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FEASIBILITY STUDY of a TOLL ROAD

from

HOULTON to VAN BUREN

Prepared by the

MAINE DEPARTMENT OF TRANSPORTATION

BUREAU OF PLANNING

September 1975

Appropriation 11

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INTRODUCTION

Aroostook County has 2 highways spanning the entire distance between its northern and southern boundaries. U. S. Route 1 currently serves the majority of the highway traffic in the Houlton to Van Buren transportation corridor. State Route 11 connects the towns of Sherman and Fort Kent by way of Ashland and Eagle Lake. The purpose of this report is to address travel demand between Houlton and Van Buren and to examine the potential for a toll road in this corridor.

U. S. Route 1 serves as the major artery of highway travel and directly affects the livelihood of Aroostook County residents. In recognition of this fact Legislative Document 296 was introduced into the 106th Maine State Legislature by Representative James Briggs to obtain funding of a "Feasibility Study for a Turnpike Facility from Houlton to Van Buren". While this bill was not enacted, the Department of Transportation did agree to conduct the feasibility study as time could be made available as part of the Department's overall planning activity. This report, therefore, examines the construction and various operating costs of such a turnpike facility. Feasibility is discussed as it relates to costs compared with the revenue generating capacity of the study toll highway.

A 4-lane, controlled access highway between Houlton and Van Buren was previously evaluated in 1968 as one of several proposed additions to the Interstate Highway System. This same general concept was used for the 4-lane toll facility studied here. A general location description of the study highway in this corridor is as follows (See Figure 1):

SECTION I (12½ miles) - Begins at an interchange with the present Interstate Route 95 in Houlton, west of U. S. Route 1 and proceeds northerly, generally parallel with U. S. Route 1, to an interchange in Monticello.

SECTION II (10 miles) - Begins at the interchange in Monticello and proceeds northerly, west of U. S. Route 1, to an interchange at the Bridgewater/Blaine town line.

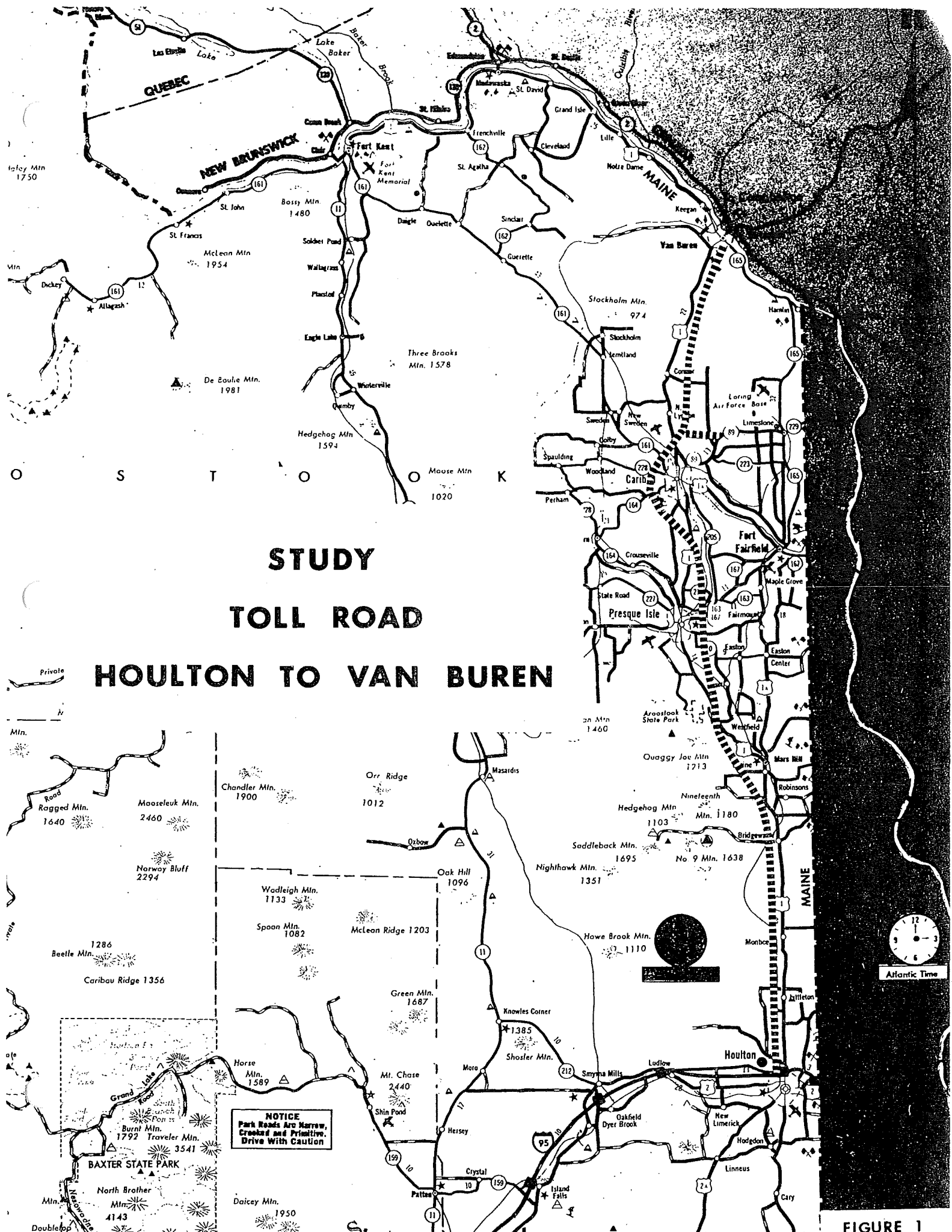
SECTION III (10 miles) - Begins at the Bridgewater/Blaine interchange and proceeds northwesterly, generally parallel to U. S. Route 1, to an interchange at the Westfield/Presque Isle town line.

SECTION IV (12.5 miles) - Begins at the Westfield/Presque Isle interchange then crosses to the east of U. S. Route 1 and proceeds northerly, by-passing the city of Presque Isle to the east. This section includes interchanges with State Routes 10 and 163/167 and U. S. Route 1 at its terminus, the Presque Isle/Caribou town line.

SECTION V (16 miles) - Begins at the Presque Isle/Caribou interchange then crosses to the west of U. S. Route 1 and proceeds northerly, bypassing the city of Caribou to the west. This section includes interchanges with State Route 161 and U. S. Route 1 where it crosses back to the east of U. S. Route 1. Section V then proceeds north-easterly to its terminus at an interchange with a proposed State Route 89 extension, servicing Limestone.

SECTION VI (16½ miles) - Begins at the State Route 89 interchange and proceeds northerly to the turnpike terminus at an interchange with State Route 165 southeast of Van Buren.

The total length of the study road is 77.5 miles with 11 interchanges.



STUDY TOLL ROAD HOULTON TO VAN BUREN

FIGURE 1

ANALYSIS OF TRAFFIC AND ORIGIN & DESTINATION DATA

An origin and destination (O & D) survey was conducted on August 14 and 15, 1973 on U. S. Route 1, 2.6 miles north of Interstate Route 95 in Houlton. This location is referred to as interview station #01 and has been used by the Department in the past as a weighing station. Also, 0.9 miles south of this station, on U. S. Route 1, the Maine Department of Transportation (MDOT) operates a continuous automatic traffic recorder, AR Station #11. The proximity of these 2 stations allow some melding of data thus providing a broad enough base for a complete and accurate traffic analysis.

Table 1 below lists comparative data collected at each of these stations. Average daily traffic at the O & D station for the 2 days of the survey is above the 1973 Annual Average Daily Traffic (AADT) at AR Station #11. This is consistent with the normal seasonal variation.

TABLE 1
TRAFFIC COMPOSITION

	<u>Vehicles/Day</u>	<u>%Cars</u>	<u>%Trucks</u>
Average Daily Traffic - O & D Survey	4758*	88.4	11.6
1973 Annual Average Daily Traffic at the Automatic Traffic Recorder on U. S. Route 1	4418	82.8	17.2

* 2366 of a total 9515 vehicles were interviewed in the two day period.

Historic traffic growth rates for an area must be assessed when projections of traffic are made. A 10 year history, 1963 to 1973, at AR Station #11 was used in this case and is shown in Table 2 below.

TABLE 2
HISTORIC TRAFFIC GROWTH

<u>Year</u>	<u>AADT</u>	<u>%Change</u>
1963	3218	
1964	3066	-4.7
1965	3355	+8.8
1966	3510	+5.2
1967	3548	+1.1
1968	3676	+3.6
1969	3852	+4.8
1970	4037	+4.8
1971	4215	+4.4
1972	4316	+2.4
1973	4418	+2.4

More recent data at the same station gives an indication of traffic growth for each month of a 12 month period, ending in July, 1974. Table 3 shows the percent change of the AADT over the same month of the previous year. The negative values seem to indicate motorists response to the unsettled energy and economic situations.

TABLE 3

TRAFFIC GROWTH - PREVIOUS 12 MONTHS

Month	Year	Percent Change Same Month Previous Year
August	1973	+4.9
September	1973	+3.5
October	1973	+5.5.
November	1973	+0.4
December	1973	+0.3
January	1974	-4.9
February	1974	-3.8
March	1974	-6.6
April	1974	-6.6
May	1974	-6.4
June	1974	-4.6
July	1974	-1.1

The 1973 AADT for U. S. Route 1 in the area of the O & D Survey Station can be taken directly from AR Station #11 data. However, a base level 1974 AADT must be projected and then expanded at some annual rate to determine both the levels of travel demand and revenue generation on the study turnpike facility. The 1973 AADT at AR Station #11, from Table 1, is 4418 vehicles/day. Table 2 produces an average annual growth rate of approximately 3.3%. However, by comparison, Table 3 shows traffic declining in the first 7 months of 1974. Therefore, this report projects an overall 0 to 1 percent decline in traffic on this section of U. S. Route 1 for 1974, establishing a base level 1974 AADT of 4400 vehicles/day. Also, it is estimated that the annual traffic growth factor will be slightly greater than 3%. This would increase traffic to approximately 7200 in 1994 and 10,000 in the year 2014 on this portion of U. S. Route 1.

O & D Survey data indicated that 67% of the traffic sampled would use a toll facility (Table 4). The question asked during the interview was: "If a Turnpike toll facility was constructed between Houlton and Van Buren, would you use it?" Each of the motorists interviewed responded to this question.

TABLE 4
TURNPIKE QUESTION RESPONSE

Vehicle Registration		Positive Response Interviews Trips (veh/day)		Negative Response Interviews Trips (veh/day)	
North-bound	Maine	629	1,092	322	544
	Canada	28	45	11	18
	Out of State	102	184	33	53
	Total	759	1,321	366	615
South-bound	Maine	681	1,193	356	597
	Canada	24	41	22	37
	Out of State	106	183	52	89
	Total	811	1,417	430	723
Grand Total		1,570	2,738	796	1,338

The positive response of 67%, was applied directly to projected AADT's to determine traffic levels on the study toll facility. Traffic on the toll road which might be induced from routes other than the one sampled is considered negligible, since there are no other major through highways between Houlton and points North. In addition, the traffic projections assume that vehicular growth, resulting from turnpike induced economic expansion, is included within the annual growth estimates.

Table 5 below represents a cross-section of AADT projections used throughout this report. An average annual traffic growth rate factor of approximately 3.2% was used the entire length of U. S. Route 1 for both the 20 and 40 year projections. The 1974, base level AADT's for the various sections of U. S. Route 1 adjacent to the proposed facility were determined in a manner similar to the 1974 AADT for Section I. However, in most cases the 1972 "Maine Traffic Flow Map" was used. See Traffic Maps in the appendix.

TABLE 5
PRESENT AND FUTURE AADT*

Section	U. S. Route 1			Study Turnpike		
	1974	1994	2014	1974	1994	2014
I	4400	7210	10019	2948	4831	6713
II	4050	6636	9222	2714	4446	6179
III	3650	5981	8311	2446	4007	5568
IV	5150	8439	11727	3451	5654	7857
V	4650	7619	10588	3116	5105	7094
VI	2300	3769	5237	1541	2525	3509

* All values are estimated based on present and historic traffic growth trends and represent averages for the section shown.

Data from the origin and destination survey was tabulated in several other ways in order to better illustrate the characteristics of travel demand in this area of Maine.

Table 6 shows that, as expected, the predominant trip purposes were Work/Business and Social/Recreational, accounting for 56.4% and 33.2% of the trips respectively.

TABLE 6
TRIP PURPOSE AND FREQUENCY

Trip Purpose	No. of Trips (veh./day)	Percentage
Work/Business	2300	56.4
Medical/Dental	81	2.0
School	17	0.4
Social/Recreational	1354	33.2
Range Mode	1	0.0
Eat Meal	16	0.4
Shopping	270	6.7
Serve Passenger	37	0.9
TOTAL	4076	100.0

Table 7 below gives an indication of attraction to motorists for making an intermediate stop within the general area of the Houlton to Van Buren Corridor. Approximately, 14.8% of the traffic had trip plans that included an intermediate stop in the area. Work/business dominates with 33.5% of the intermediate stops, while Meals and Gas/Oil account for 23.8% and 16.7% respectively.

TABLE 7

INTERMEDIATE TRIP PURPOSE AND FREQUENCY

Trip Purpose	No. of Trips (veh./day)	Percentage
Work/Business	202	33.5
Shopping	75	12.4
Recreation	44	7.3
Serve Passenger	33	5.5
Meals	144	23.8
Gas or Oil	101	16.7
Overnight	5	0.8
TOTAL	604	100.0

COSTS

This part of the report details the estimated costs of constructing, operating and maintaining a toll highway between Houlton and Van Buren. Construction cost was estimated for the entire facility divided into 6 sections, I through VI. Table 8 summarizes the estimated 1974 level construction cost for each of these sections.

TABLE 8

SUMMARY OF TURNPIKE CONSTRUCTION COST

Section	Description	Length	Construction Cost (1974)
I	Houlton, junction with I-95 to Monticello, Inventory Rd. #1330	12.5	\$ 35,900,000
II	Monticello, Inventory Rd. #1330 to Blaine/Bridgewater Town Line	10.0	\$ 22,900,000
III	Blaine/Bridgewater Town Line to Westfield/Presque Isle Town Line	10.0	\$ 24,800,000
IV	Westfield/Presque Isle Town Line to Presque Isle/Caribou Town Line	12.5	\$ 41,200,000
V	Presque Isle/Caribou Town Line to & including Loring AFB Spur	16.0	\$ 45,900,000
VI	Loring AFB Spur to Van Buren, junction with S.R. 165	16.5	\$ 34,400,000
TOTAL		77.5	\$205,100,000

Table 9 below summarizes the various unit costs applied to the entire costing effort. Further explanation regarding the generation of these unit costs follows the table.

TABLE 9
SUMMARY OF UNIT COSTS

Item	Unit Cost (\$)	Source
1. Roadway Construction - incl. R/W, Preliminary & Construction Engineering & Contingencies.	\$1,696,300/mile.	State and Federal Construction Experience.
2. *Interchange Construction- incl. toll plaza, ramps, loops 2-lane overpass and R/W	\$2,483,000 each	State and Federal Construction Experience
3. *Structures	Various (\$250,000 to \$2,500,000)	MDOT, Bridge Design Sec- tion
**Maintenance - annual summer and winter 1974	\$8,000/mile	MDOT, Maintenance Division
5. ***Operation - toll coll- ectors' salaries and uniforms, 1974	Low Volume-\$36,000/yr. High Volume-\$60,000/yr.	Maine Turnpike Authority

* Does not include estimated cost of preliminary and construction engineering, or contingencies.

** Does not include anticipated cost of resurfacing, or major reconstruction.

*** Does not include an estimate of various administrative costs dealing with operation (salaries of administrative personnel, supplies, etc.).

Maintenance cost estimates were obtained from MDOT's Maintenance Division and do not include the costs of anticipated resurfacing, or major reconstruction. The figure shown in Table 9 is for annual summer and winter maintenance at 1974 levels. This would include such things as snow and ice removal; maintenance of roadway surface, shoulders and ditches; striping and maintenance personnel salaries and equipment.

Operating cost estimates were obtained from the Maine Turnpike Authority and do not include any allowance for administrative costs. The figures contained in Table 9 allow for toll collectors' salaries and uniforms at 1974 cost levels. The administrative cost of operation would be relatively minor in this case since MDOT would absorb a significant portion of the administrative work-load within its normal operating budget.

The largest single cost involved in this study toll facility is repayment of bonds sold to finance construction of the toll road. It was assumed that 40 year bonds would be sold at an annual interest rate of 6%. A 5 year construction period was used in this case with equal amounts of bonds sold each year for that year's construction.

Projection of the cost of maintenance and operation was necessary to complete the cost picture over a 40 year period. The 1974 base level costs were increased by 20% in order to arrive at a 1980 estimate, for the first year of operation. This 1980 level cost was then projected at the annual rate of 3%.

Table 10 shows the total, estimated, annual cost of the toll road for the year 1980. These costs were also projected to the year 2015 and compared graphically with estimated revenue in Figure 2 later in this report.

TABLE 10
SUMMARY OF ANNUAL COSTS (1980)

	ANNUAL COST PER SECTION (Dollars)						TOTAL (1980)
	I	II	III	IV	V	VI	
Maintenance	120,000	96,000	96,000	120,000	153,600	158,400	\$ 744,000
Operation	86,400	86,400	86,400	230,400	230,400	86,400	\$ 806,400
Bond Retirement	2,001,420	1,276,670	1,382,600	2,296,900	2,558,925	1,917,800	\$11,434,315
Total	2,207,820	1,459,070	1,565,000	2,647,300	2,942,925	2,162,600	\$12,984,715

Values shown in this table were derived as explained in the preceeding paragraphs, using 1980 as the year of operation. It must be remembered that the costs of maintenance and operation are estimated to increase at the rate of 3% per year, while the cost of bond retirement is the same each year for 40 years.

REVENUE

Tolls paid by the user of the study turnpike would be the major source of anticipated revenue. Potential interest from short term investments were also accounted for, but were found to represent a very small portion of total annual revenue.

Current Maine Turnpike toll rates were applied to the vehicular classification groups that passed through the 1973 O & D survey station. Table 11 produces an average toll rate per vehicle mile by applying the current Maine Turnpike toll rates to anticipated traffic on the study toll road.

TABLE 11

COMPUTATION OF AVERAGE TOLL RATE - ALL VEHICLES

Vehicle Type	% Composition of O & D Traffic	Maine Turnpike Toll Rates	Avg. Toll Rate ¢/Veh. Mile
Passenger Cars	83.3%	2.2¢/mile	1.83
Veh. with Dual Tires	5.8%	3.5¢/mile	0.20
Three Axle Trucks	1.5%	5.0¢/mile	0.08
Four or More Axles	9.4%	6.0¢/mile	0.56
Average Toll =			2.67¢/Veh.Mile

The average toll rate generated above was then applied to a projection of annual vehicle miles on the study toll facility (See Table 12). This established an annual toll revenue projection, which when combined with a small allowance for potential interest income, gave a value suitable for comparison with annual cost figures developed earlier.

TABLE 12

SUMMARY OF ANNUAL TOLL REVENUE

Section	Year	(Veh./Day) AADT	Annual Vehicle Miles	($\$$) Annual Toll Revenue
I	1980	3532	16,114,750	430,264
(12.5 mi.)	1994	4831	22,041,438	588,506
	2014	6713	30,628,063	817,769
II	1980	3251	11,866,150	316,826
(10.0 mi.)	1994	4446	16,227,900	433,285
	2014	6179	22,553,350	602,174
III	1980	2930	10,694,500	285,543
(10.0 mi.)	1994	4007	14,625,550	390,502
	2014	5568	20,323,200	542,629
IV	1980	4134	18,861,375	503,599
(12.5 mi.)	1994	5654	25,769,375	688,042
	2014	7857	35,847,563	957,130
V	1980	3733	21,800,720	582,079
(16.0 mi.)	1994	5105	29,813,200	796,013
	2014	7094	41,428,960	1,106,153
VI	1980	1846	11,117,535	296,838
(16.5 mi.)	1994	2525	15,206,813	406,022
	2014	3509	21,132,953	564,250
Total	1980	----	90,455,030	2,415,149
(77.5 mi.)	1994	----	123,684,276	3,302,370
	2014	----	171,914,089	4,590,105

FINDINGS

Several findings resulted from the analyses and discussions within this report. The major findings are listed below and form the base from which this study's conclusions are made.

1. Corridor traffic growth from a 1974 base is estimated to be approximately 3.2% per year.
2. Traffic diversion from U. S. Route 1 to the study "toll road" is estimated to be 67% based on 1973 Origin and Destination (O & D) Survey.
3. Estimated 1974 AADT on the "toll road" varies between 1541 vehicles/day from Caribou to Van Buren and 3451 vehicles/day in Presque Isle.
4. Estimated 1974 level construction cost for a 4 lane divided facility is \$205.1 million and based on inflationary trends this can be expected to increase at least by 10% per year.
5. Estimated annual cost in 1980 to provide for maintenance, operation and bond retirement is \$12.98 million.
 - Maintenance = \$0.74 million
 - Operation = \$0.81 million
 - Bond Retirement = \$11.43 million
6. Estimated annual revenue in 1980 is \$2.42 million.
7. Average toll rate based on current Maine Turnpike toll rates is 2.67¢/vehicle mile.

The following graph (Figure 2) illustrates a comparison between cost and revenue, showing the large disparity between total revenue and total cost. Cost during the first year of operation would be more than 5 times the anticipated revenue for that same year and this gap would continue.

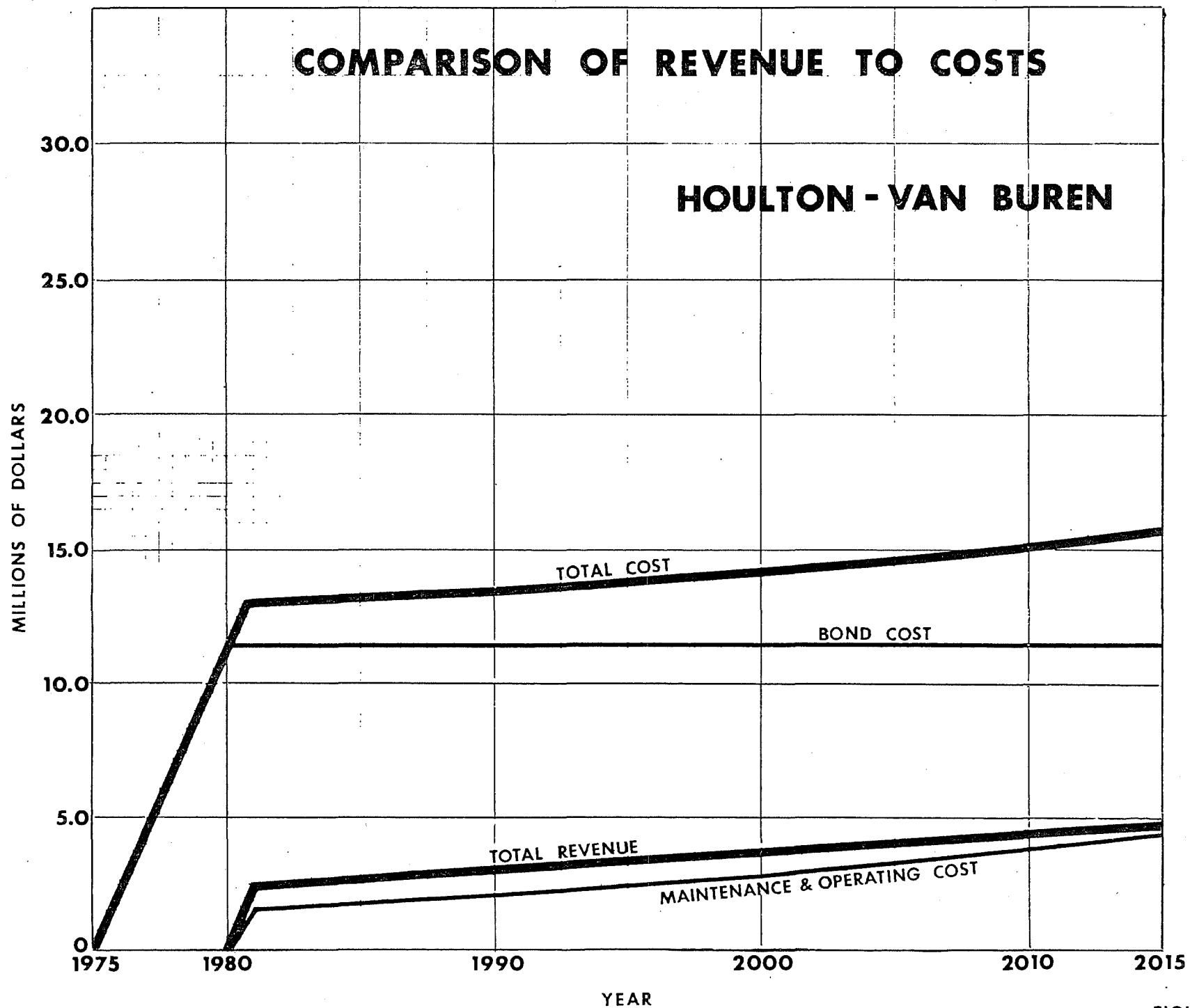


FIGURE 2

CONCLUSIONS

A toll road from Houlton to Van Buren is not feasible. This conclusion is based on economics and illustrated by the fact that the facility would operate at a deficit of approximately 10 million dollars annually.

If reasonable toll rates, similar to those on the Maine Turnpike, are applied to the projected traffic volumes, less than 25% of all the costs during a 40 year period would be collected. This estimate does not include the eventual upward curve of maintenance costs as resurfacing and major reconstruction become necessary within this 40 year period.

Higher toll rates were considered, but diminishing returns would result. The resulting increase in revenue per vehicle mile would not offset the inevitable decline in use. If tolls were decreased in an effort to increase ridership no benefit would be probable. It would not seem likely that substantially more than 67% of the Route 1 travellers (as shown in the O & D Survey) would use the turnpike, regardless how low the toll is. Toll rates would have to be increased by more than 5 times the rate on the Maine Turnpike and traffic projections maintained to break even in 1980. This would result in a toll cost of \$18.08 for a round trip between Houlton and Van Buren in an automobile.

Figure 2 shows the large gap between estimated cost and projected revenue. Anticipated revenue would only cover estimated maintenance and operation costs with insufficient funds available to support debt costs. In short, it would appear that a toll road would operate at a deficit indefinitely.

A P P E N D I X

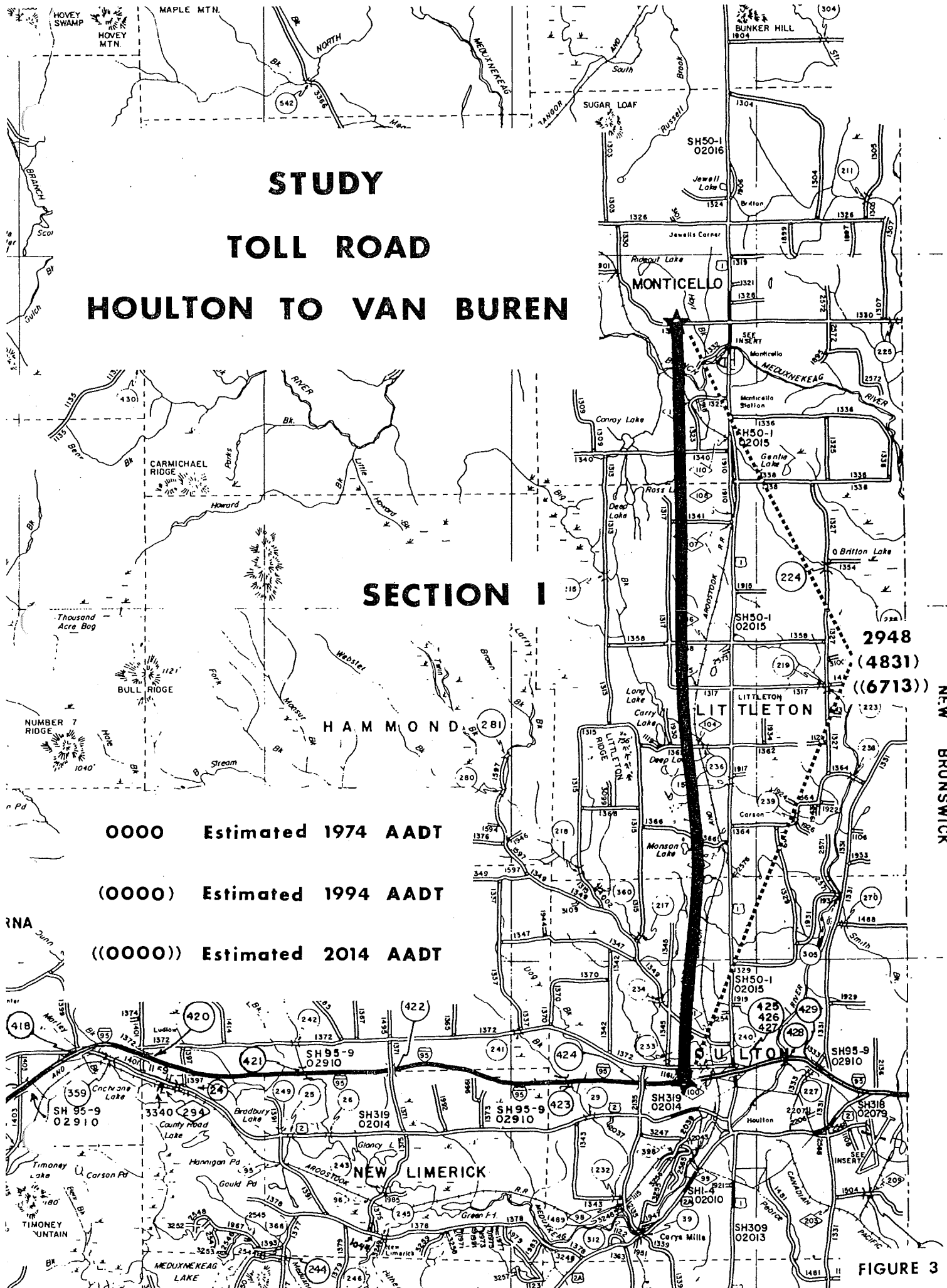
STUDY TOLL ROAD HOULTON TO VAN BUREN

SECTION I

0000 Estimated 1974 AADT

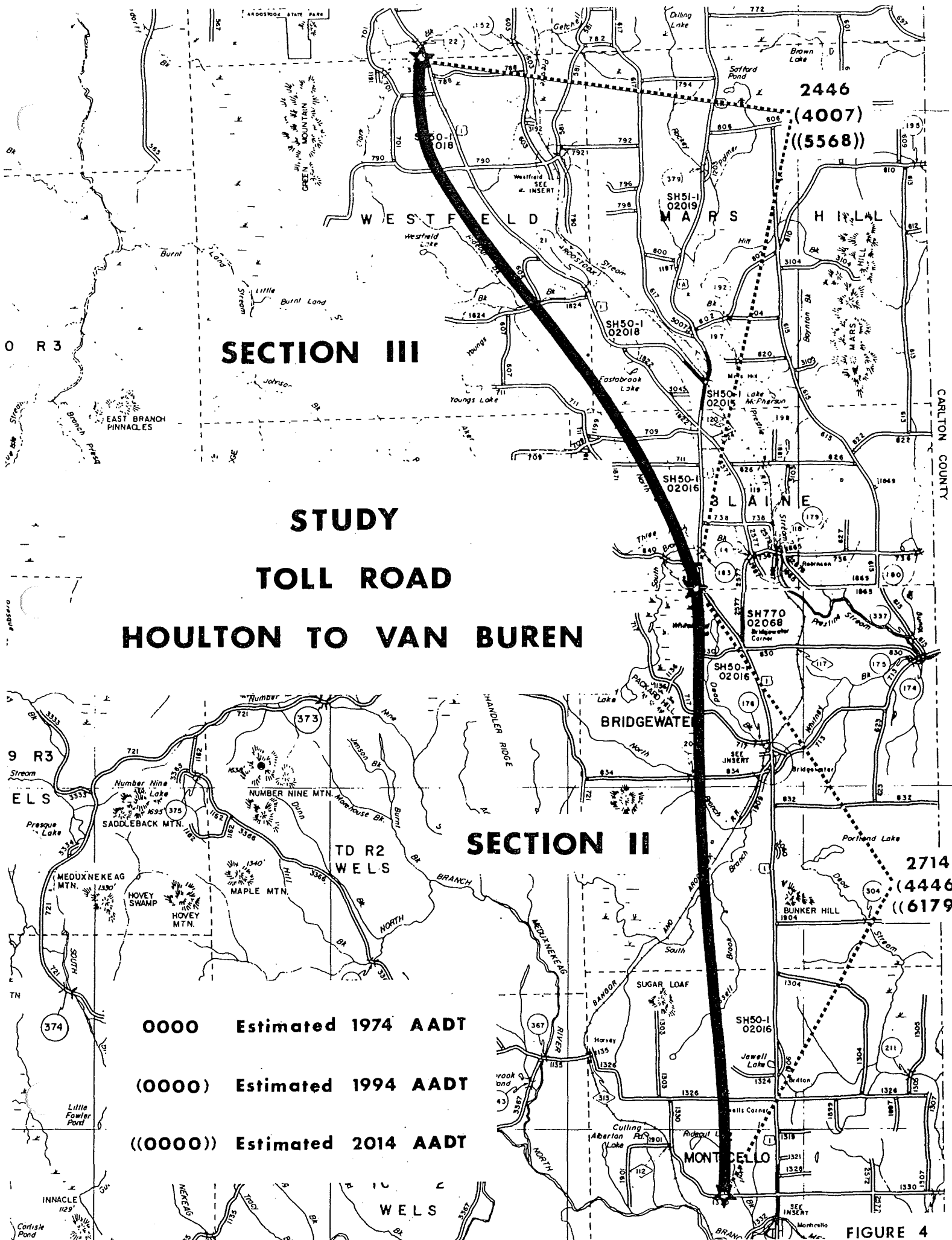
(0000) Estimated 1994 AADT

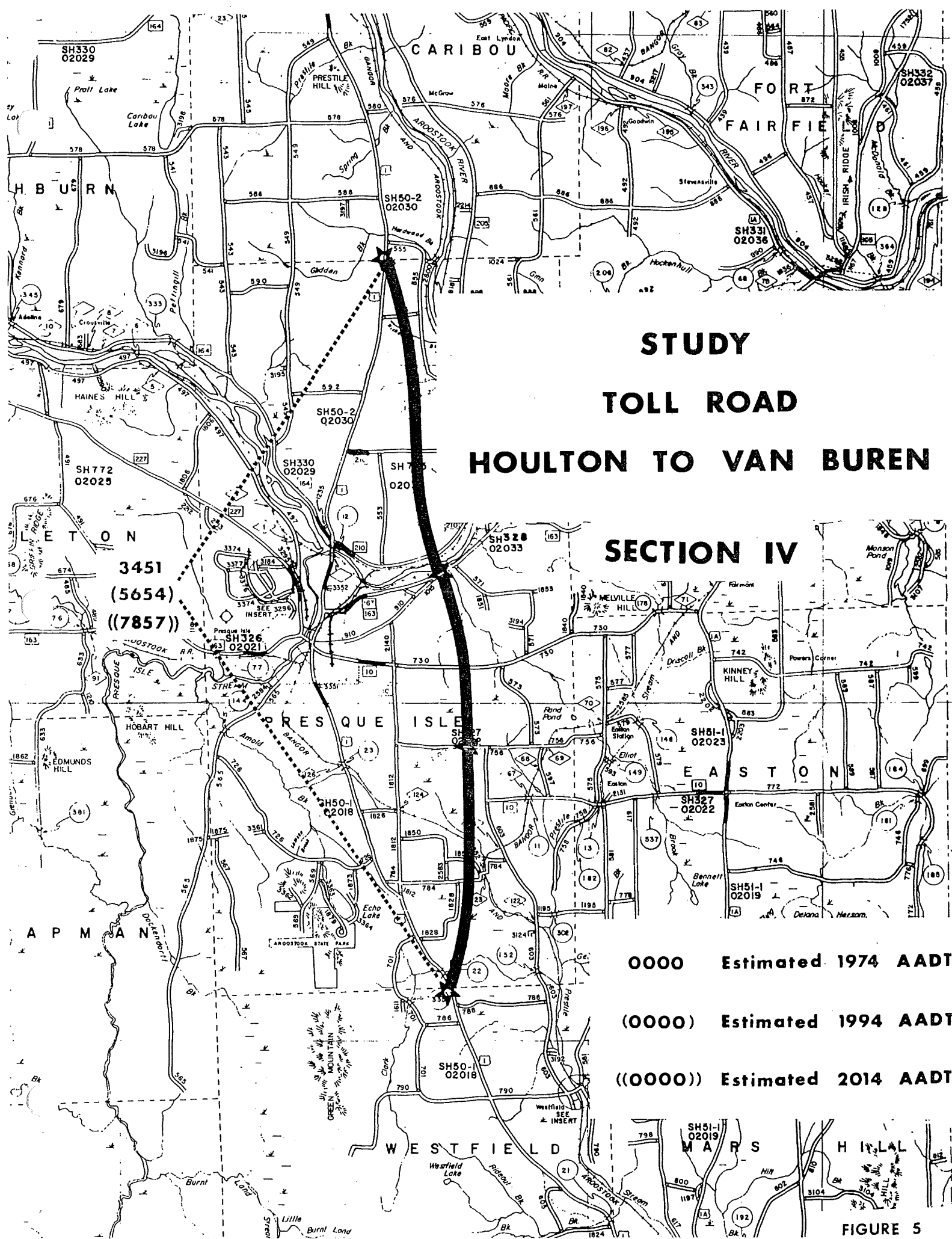
((0000)) Estimated 2014 AADT



CANADA
NEW BRUNSWICK

FIGURE 3



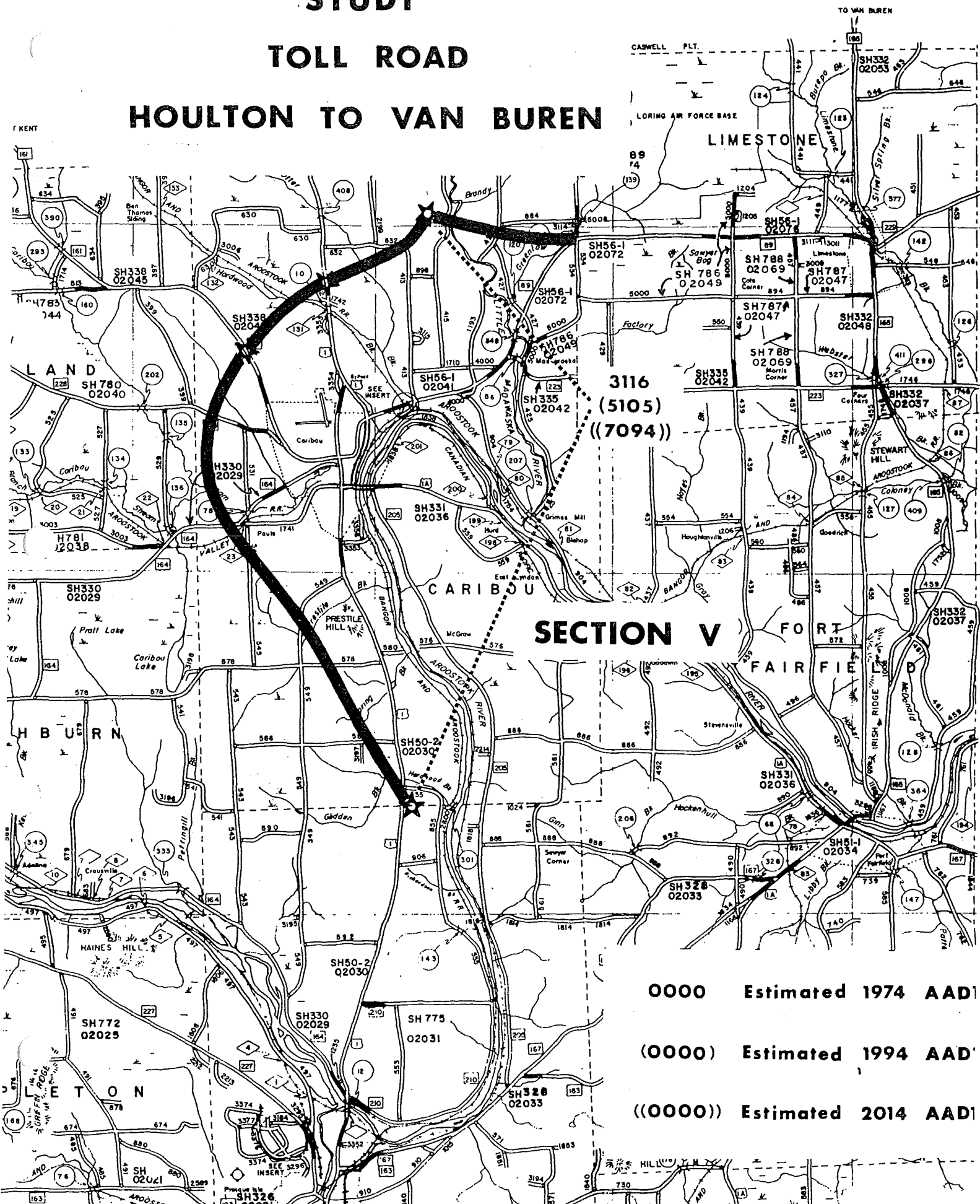


STUDY

MAP 4

TOLL ROAD

HOULTON TO VAN BUREN



SECTION V

0000 Estimated 1974 AADT

(0000) Estimated 1994 AADT

((0000)) Estimated 2014 AADT

A circular map of St. David, Maryland. The map shows a network of roads including US-1, MD-252, MD-180, and MD-2210. A large circle labeled '407' is centered in the map. The text 'ST. DAVID' is printed at the bottom of the map.

