
TRENDLINE	14,670	20,040
STATEWIDE MODEL	11,600	14,500
COMBINATION	12,000	16,340

Ⓑ	1985	2000
TRENDLINE	4,822	6,608
STATEWIDE MODEL	6,400	8,000
COMBINATION	5,260	6,860

Ⓒ	1985	2000
TRENDLINE	5,460	6,360
STATEWIDE MODEL	7,400	9,200
COMBINATION	6,820	9,160

Ⓓ	1985	2000
TRENDLINE	7,690	11,100
STATEWIDE MODEL	9,050	11,417
COMBINATION	6,900	9,500

Ⓔ	1985	2000
TRENDLINE	4,790	6,700
STATEWIDE MODEL	5,150	6,800
COMBINATION	5,060	7,000

More important than the projections themselves is the level of service range that these highways provide with the projected volumes. Exhibit 13 illustrates the level of service range that each highway would provide in the year 2000 if these projections become reality and if major improvements are not made. US-10/31 would probably have a daily range between level of service E and F. US-31 and US-10 north and east of Scottville, respectively, could have a daily range between level of service C and D. These same routes, as they approach the Mason County line, remain within the C range of service.

Again, it is important to emphasize that these are projections of average daily traffic and that the high daily volume for the year 2000 may be as much as twice the volume projected for the ADT.

Accidents

Accident trends, much like traffic trends, reveal traffic problems and conflicts that exist along a roadway. Exhibit 14 illustrates the accident history along US-10/31, US-31 north, and US-10 in Mason County. This illustration when compared to the illustration showing traffic trends (Exhibit 7, page 14), indicates that the growth trends of traffic volumes and accidents do not have a direct correlation.

The accident history does, however, illustrate that US-10/31 has exceeded US-31 north or US-10 in the number of accident occurrences and this can be attributed to larger volumes on US-10/31 and therefore a higher probability of accidents. Exhibit 15 depicts the relationship of accident rates along two lane roadways with the average daily traffic. This relationship indicates that as the traffic volume increases the accident rate decreases. This phenomenon results from increasing traffic congestion, lower traveling speeds, and the capability of the driver to avoid the accident. The reduction in the accident rate should not be confused with a reduction in the actual number of accidents rather, a reduction in the frequency with which an accident is expected to occur decreases as the total number of vehicles traveling along the roadway increases.

Accident rate, together with accident severity, is a means of evaluating the accident occurrences along these roadways. In 1976, the statewide rural two lane highway accident rate was 298.2[9] accidents per 100 million vehicles miles of travel (169 million vehicle kilometers of travel). In comparison, US-10/31, US-31 north, and US-10 east of Scottville had 344, 231, and 274 accidents per 100 million VMT, respectively. This generalized comparison of rates indicates that US-10/31 is above the statewide average and should be examined for possible improvements.

Table 2 lists the 1976 accidents along US-10/31, US-31 and US-10 in subsections. The list includes the number and severity of accidents followed by the rate and ranking of the subsections of these three routes. From this rate and ranking process three subsections can be identified as areas where accident problems exist. The three subsections include the

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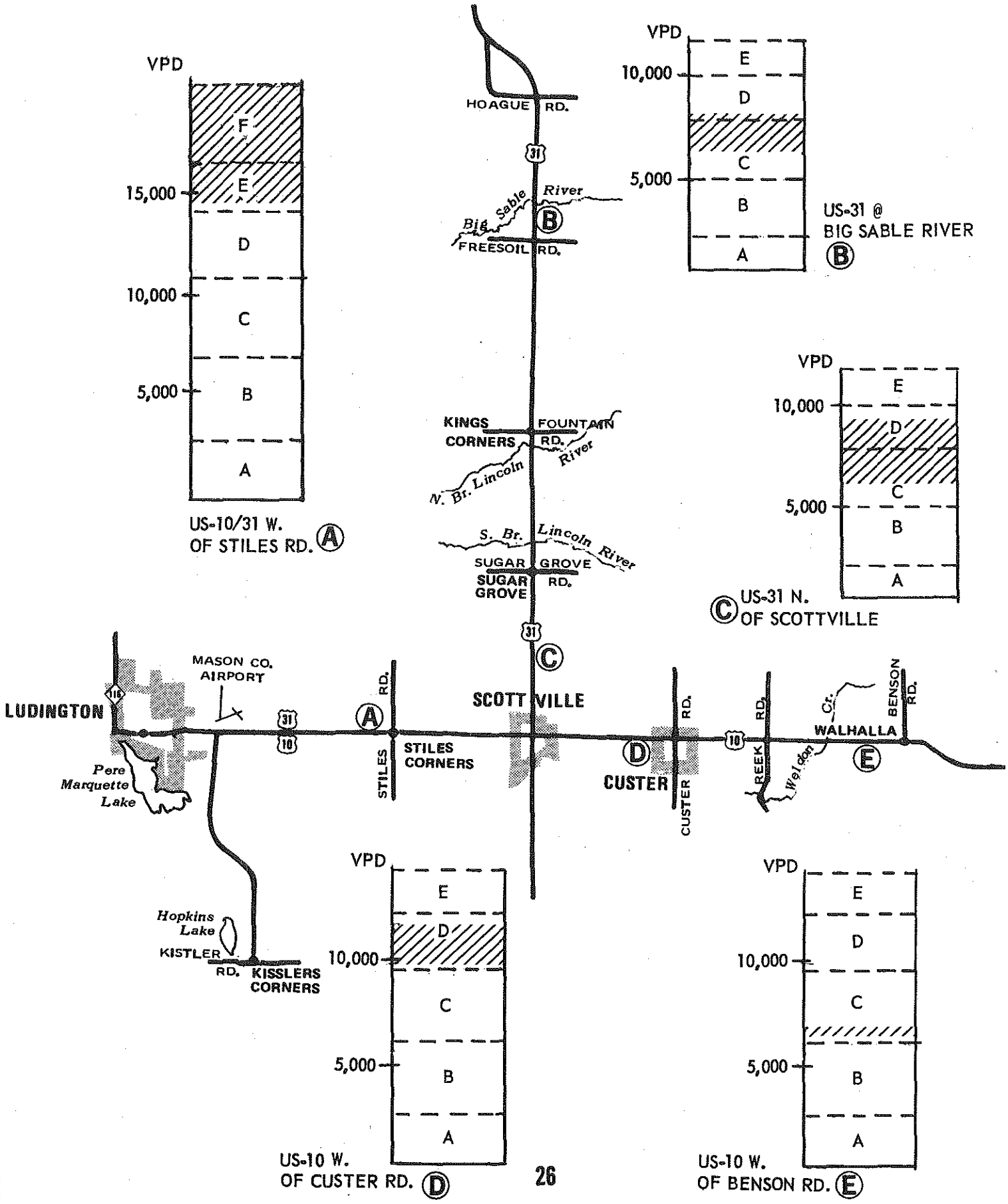
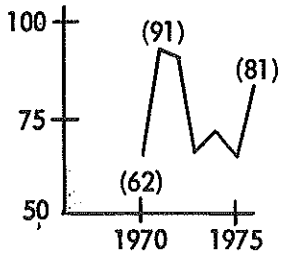
9 Accident rate does not include accidents in Kent, Macomb, Saginaw, and Wayne Counties.

FUTURE LEVEL OF (TRAFFIC) SERVICE RANGE

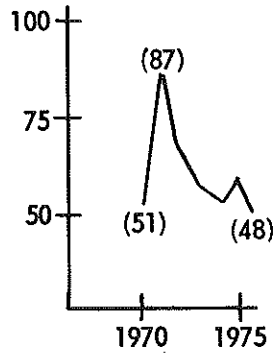


ACCIDENT HISTORY
1970 – 1976

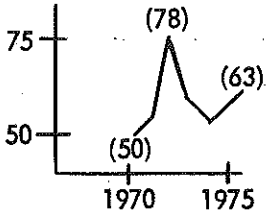
	US 10/31	US 31	US 10
1970	62	51	50
1971	91	87	53
1972	87	64	78
1973	63	55	58
1974	69	53	54
1975	63	58	47
1976	81	48	63
	516	416	413



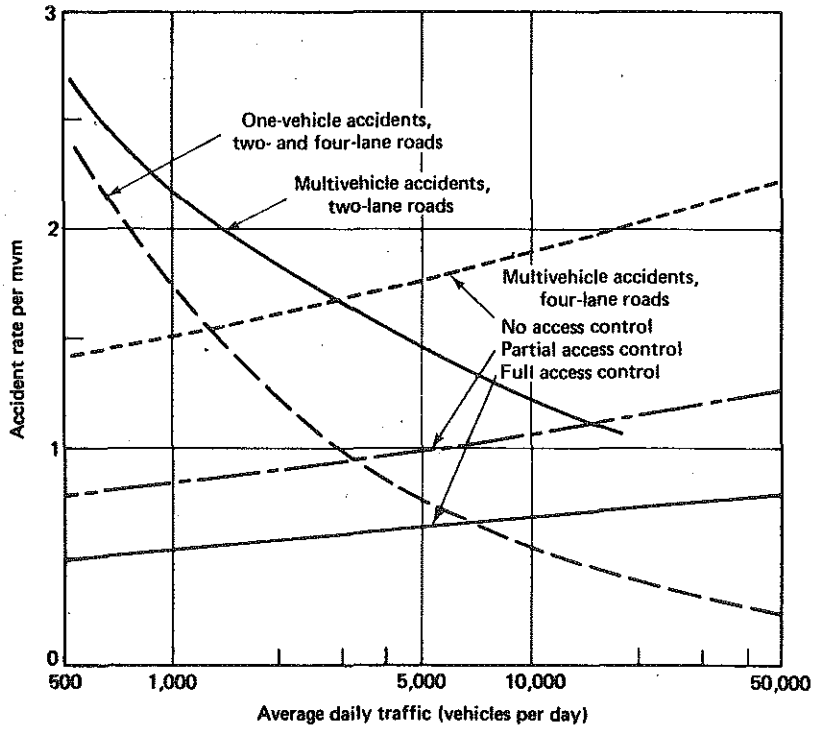
US-10/31
6.8 MILES



US-31: SCOTTVILLE TO
N. COUNTY LINE
15.8 MILES



US-10: SCOTTVILLE TO
E. COUNTY LINE
12.1 MILES



RELATIONSHIP BETWEEN AVERAGE DAILY TRAFFIC AND ACCIDENT RATES

SOURCE: Traffic and Transportation Engineering Handbook, Institute of Traffic Engineers, Third Edition, 1976

1976 ACCIDENT

COMPARATIVE ANALYSIS

	US-10/31		US-31				US-10	
	US-31 S. to Stiles Rd.	Stiles Rd. to US-31 N.	US-10 to Sugar Grove	Sugar Grove to Fountain	Fountain to Hoague	Hoague to N. Co. Line	US-31 to Custer Rd.	Custer Rd to Benson
Length-Miles	3.74	3.03	3.34	3.00	7.10	2.09	3.03	4.94
Average Daily Traffic	10,400	9,000	4,400	3,600	3,600	3,600	5,300	3,600
Accidents	47	34	20	13	10	5	34	12
Vehicle Involvements	75	54	29	21	14	6	62	13
Killed	0	2	0	2	1	1	0	0
Injured	21	11	14	8	8	1	13	4
No-injury Accidents	33	26	11	8	6	4	25	10
RATES								
Accidents/Mile	13.54	11.22	5.99	4.33	1.41	2.39	11.22	2.43
Involvements/Mile	20.05	17.82	8.68	7.00	1.97	2.87	20.46	2.63
Accident Rate	331	342	373	330	107	182	580	185
Involvement Rate	530	543	541	534	150	218	1,056	199
Estimated Cost ($100,000)*	1.06	2.13	0.53	1.95	1.12	0.87	0.56	0.18
Injury Rate	148	111	261	203	86	36	218	62
RANKING								
Accidents	1	2.5	4	5	7	8	2.5	6
Involvements	1	3	4	5	6	8	2	7
Costs	4	1	7	2	3	5	6	8
Accidents/Mile	1	2.5	4	5	8	7	2.5	6
Involvement/Mile	2	3	4	5	8	6	1	7
Accident Rate	4	3	2	5	8	7	1	6
Involvement Rate	5	2	3	4	8	6	1	7
Injury Rate	4	5	1	2	6	8	3	7
Total	22	22	29	33	54	55	19	54

TABLE 7

* Costs of Accidents (1972 dollars) at $82,000 per death, $3,400 per injury, and $460 per no-injury accident.
Source: Transportation and Traffic Engineering, Handbook, Institute of Traffic Engineers, 1976.

two subsections of US-10/31 and the subsection of US-10 between US-31 and Custer Road. The two subsections of US-31 from US-10 to Fountain Road are in a second grouping that also can be identified as an area where accidents are reaching a magnitude for concern.

Another element that should be considered when examining accident records is the type of accidents occurring along a segment of highway. Table 3 presents the type of accidents that occurred along US-10/31, US-31 and US-10 during 1976. According to the 1973 Analysis of State Highway Accident Facts, published by the Traffic and Safety Division, Michigan Department of State Highways and Transportation, a good indication of relative congestion or deficient capacity on a roadway is exhibited by the number of rear end and left turn collisions. These two types of accidents accounted for 28 and 27 percent of the US-10/31 and US-10 accidents, while US-31 had 19 percent recorded in 1976. This indicates that US-10/31 and US-10 capacity problems are beginning to be reflected in the type accidents that are occurring.

A similar comparison can be made in relation to the number of accidents with the time of day and the day of the week. Table 4 lists 1976 accidents for US-10/31, US-31 and US-10 in three hour intervals and whether they occurred on a weekday or weekend. This limited information is not conclusive evidence of a particular traffic situation, however, the data does provide some indicators. A majority of the accidents along US-10/31 occurred on weekdays while US-31 north of Scottville had a majority of occurrences recorded on weekends. Accidents along US-10 were evenly divided between weekdays and weekends. In all three situations, the predominance of occurrence is between the three hour intervals starting at 9:00 A.M. and ending at 9:00 P.M.

The differentiation between weekday and weekend accidents provides a means of determing when there is a propensity for an accident and thereby indicates the period during the week when traffic volumes are predominant. From the information above, US-31 appears to be the vacation/weekend trip route whereas US-10/31 simulates a route with heavy daily traffic and US-10 has an equal mixture. Obviously the travel on US-10 and US-31 are contributors to the US-10/31 situation.

Public Transportation Service

There are two levels of public transportation service in Mason County which serve local and inter-city travel. Long-distance inter-city travel is served by North Star Bus Lines with one round trip per day.

The southbound trip is available each day at 12:15 P.M. and has major terminal points at Muskegon and Holland. By way of transfer at Holland, southbound trips can be continued to St. Joseph-Benton Harbor and to Chicago, Illinois. Northbound trips depart Ludington daily at 7:40 P.M. This route extends to Sault Ste. Marie by way of Manistee, Frankfort, Traverse City, Petoskey, Mackinaw City and St. Ignace.

An inter-city bus survey was conducted by the Michigan Department of State Highways and Transportation during May, 1977. This survey indicated that

ACCIDENT TYPES

1976

	US-10/31		US-31		US-10		TOTAL	
	#	%	#	%	#	%	#	%
Fixed Object	10	(12)	10	(21)	5	(8)	25	13
Rear End	18	(22)	7	(15)	7	(11)	32	16
Head On	8	(10)	3	(6)	2	(3)	13	7
Left Turn	5	(6)	2	(4)	10	(16)	17	9
Right Turn	3	(4)	3	(6)	4	(6)	10	5
Angle	3	(4)	1	(2)	1	(2)	5	3
Parked/Parking Vehicle	14	(17)	8	(17)	11	(17)	33	17
Overturn	4	(5)	2	(4)	3	(5)	9	5
Pedestrian	1	(1)	2	(4)	1	(2)	4	2
Animal	15	(19)	8	(17)	18	(29)	41	21
Other	0	(0)	2	(4)	1	(2)	3	2
Total	81		48		63		192	
% of Total		42		25		33		

Source: General Accident Program: Traffic and Safety Division, Michigan Department of State Highways and Transportation

TABLE 3

ACCIDENTS BY TIME OF DAY/WEEKDAY OR WEEKEND

1976

	US-10/31		US-31		US-10		TOTAL		
	Mon. Thurs.	Fri. Sun.	Mon. Thurs.	Fri. Sun.	Mon. Thurs.	Fri. Sun.	Mon. Thurs.	Fri. Sun.	TOTAL # %
12:00 a.m. 3:00	1	1	3	5	1	3	5	9	14 (7)
3:00 6:00	2	0	1	3	1	0	4	3	7 (4)
6:00 9:00	5	2	1	1	5	4	11	7	18 (9)
9:00 12:00	13	8	3	2	5	4	21	14	35 (18)
12:00 p.m. 3:00	5	4	3	3	5	7	13	14	27 (14)
3:00 6:00	8	7	6	8	6	5	20	20	40 (21)
6:00 9:00	9	4	2	2	6	7	17	13	30 (16)
9:00 12:00 a.m.	5	7	1	4	2	2	8	13	21 (11)
TOTAL	48 % (59)	33 % (41)	20 % (42)	28 % (58)	31 % (49)	32 % (51)	99 % (52)	93 % (48)	
	81		48		63		192		192

Source: General Accident Program, Traffic and Safety Division, Michigan Department of State Highways and Transportation

TABLE 4

50 percent of the travelers interviewed were traveling to visit friends or for personal business. Vacation trips comprised only 7 percent of all the trips taken statewide.

Although daily ticket sales were not monitored at the Ludington terminal, results from other cities in northwest Michigan would indicate the trend of inter-city bus ridership. Table 5 indicates that during the week of May 9 through 15 the average daily ticket sales was the highest at Traverse City with 20.4 tickets sold whereas the lowest was at Frankfort with 0.3 tickets sold. Table 6 lists the weekly ticket sales at these same stations for the month of May. This table indicates that with the exception of the City of Cadillac, there was little fluctuation in the weekly ticket sales, thereby illustrating that the average daily trips should not fluctuate extensively.

The ticket sales listed in the previous tables only account for trips that originated from the cities in northwest Michigan. It must be assumed that trips destined for these cities or round-trip travelers would constitute an equal amount of inter-city travel. In the case of Traverse City this would mean that nearly 40 bus passengers embark or disembark daily at this terminal. Since Traverse City has the largest volume of inter-city bus passengers it must be assumed that Ludington volumes do not exceed this number. This assumption is substantiated by Exhibit 16 which depicits the 1972 average daily bus passengers on Michigan bus routes. The bus route which enters Ludington is shown to have had volumes that did not exceed 20 passengers per day.

The potential for increased bus passenger ridership does not appear promising. Table 7 lists the 1968 to 1972 statewide bus ridership along with the 1972 to 1975 ridership. The average annual decrease between 1968 to 1972 was 4.0 percent, whereas the 1972 to 1975 average annual decline was 8.4 percent. This latter reduction in ridership is even more significant in that it occurred during the period of the energy crisis. These figures would indicate that inter-city bus passenger service has had and probably will continue to have little impact on traffic diversion through the US-10/31 corridor.

The second level of public transportation that should be considered, even though it currently does not affect US-10/31 traffic, is the Ludington Dial-a-Ride System. This system served 65,608 passengers during the fiscal year ending September, 1976. This ridership equals 24.4 daily passengers per 1,000 population in the service area. In comparison, the average daily ridership per 1,000 population for the 20 Michigan communities between 5,000 and 50,000 was 15.7 passengers.[10] This indicates that the residents of Ludington utilize their public transportation system and probably would support a county-wide system.

Michigan had seven county-wide systems in operation as of January 1, 1977. Two contiguous counties, Manistee and Lake, have recorded the highest daily ridership average per 1,000 population with 12.9 and 15.9 riders, respectively. In

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[10] See Appendix G for the list of public transportation characteristics in the 20 Michigan communities.

Intercity Bus Survey - Daily Ticket Sales, May 1977

Station	Monday May 9	Tuesday May 10	Wednesday May 11	Thursday May 12	Friday May 13	Saturday May 14	Sunday May 15	Total	Average
Big Rapids	7	11	5	7	6	8	-0-	44	6.3
Cadillac	24	-0-	-0-	35	-0-	-0-	-0-	59	8.1
Frankfort	2	-0-	-0-	-0-	-0-	-0-	-0-	2	0.3
Manistee	1	3	3	1	-0-	2	2	12	1.7
Petosky	8	1	2	5	5	5	2	28	4.0
Traverse City	35	10	20	23	20	12	23	143	20.4
	77	25	30	71	31	27	27	288	40.8

NOTES: 1/Station is not open on Sundays. Passengers buy tickets from driver.
2/Monday and Tuesday surveys conducted on June 6 and June 7 respectively. Wednesday through Sunday surveys are for June 1 through June 5 respectively.

Source: Ridership and travel characteristics ... Michigan Intercity Bus Study, Michigan Department of State Highways and Transportation, November,1977

TABLE 5

Intercity Bus Weekly Sales - Selected Smaller Stations, May 1977

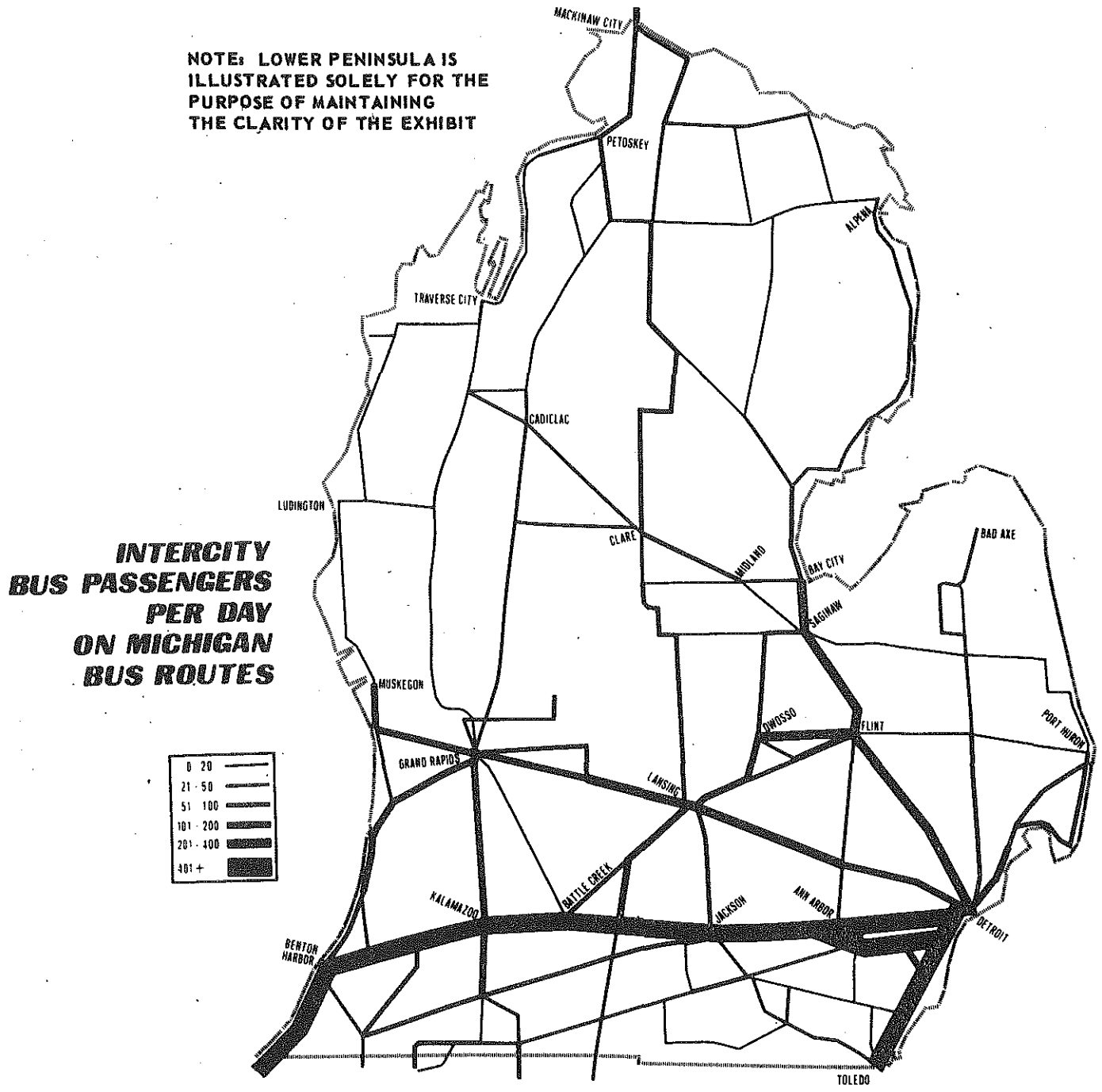
Station	May 2 - 8	May 9 - 15	May 16 - 22	May 23 - 29	TOTAL
Cadillac	39	59	91	35	224
Frankfort	3	2	7	7	19
Manistee	18	12	8	14	52
Petoskey	22	28	28	28	106
Traverse City	168	143	107	142	560
	250	244	241	226	961

Source: Ridership and Travel Characteristics ... Michigan Intercity Bus Study, Michigan Department of State Highways and Transportation November, 1977

TABLE 6

1972 LOWER PENINSULA INTERCITY BUS VOLUMES

NOTE: LOWER PENINSULA IS ILLUSTRATED SOLELY FOR THE PURPOSE OF MAINTAINING THE CLARITY OF THE EXHIBIT



SOURCE: MICHIGAN INTERCITY BUS STUDY - PHASE 1, INVENTORY AND ANALYSIS; MDSH&T, JULY, 1974

Intercity Regular Route Passengers; Selected Carriers

Company	1968	1972	% Change 68 - 72	1975	% Change 72 - 75
Greyhound (Michigan)	2,632,193	2,161,638	-17.9%	1,666,166	-22.9%
Indian Trails	351,504	333,386	- 5.1%	270,874	-18.7%
North Star	136,634	207,682[1/]	+52.0%	177,469	-14.5%
Short Way	310,465	179,213[1/]	-42.3%	40,320	-77.5%
TOTAL[2/]	3,430,796	2,881,919	-16.0%	2,154,829	-25.2%

SOURCE: Michigan Department of Commerce, Public Service Commission. Greyhound data was obtained from Greyhound Lines, Inc., and only includes Michigan information.

1/ North Star took over selected Short Way routes in 1972.

2/ The average annual decrease in total passengers from 1968 to 1972 was 4.0 percent. The average annual decrease in total passengers from 1972 to 1975 was 8.4 percent.

TABLE 7

1970, Mason County had a rural population of 13,591. If the population - ridership ratio for Manistee and Lake Counties are applied to the Mason County rural population a daily ridership of 175 to 216 passengers could be expected. If these passengers were diverted from daily auto trips, this sum would not subtantially affect travel in the US-10/31 corridor.

It can be safely concluded that public transportation does not and probably will not affect the vehicular flow in the US-10/31 corridor to the extent that it will relieve the current capacity deficiency.

POSSIBLE FUTURE ALTERNATIVES

The preceding pages have outlined the planning history and decision making which have preceded this study and which are responsible for triggering this study. The fact that problems exist along US-10/31 today and will intensify with traffic growth is cause for an evaluation of alternatives which may resolve some or all of the problems along US-10/31. Listed below are several generalized transportation alternatives that will need to be considered by the Location Study Team. An initial evaluation of these alternatives will reduce them to a group of practical alternatives which will receive detailed social, economic, and environmental assessment. From these practical alternatives will come the action which the Michigan Department of State Highways and Transportation will determine as the most feasible for the situation and one which will provide the greatest benefit to the public. The generalized alternatives for evaluation are:

Alternate 1: Do Nothing

This alternative would limit improvements along US-10/31, and where needed along US-31 and US-10, to maintenance of the existing facility. This would not include capacity or safety improvements to the roadway. This alternative is the base for the evaluation of all other alternatives.

Alternative 2: Low Capital Improvement

This alternative considers improvements to existing US-10/31, and to US-31 and US-10, which would involve minimal expenditures of revenue. This could include intersection widenings, acceleration-deceleration lanes at major land development sites, and signalization. This alternative primarily would permit a more orderly flow of traffic as the demand increases, but would not necessarily increase or improve the capacity and safety as traffic volumes increase.

Alternative 3: Major Reconstruction of the Existing Facility

This alternative poses several design options which could be implemented along the existing US-10/31, US-31 and US-10 alignments. This could include a five lane roadway or a four lane boulevard design. It may also include the purchase of access rights or right-of-way in locations where restriction or prohibition of access may be beneficial to the operations of the roadway.

Alternative 4: Construction of a Facility on New Location

This alternative considers the effect of constructing a completely new and

relocated facility. The design type may range from a two lane free access facility to a four lane freeway. Examples of some possible corridors are illustrated on Exhibit 17.

Alternative 5: Modal Diversion of Travel Demand

This alternative considers the magnitude of demand and service that will be necessary in order to permit public transportation to serve as the solution to the existing and future traffic problem.

Issues

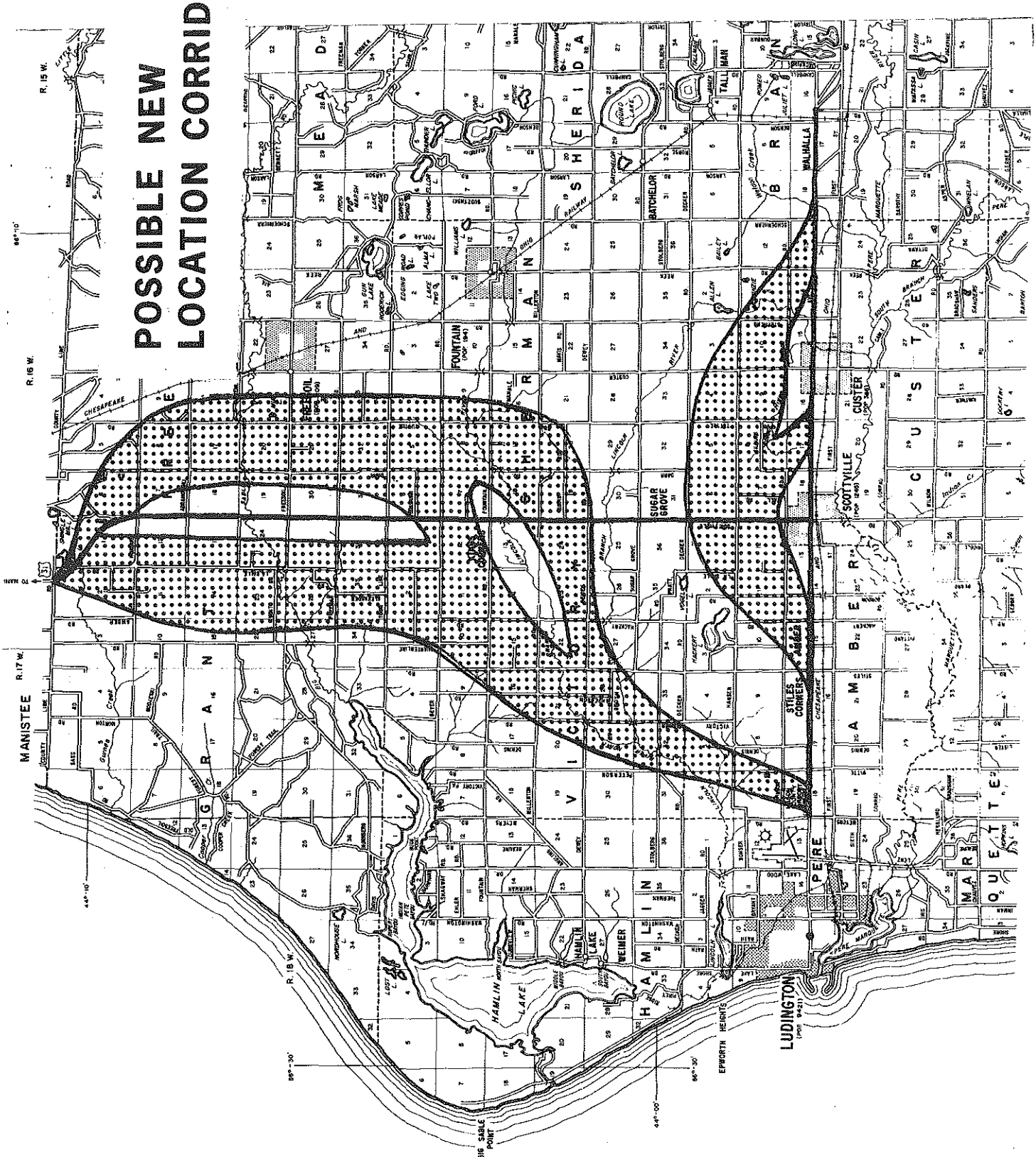
In the development of major highway projects in which the relocation of the facility is being considered, several issues pertaining to land use, economic development, environmental protection and transportation usually arise. The future of US-10/31 raises some issues which will need evaluation within the Environmental Impact Statement. These issues include, but are not limited to:

1. Is the extention of US-31 Freeway essential in order to provide a safe and efficient traffic facility.

2. Would unavoidable, if any, environmentally sensitive areas in Northern Mason County be of such importance that they should prohibit the possible relocation of a U.S. highway which has statewide and national significance.

3. Is the loss of total economic activity greater from relocation or will the increase in traffic along existing alignments cause a decline in the quality of economic activities along existing roadways.

Public reaction to these issues as well as many others will be solicited at the Pre-Study Meeting, Public Hearing, and any other public meetings or workshops which may be held to resolve the US-10/31 traffic problem.


POSSIBLE NEW
LOCATION CORRIDORS
MANISTEE
MANISTEE COUNTY
GRAND TRAVERSE COUNTY
WEXFORD COUNTY
MISSAUKEE COUNTY
OSCEOLA COUNTY
LAKE COUNTY
MASON COUNTY
OCEANA COUNTY
NEWAYGO COUNTY
MECOSTA COUNTY
OSCODA COUNTY
CRAWFORD COUNTY
OTSEGO COUNTY
MONTMORENCY COUNTY
ALPENA COUNTY
ALCONA COUNTY
IOSCO COUNTY
ARENAC COUNTY
BAY COUNTY
GLADWIN COUNTY
GRATIOT COUNTY
CLARE COUNTY
ISABELLA COUNTY
MIDLAND COUNTY
GENESEE COUNTY
SAGINAW COUNTY
TUSCOLA COUNTY
HURON COUNTY
SANILAC COUNTY
LAPEER COUNTY
SHIAWASSEE COUNTY
GENESEE COUNTY
OAKLAND COUNTY
MACOMB COUNTY
ST. CLAIR COUNTY
LIVINGSTON COUNTY
WASHTENAW COUNTY
MONROE COUNTY
WAYNE COUNTY
R. 15 W.
R. 16 W.
R. 17 W.
R. 18 W.
FREESOIL
FOUNTAIN
SUGAR GROVE
SCOTTVILLE
CUSTER
STILES CORNERS
HAMLIN LAKE
WEIMER
LUDINGTON
PERE MARQUETTE
EPWORTH HEIGHTS
BIG SABLE POINT
CHESAPEAKE AND OHIO RAILWAY
TO MANI
31

APPENDICES

APPENDIX A

FUNCTIONAL CLASSIFICATION

APPENDIX A

FUNCTIONAL CLASSIFICATION DEFINITIONS

STATEWIDE ARTERIALS

The primary function of Statewide Arterial Highways is to provide the highest level of traffic mobility available on the total highway system. These provide direct and unrestricted routings between major metropolitan centers and principally serve movements between rather than within activity areas. These are generally located in widely spaced corridors of concentrated travel desire and are characterized by: High capacity design thereby facilitating sustained high speeds; minimal ingress and egress; and, continuity of routing for regional or interregional travel movements. These facilities should serve the longest trip desires in an expeditious manner. These should also link and serve major sections of metropolitan areas, carrying a majority of the total arterial travel on a minimum mileage with the highest degree of service. This system of highways should include all sections of the Interstate Highway System.

REGIONAL ARTERIALS

Regional Arterial Highways interconnect and augment the Statewide Arterial Highways, forming a continuous, high-mobility network of highways which will efficiently serve major travel desires in all areas of the state. A primary function is to interconnect major population and economic activity centers not served by Statewide Arterial Highways. These highways also provide service to other large areas of special interest and recreation areas which generate or attract a substantial amount of traffic, occasionally subordinating directness of routing in order to perform this secondary function. However, these offer a high degree of trip continuity either alone or as an extension of the Statewide Arterial System.

LOCAL ARTERIALS

Streets in this classification provide service to trips of moderate length at a somewhat lower level of travel mobility than the major arterials. They distribute travel within geographic areas which are smaller than those identified with the higher systems. Local Arterials include those facilities which service a secondary arterial function at the local level, placing more emphasis on land access than the higher systems and offering a lower level of traffic mobility. They also provide service between smaller cities and connect these cities with the higher arterial systems. They should not, however, penetrate identifiable neighborhoods.

Source: Functional Highway Classification for 1970 Needs Study, Michigan Department of State Highways.

APPENDIX B

URBAN PLACE CLASSIFICATION

APPENDIX B

URBAN PLACE CLASSIFICATION DEFINITION

1. Metropolitan Center

   A place which offers complete market, service distribution, financial, professional and health facilities for a large trade area, and which individually services as one of the major elements in the State's economic structure.

2. Regional Center

   A place which has characteristics similar to a Metropolitan Center, only on a substantially lesser scale. Individually these also may be outstanding in one or more economic categories, such as manufacturing, processing, or Great Lakes shipping.

3. District Center

   A place which offers extensive market, service, health, and professional facilities to its trade area, and may be considered a minor banking and distributing center. Individually a District Center may also be important because of a commercial airport or Great Lakes port facility.

4. Area Center

   A place which offers essential market and service facilities to a limited trade area, or which is a County Seat of Government. It should also offer limited health and professional service.

5. Special Interest Center

   A place which may offer limited market or other services to a small localized area, but which is important chiefly as (a) a center of recreational or cultural activity, (b) the seat of an institution or educational plant, or (c) a terminal point, or "most distant point" graphically.

Source: Highway Classification in Michigan, Transportation Planning Division, Michigan Department of State Highways, 1967.

APPENDIX C

RESOLUTIONS

RESOLUTION

Regarding US-10 in Mason County

To:

John Woodford, Director MDSH&T

Peter Fletcher, State Highway Commission

Hannes Meyers, State Highway Commission

Carl Pellonpaa, State Highway Commission

Weston Vivian, State Highway Commission

Governor William Milliken

Area Legislators

WHEREAS, the West Michigan Regional Planning Commission is vitally concerned with transportation problems in West Michigan; and

WHEREAS, Officials in Mason County are highly interested in seeking a solution to the potentially long term problem of severe traffic congestion on US-10 due to the planned abrupt termination of the US-31 freeway facility; and

WHEREAS, the Michigan Department of State Highways and Transportation (MDSH&T) has jurisdictional responsibility for the improvement and maintenance of the US-31 freeway facility and US-10, but has yet to fully address the problem in Mason County mentioned above;

THEREFORE, BE IT RESOLVED, the West Michigan Regional Planning Commission requests that the Michigan Department of State Highways and Transportation work with appropriate officals in Mason County to develop a mutually agreeable solution to the problem as soon as possible, but certainly prior to construction of the freeway in Mason County.

4/15/77

Date

Harold Dekker, Chairman
West Michigan Regional Planning Commission

June 14, 1977

TO: John T. Woodford
Director - Michigan Dept. of State Highways & Transportation
Engineering - Route Location Division

Re: U.S. 31 Freeway Termination Point in Mason County

FROM: City of Scottville Planning Commission

Dear Sir:

The Scottville City Planning Commission has discussed the referenced subject in past monthly meetings. Our main concern is the additional traffic routed through an already congested area containing a rather difficult, route-turning intersection of our small city. Generally, our commission has formulated a resolution containing several significant points which are consistant with the long range planning in our area.

The following outlined recommendations are submitted by our group for your valued considerations:

1. Extend proposed U.S. 31 N traffic exit (termination) point to Fountain Road - 6 miles North of Scottville or other road in vicinity:
    a. Requires improving county road - 2 or 3 miles;
    b. could be permanent termination point at U.S. 31 - 10 years (or more) depending on budgeting problems, right-of-ways, etc.
2. Improve existing U.S. 10 & 31 route into Scottville only as necessary to accommodate long range U.S. 10 and local traffic in the area:
    a. include 3 lane width at intersections for left turns and deceleration lanes as required;
    b. no room for 4 or 5 lanes - or requirement for same with U.S. 31 traffic removed from our area.

3. Provide U.S. 10 & 31 N route bypass north around Scottville limits if Proposed Freeway termination point remains unchanged at existing U.S. 10 & 31:

    a. short range solution - may not be required in future;

    b. must be positive consideration - without a bypass traffic which is already heavy could become dangerously congested at our Main & State Street intersection.

Finally, our representative and spokesman, Mr. Jeff Dongvillo - Vice Chairman, Scottville Planning Commission will convey our collective thoughts as outlined above. Furthermore, we join other agencies in the Mason County area in committing our support to these ends.

Respectfully Yours,

Dean A. Archer gp

Dean A. Archer
Chairman - Scottville City Planning Commission

APPENDIX D

STRATEGY FOR DEVELOPING

ALTERNATIVE TRANSPORTATION NETWORKS

Revised
3-24-77

STRATEGY FOR DEVELOPING ALTERNATIVE TRANSPORTATION NETWORKS

A major objective of Regional Transportation Studies is to develop a range of transportation alternatives that reflect the Department's total transportation responsibilities. To accomplish this task, the Northwest Study has recognized two principle considerations that will strongly affect transportation plans for the future. These are the availability of liquid fuels and the continuing changes in settlement patterns of the population. Both fundamentally lie outside the control of transportation planning and policymaking. In any event, both will occur independently unless public policy more consciously attempts to relate them.

The availability of liquid fuels, either in the form of synthetic substitutes or in the discovery of new resources, will define the cost and much of the character of future transport services. This energy related issue was of little concern in past planning efforts due to an abundance of relatively inexpensive fuel. However, in view of recent occurrences and the uncertainty of future energy supplies, it is imperative that this study consider future transportation system needs in terms of varying levels of energy availability. A range of possible transportation networks have therefore been developed based upon "abundant", "conserved" and "restricted" energy supplies.

Changes in settlement patterns, including declining urban densities, suburbanization and rural migration, with accompanying changes in population size and lifestyle will also significantly affect the character of demand for transportation services in the future. In this study, these traditional factors are incorporated into a range of "low", "medium" and "high" growth trends.

Figure 1 illustrates the basic planning concept adopted by the Northwest Regional Transportation Study. The nine alternative futures represent possible variations of the energy supply and growth trend factors. Each sample network shown is derived from the premise that:

1. The availability of future "energy supplies" determines the <u>type</u> of transportation mode to be developed, and

2. The amount and location of future "growth" determines the <u>extent</u> of transportation services.

In reviewing the various alternatives you will find that a 100% increase in the region's seasonal or permanent population would generate a "high" growth condition. In the "abundant" energy future this would produce a large increase in the travel demand that is auto oriented. This future is intended to portray a continuance of past travel and development trends. Therefore, the resulting transportation network reflects extensive highway improvements.

The "conserved" energy future implies a condition where transportation costs have increased to a level that causes some change in travel habits. More people will form car pools or take a bus to work. Some people may be inclined to take fewer, but longer vacations or recreation trips. In general, people will be planning their trips more carefully. These changes would cause a reduction in the demand for some auto oriented travel. Although this would probably reduce the need for extensive highway improvements, many projects would still be required. These changes would also cause an increase in the demand for public transportation services like city, county, and intercity bus systems. Rail passenger service may also occur in some major travel corridors. Therefore, the resulting transportation network reflects a combination of highway and transit improvements.

The "restricted" energy future implies a condition where fuel allocation piograms will be in affect. This condition would have a significant impact on lifestyles and probably severely reduce certain types of auto oriented travel. Auto free zones would become more frequent with transit taking on a more significant role in urban areas. Therefore, the resulting transportation network reflects extensive improvements in the non-auto transportation modes.

The "medium" growth condition can be represented by a 50% increase in the region's population. As a comparison, the Bureau of Management and Budget now forecasts a 60% increase for this region's year 2000 population. As previously mentioned, the resulting transportation networks would be dependent on the corresponding energy futures.

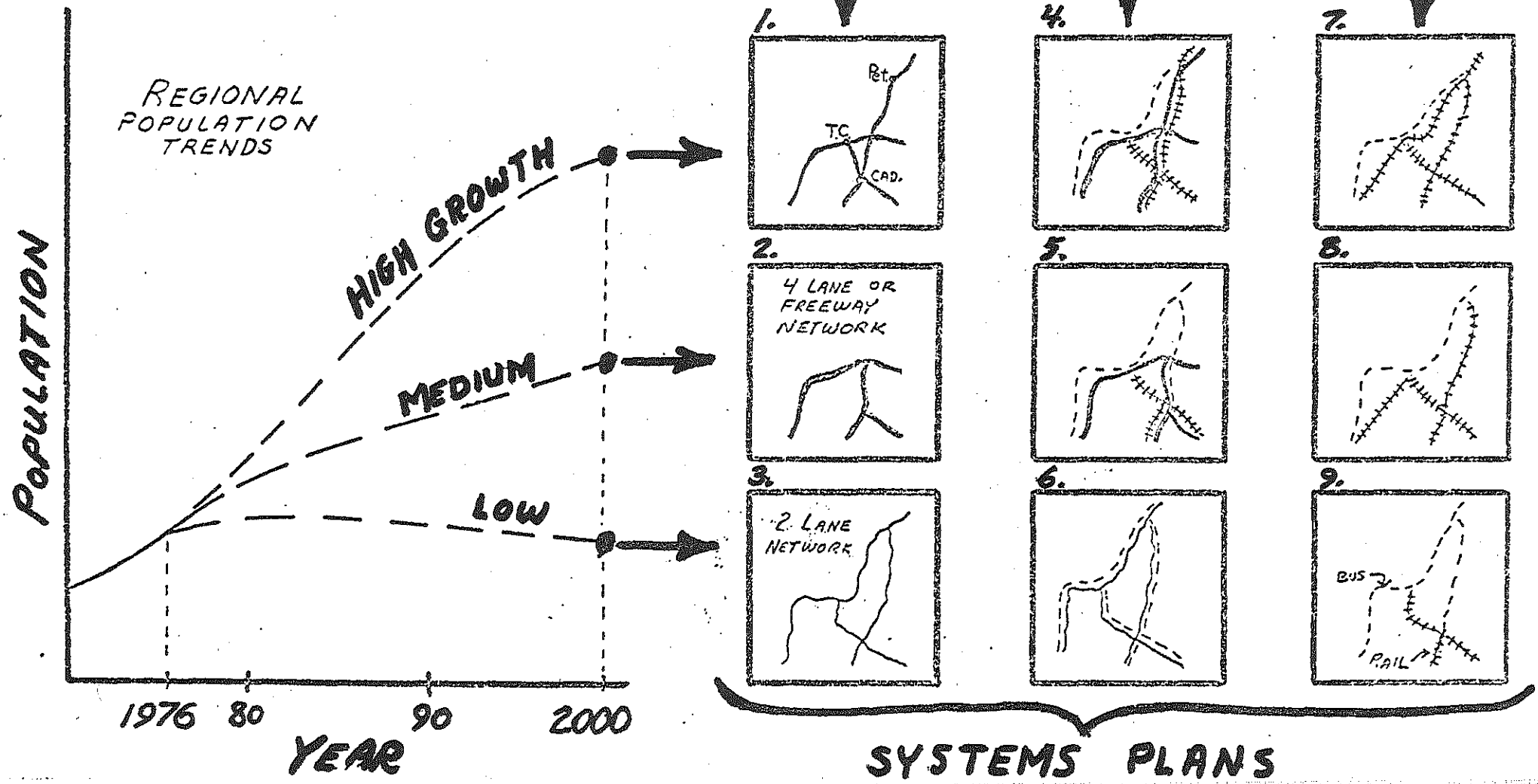
The "low" growth condition represents a 10-20% increase in population or slightly greater than that existing today. For an "abundant" energy future, some highway improvements would be required but not very extensive. The existing highway system could be upgraded with some urban by-passes. For the "conserved" and "restricted" energy futures, only minor highway improvements would be required. However, transit improvements would certainly receive increased emphasis in even the smaller urban areas.

In the regional study we are looking beyond the initial effects of an energy shortage. We believe that our society's desire for high mobility will demand transportation services that are far greater then the essentials. For example, tourism plays a significant role in our State's economy. Thus, the potential affects of allowing a reduction of recreational travel would be disastrous to our out-state regions. We believe that strong governmental transportation programs will be implemented to sustain recreation or any other travel that is essential to maintaining a sound economy. Therefore, our planning efforts should concentrate on developing efficient transportation networks that will provide this desired mobility.

FUTURE ENERGY SUPPLY

FIGURE 1

	ABUNDANT	CONSERVED	RESTRICTED
MAIN TRAVEL MODE....	AUTO	AUTO/TRANSIT	TRANSIT
ENERGY COSTS.....	CHEAP	COSTLY	EXPENSIVE
HOUSING + INDUSTRIAL DEVELOPMENT PATTERNS...	SPARSE	CONTROLLED	CONCENTRATED



Alternative 1--The high growth, abundant energy future

A. Description

This future assumes that sufficient energy will be available. New technologies and expansion of existing sources will provide an abundant energy supply. Population growth will occur at a rate above recent trends levels. A sound economy will exist with minor governmental influence. Development patterns will be scattered and lifestyles will reflect affluent, suburban living typical of today's mobile society. More leisure time will result from a shorter work week.

B. Transportation Implications

1. With increases in population, travel demand will increase significantly.
2. Recreation travel will increase proportionally with population levels and as a result of more leisure time.
3. With abundant energy, the automobile will remain the dominant mode of transportation.
4. Trucks will provide primary freight service.
5. Rail service will be limited to bulk cargo operations.

C. Necessary Transportation Actions (commensurate with anticipated growth)

Air

1. Increase airport capacity (Terminals, runways, navigational aids, gates, parking etc.)
2. Increase frequency of service for air carrier operations.

Bus

1. Provide "essential" public transportation service to all citizens. (permits access to necessities such as food, health care and human service programs).

2. Maintain "basic" public transportation service (includes "essential" service plus permits access to employment and educational opportunities) to all major urban areas (Class 1 & 2).

Highways

1. Increase capacity of existing arterial highway system.

2. Increase capacity on major routes serving recreation areas.

3. Increase capacity on existing collector and feeder routes.

4. Improve highway accessibility to newly developed areas by expanding system of collector and feeder routes.

5. Maintain an adequate highway connection to port and rail facilities.

6. Provide for separation of through and local traffic when additional capacity is needed on arterial routes in Class 1, 2 & 3 cities.

Ports

1. Maintain essential port facilities.

Rail

1. Maintain essential rail freight and passenger operations between major urban areas (Class 1 & 2-population 100,000)

2. Maintain essential rail freight between other Class 1, 2 & 3 centers.

Non-Motorized

1. Provide appropriate facilities for primarily recreation uses.

Alternative 2--The medium growth, abundant energy future

A. Description

This future assumes that sufficient energy will be available. New technologies and expansion of existing sources will provide an abundant energy supply. Population growth rates will remain consistent with recent trends. A sound economy will exist with minor governmental influence. Development patterns will be scattered and lifestyles will reflect affluent, suburban living typical of today's mobile society. More leisure time will result from a shorter work week.

B. Transportation Implications

1. With increases in population, travel demand will moderately increase.
2. Recreation travel will increase proportionally with population levels and as a result of more leisure time.
3. With abundant energy, the automobile will remain the dominant mode of transportation.
4. Trucks will provide primary freight service.
5. Rail service will be limited to bulk cargo operations.

C. Necessary Transportation Actions (commensurate with anticipated growth)

Air

1. Increase airport capacity (Terminals, runways, navigational aids, gates, parking etc.)
2. Increase frequency of service for air carrier operations.

Bus

1. Provide "essential" public transportation service to all citizens. (permits access to necessities such as food, health care and human service programs).

2. Maintain "basic" service (includes "essential" service plus permits access to employment and educational opportunities) to all major urban areas (Class 1 & 2).

Highways

1. Increase capacity of existing arterial highway system.

2. Increase capacity on major routes serving recreation areas.

3. Increase capacity on existing collector and feeder routes.

4. Improve highway accessibility to newly developed areas by expanding system of collector and feeder routes.

5. Maintain an adequate highway connection to port and rail facilities.

6. Provide for separation of through and local traffic when additional capacity is needed on arterial routes in Class 1, 2 & 3 cities.

Ports

1. Maintain essential port facilities.

Rail

1. Maintain essential rail freight and passenger operations between major urban areas (Class 1 & 2 population 100,000)

2. Maintain essential rail freight between other Class 1 & 2 centers.

Non-Motorized

1. Provide appropriate facilities for primarily recreation uses.

Alternative 3--The low growth, abundant energy future.

A. Description

This future assumes that sufficient energy will be available. New technologies and expansion of existing sources will provide an abundant energy supply. Growth rates will decline, resulting in a population level only slightly above that of today. A sound economy will exist with minor governmental influence. Development patterns will be scattered and lifestyles will reflect affluent, suburban living typical of today's mobile society. More leisure time will result from a shorter work week.

B. Transportation Implications

1. Travel will experience a slight increase, commensurate with population growth.
2. Recreation travel will increase proportionally with population levels and as a result of more leisure time.
3. With abundant energy, the automobile will remain the dominant mode of transportation.
4. Trucks will provide primary freight service.
5. Rail service will be limited to bulk cargo operations.

C. Necessary Transportation Actions (commensurate with anticipated growth)

Air

1. Increase airport capacity to accommodate existing needs. (Terminals, runways, navigational aids, gates, parking etc.)
2. Increase frequency of service.

lternative 3--The low growth, abundant energy future (continued)

Bus

1. Provide "essential" public transportation service to all citizens. (permits access to necessities such as food, health care and human service programs).

2. Maintain "basic" public transportation service (includes "essential" service plus permits access to employment and educational opportunities) to all major urban areas. (Class 1 & 2).

Highways

1. Increase capacity of existing arterial highway systems to accommodate existing volumes of traffic at an acceptable level of service.

2. Increase capacity on major routes serving recreation areas where needed.

3. Increase capacity on existing collector and feeder routes where needed.

4. Improve highway accessibility to newly developed areas by expanding system of collector and feeder routes.

5. Maintain adequate highway connections to port and rail facilities.

6. Provide for separation of through and local traffic when additional capacity is needed on arterial routes in Class 1, 2 & 3 cities.

Ports

1. Maintain essential port facilities.

Rail

1. Maintain essential rail freight and passenger operations between major urban areas (Class 1 & 2-population 100,000)

2. Maintain essential rail freight between other Class 1 & 2 centers.

Non-Motorized

1. Provide appropriate facilities for primarily recreation uses.

Alternative 4--The high growth, conserved energy future.

A. Description:

This future assumes that the energy shortage is a long-term reality. Concern for this situation will become more apparent in daily operations. Population growth will occur at a rate above recent trend levels. A strong economy will prevail due to voluntary adjustments in the marketplace, influenced largely by governmental incentives. The realization of energy limitations will result in higher urban densities and corridor development patterns. Lifestyles will reflect an urban/suburban influence and will remain affluent and mobile. More leisure time will result from a shorter work week.

B. Transportation Implications

1. With increases in population, travel demand will increase moderately.
2. A greater emphasis will be placed on energy efficient forms of transportation.
3. Recreation travel demand will increase moderately. But recreational trips will be fewer than expected.
4. Public transportation will take on a greater role in commuter travel.
5. Higher vehicle occupancy will be encouraged.
6. Rail will assume more significance for long-haul freight operations.

C. Necessary Transportation Actions (commensurate with anticipated growth)

Air

1. Maintain adequate air carrier service to Class I cities or multi-county facilities.
2. Encourage higher occupancy use of aircraft
2. Maintain adequate facilities capacity.

Bus

1. Provide "basic" service ("essential" plus employment and education transportation) to all citizens.

2. Provide "intermediate" service ("essential" and "basic" plus social and recreation transportation) to major urban areas (Class 1 & 2).

3. Increase terminal capacities to accommodate additional modal transfers.

Highways

1. Increase capacity in and around urban areas.

2. Increase capacity on arterial routes between major urban centers (Class 1 & 2)

3. Increase capacity along principal routes serving primary recreation areas.

4. Provide an efficient system of collector and feeder highways.

5. Encourage higher vehicle occupancy.

6. Provide for separation of thru and local traffic when additional capacity is needed on arterial routes in Class 1, 2 & 3 cities.

7. Maintain adequate highway connections to port and rail facilities.

Ports

1. Maintain essential port facilities.

Rail

1. Increase freight operations on all major lines.

2. Provide rail passenger service to all Class I cities.

~~3. Provide sufficient terminal facilities to accommodate~~ modal transfers.

Non-Motorized

1. Expand facilities to accommodate increases in recreation uses and some commuter travel.

Alternative 5--The medium growth, conserved energy future

A. Description

This future assumes that the energy shortage is a long-term reality. Concern for this situation will become more apparent in daily operations. Population growth rates will remain consistent with recent trends. A strong economy will prevail due to voluntary adjustments in the marketplace, influenced largely by governmental incentives. The realization of energy limitations will result in higher urban densities and corridor development patterns. Lifestyles will reflect an urban/suburban influence and will remain affluent and mobile. More leisure time will result from a shorter work week.

B. Transportation Implications

1. With increases in population, travel demand will increase slightly.
2. Recreation travel demand will increase slightly. But recreational trips will be fewer than normally expected.
3. A greater emphasis will be placed on energy efficient forms of transportation.
4. Public transportation will take on a greater role in commuter travel.
5. Higher vehicle occupancy will be encouraged.
6. Rail will assume more significance for long-haul freight operations.

C. Necessary Transportation Actions (commensurate with anticipated growth)

Air

1. Maintain adequate air carrier service to Class 1 cities or multi-county facilities.
2. Encourage higher occupancy use of aircraft.
3. Maintain adequate facility capacity.

Bus

1. Provide "basic" service (essential" plus employment and education transportation) to all citizens.

2. Provide "intermediate" service ("essential" and "basic" plus social and recreation transportation)to major urban areas (Class 1 & 2).

3. Increase terminal capacities to accommodate additional modal transfers.

Highway

1. Increase capacity in and around urban areas.

2. Increase capacity on arterial routes between Class 1 & 2 cities.

3. Increase capacity along principle routes serving primary recreational areas.

4. Provide an efficient system of collector and feeder highways.

5. Encourage higher vehicle occupancy.

6. Provide for separation of through and local traffic when additional capacity is needed on arterial routes in Class 1, 2 & 3 cities.

7. Maintain adequate highway connections to port and rail facilities.

Ports

1. Maintain essential port facilities.

Rail

1. Increase freight operations on all major lines.

2. Provide rail passenger service to all Class I cities.

3. Provide sufficient terminal facilities to accommodate modal transfers.

Non-Motorized

1. Expand facilities to accommodate increases in recreation uses and some commuter travel.

ernative 6--The low growth, conserved energy future.

A. Description

This future assumes that the energy shortage is a long-term reality. Concern for this situation will become more apparent in daily operations. Growth rates will decline, resulting in a population level only slightly above that of today. A strong economy will prevail due to voluntary adjustments in the marketplace, influenced largely by governmental incentives. The realization of energy limitations will result in higher urban densities and corridor development patterns. Lifestyles will reflect an urban/suburban influence and will remain affluent and mobile. More leisure time will result from a shorter work week.

B. Transportation Implications

1. With increases in population, travel demand will increase slightly.
2. Recreation travel demand will increase slightly. But recreational trips will be fewer than normally expected.
3. A greater emphasis will be placed on energy efficient forms of transportation.
4. Public transportation will take on a greater role in commuter travel.
5. Higher vehicle occupancy will be encouraged.
6. Rail will assume more significance for long-haul freight operations.

C. Necessary Transportation Actions (commensurate with anticipated growth)

Air

1. Maintain adequate air carrier service to Class I cities or multi-county facilities.
2. Encourage higher occupancy use of aircraft
3. Maintain adequate facility capacity

Bus

1. Provide "basic" service to all citizens. (Includes "essential" plus employment and education transportation)
2. Provide "intermediate" service ("essential" and "basic" plus social and recreation transportation) to major urban areas (Class 1 & 2).
3. Increase terminal capacities to accommodate additional modal transfers.

Highway

1. Increase capacity in and around urban areas.
2. Increase capacity on arterial routes between Class 1 & 2 cities.
3. Increase capacity along principle routes serving recreational areas.
4. Provide an efficient system of collector and feeder highways.
5. Encourage higher vehicle occupancy.
6. Provide for separation of through and local traffic when additional capacity is needed on arterial routes in Class 1, 2 & 3 cities.
7. Maintain adequate connections to port and rail facilities.

Ports

1. Maintain essential port facilities.

Rail

1. Increase freight operations on all major lines.
2. Provide rail passenger service to all Class I cities.
3. Provide sufficient terminal facilities to accommodate modal transfers.

Non-Motorized

1. Expand facilities to accommodate increases in recreation uses and some commuter travel.

Alternative 7--The high growth, restricted energy future

A. Description

The energy shortage is assumed to be a short-term reality. Restricted use of energy intensive activities will be mandatory; gasoline will be rationed. Population growth will occur at a rate above recent trend levels. The economy will be influenced by severe energy conservation measures imposed by strong governmental programs. This will significantly alter lifestyles and travel habits. A shorter work week will occur. Land use and development patterns will begin to shift towards higher density urbanization and along major transportation corridors.

B. Transportation Implications

1. With increases in population, travel demand will increase slightly.
2. There will be a substantial swing toward energy efficient transportation.
3. Public transit will be the dominant mode of transportation for the majority of all trip purposes.
4. Air, auto and truck travel will decrease substantially.
5. Recreation travel demand will increase slightly. But recreational trips will be fewer than normally expected.
6. Rail will provide dominant service for long-haul operations.

C. Necessary Transportation Actions (commensurate with anticipated growth)

Air

1. Provide essential air carrier service to Class I cities or Multi-county facilities.
2. Promote high occupancy use of aircraft.
3. Discourage general aviation operations.

Bus

1. Provide "essential" "basic" and "intermediate" service to all communities and along developed corridors.
2. Provide frequent service in concentrated areas.
3. Maintain "essential" services in outlying areas.
4. Increase capacity of terminal facilities to accommodate a high degree of intermodal transfer.
5. Expand service to major recreation areas.

Highway

1. Maintain an adequate system of highways.
2. Improve access to modal transfer facilities.
3. Adapt highway system to accommodate increased public transit usage.

Port

1. Maintain essential port facilities.

Rail

1. Provide rail passenger service to all Class 1, 2 & 3 cities.
2. Expand freight operations on all major lines.
3. Expand terminal facilities to accommodate extensive intermodal transfer of freight and passengers.

Non-Motorized

1. Provide for extensive recreation and commuter activity.

Alternative 8--The medium growth, restricted energy future

A. Description

The energy shortage is assumed to be a short-term reality. Restricted use of energy intensive activities will be mandatory; gasoline will be rationed. Population growth rates will remain consistent with recent trends. The economy will be influenced by severe energy conservation measures imposed by strong governmental programs. This will significantly alter lifestyles and travel habits. A shorter work week will occur. Land use and development patterns will begin to shift towards higher density urbanization and along major transportation corridors.

changes.

B. Transportation Implications

1. With increases in population, travel demand will increase slightly.
2. Recreation travel demand will increase slightly. But recreational trips will be fewer than normally expected.
3. There will be a substantial swing toward energy efficient forms of transportation.
4. Passenger service will be provided primarily by busses, with some increases in rail passenger service.
5. Air, automobile and truck travel will decrease substantially.
6. Rail will provide dominant service for long-haul operations.

C. Necessary transportation [illegible] (to accommodate growth)

Air

1. Provide essential air carrier service to Class I cities or Multi-county facilities.

2. Promote high occupancy use of aircraft..

3. Discourage general aviation operations.

Bus

1. Provide "essential", "basic" and "intermediate" service to all communities and along developed corridors.

2. Provide frequent service in concentrated areas.

3. Maintain "essential" services in outlying areas.

4. Increase capacity of terminal facilities to accommodate a high degree of intermodal transfer.

5. Expand service to major recreation areas.

Highway

1. Maintain an adequate system of highways.

2. Improve access to modal transfer facilities.

3. Adapt highway system to accommodate increased public transit usage.

Port

1. Maintain essential port facilities.

Rail

1. Provide rail passenger service to all Class 1 & 2 cities.

2. Expand freight operations on all major lines.

3. Expand terminal facilities to accommodate extensive intermodal transfer of freight and passengers.

Non-Motorized

1. Provide for extensive recreation and commuter activity.

ALTERNATIVE 9--The low growth, restricted energy future.

A. Description

The energy shortage is assumed to be a short-term reality. Restricted use of energy intensive activities will be mandatory; gasoline will be rationed. Population growth will result in a population only slightly greater than existing today. The economy will be influenced by severe energy conservation measures imposed by strong governmental programs. This will significantly alter lifestyles and travel habits. A shorter work week will occur. Land use and development patterns will begin to shift towards higher density urbanization and along major transportation corridors.

B. Transportation Implications

1. With increases in population, travel demand will increase slightly.
2. Recreation travel demand will increase slightly. But recreational trips will be fewer than normally expected.
3. There will be a substantial swing toward energy efficient forms of transportation.
4. Passenger service will be provided primarily by busses, with limited rail passenger service.
5. Air, automobile and truck travel will decrease substantially.
6. Rail will provide dominant service for long-haul operations.

C. Necessary Transportation Actions (commensurate with anticipated growth)

Air

1. Provide essential air carrier service to Class I cities or Multi-county facilities.
2. Promote high occupancy use of aircraft.
3. Discourage general aviation operations.

Bus

1. Provide "essential" "basic" and "intermediate" service to all communities and along developed corridors.

2. Provide adequate terminal facilities to accommodate intermodal transfer.

3. Provide service to major recreation areas.

Highway

1. Maintain an adequate system of highways.

2. Provide access to modal transfer facilities.

3. Adapt highway system to accommodate increased public transit usage.

Port

1. Maintain essential port facilities.

Rail

1. Provide rail passenger service to all Class 1 cities.

2. Provide freight operations on all major lines.

3. Provide terminal facilities to accommodate extensive intermodal transfer of freight and passengers.

Non-Motorized

1. Provide for extensive recreation and commuter activity.

ESTIMATED MODE SPLIT BY TRIP LENGTH, TRIP PURPOSE AND ENERGY FUTURE

MODE SPLIT PERCENTAGES

ABUNDANT ENERGY SUPPLY

TRIP* PURPOSE	TRAVEL REDUCTION	MODE	TRIP LENGTH (MIN)[5] 0-30	31-60	61-90	91-121	121-300	300+
WORK	0%	Auto	99.9	99.6	98.6	97.0	94.6	88.8
		Bus	0.1	0.2	0.6	1.0	2.0	2.0
		Rail	0.0	0.2	0.8	2.0	2.0	2.0
		Air	0.0	0.0	0.0	0.0	1.4	7.2
VACATION	0%	Auto	99.9	99.6	98.6	97.0	96.2	90.1
		Bus	0.1	0.2	0.6	1.0	2.0	2.0
		Rail	0.0	0.2	0.8	2.0	1.0	1.5
		Air	0.0	0.0	0.0	0.0	0.8	6.4
OTHER	0%	Auto	99.9	99.6	98.6	97.0	94.7	88.7
		Bus	0.1	0.2	0.6	1.0	2.0	2.0
		Rail	0.0	0.2	0.8	2.0	2.5	2.5
		Air	0.0	0.0	0.0	0.0	0.8	6.8

CONSERVED ENERGY SUPPLY

TRIP PURPOSE	TRAVEL REDUCTION	MODE	TRIP LENGTH (MIN) 0-30	31-60	61-90	91-120	121-300	300+
WORK	0%	Auto	93[1]	93[2]	97	94	91	84
		Bus	5	2	1	2	4	4
		Rail	0	0	2	4	4	4
		Air	0	0	0	0	1	8
VACATION	-5%	Auto	100	99	97	96	93	87
		Bus	0	1	1	2	4	4
		Rail	0	0	2	2	2	2
		Air	0	0	0	0	1	7
OTHER	-5%	Auto	95	99	97	93	90	84
		Bus	5	1	1	3	4	4
		Rail	0	0	2	4	5	5
		Air	0	0	0	0	1	7

RESTRICTED ENERGY SUPPLY

TRIP PURPOSE	TRAVEL REDUCTION	MODE	TRIP LENGTH (MIN) 0-30	31-60	61-90	91-120	121-300	300+
WORK	0%	Auto	85[3]	84[4]	97	93	87	81
		Bus	10	5	1	3	5	5
		Rail	0	1	2	4	7	7
		Air	0	0	0	0	1	7
VACATION	-20%	Auto	100	98	97	94	90	84
		Bus	0	1	1	3	4	4
		Rail	0	1	2	3	5	6
		Air	0	0	0	0	1	6
OTHER	-20%	Auto	90	95	97	91	85	78
		Bus	10	4	1	4	6	6
		Rail	0	1	2	5	8	10
		Air	0	0	0	0	1	6

* Work Trips Include: Work, Shopping, Personal Business
Vacation Trips Include: Vacation
Other Trips Include: Social, Recreation, and all others

1/ Reflects 2% Car Pools for 0-30 min "Work" Trips
2/ Reflects 5% Car Pools for 31-60 min "Work" Trips
3/ Reflects 5% Car Pools for 0-30 min "Work" Trips
4/ Reflects 10% Car Pools for 31-60 min "Work" Trips
5/ Based on Approximate Auto Driving Time (Minutes)

APPENDIX E

LEVEL OF SERVICE DEFINITIONS

Source: Highway Research Board
Special Report 87, 1965