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A simulation of the domestic and foreign distribution of United States' surplus grain

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A simulation of the domestic and foreign distribution of United States' surplus grain

by

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INTRODUCTION

The needs of man are basic; food, shelter and colthing. The latter two are relatively stable once they have been met. The need for food is a different matter. A nomad stock, like the Bedouins of Arabia, may be exceptionally intelligent and vigorous, they may display high qualities of character like courage, generosity and nobility; but without that simple "sine qua non" of culture, a continuity of food, their intelligence will be lavished on the perils of the hunt and the tricks of trade, and nothing will remain for the amenities, the arts, and the comforts of civilization. This suggests that the first form of culture is agriculture. It is when man settles down to till the soil and lay up provisions for the uncertain future that he finds time and reason to be civilized. Within that little circle of security - a reliable supply of water and food - he builds his huts, his temples and his schools; he invents productive tools, and domesticates the dog, the mule, the pig, at last himself. He learns to work with regularity and order, maintains a longer tenure of life, and transmits more completely than before the mental and moral heritage of his race (10, p. 2). Agriculture is a beginning for the economic conditions of civilization. By adding to this the mechanisms of transport, the process of trade, and the medium of exchange, man is brought up to the present day.

The United States has steadily increased in the production of feed grains[1] since 1956 and by all future estimates it appears that this trend will continue. See Table 1. Also note that since 1957 the amounts used for domestic utilization have generally increased along with the trend in production. The exports increased a little over five fold from 1955 to 1966 and then began to decline. The carryover has also declined in recent years and the decline has offset increases in production thus limiting increases in total supply.

Examination of Table 2 for soybeans shows that production has increased almost five fold since 1953. Domestic utilization has increased almost four fold and exports by eleven fold since 1953. It also appears that the trend will continue.

Examination of Table 3 for wheat indicates that production has generally increased in recent years with a corresponding trend in domestic utilization. Exports have fluctuated over the last ten years.

The value of feed grain exports for calendar year 1969 was $0.86 billion and in 1970 was $1.06 billion, a 26 per

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[1]Feed grains: corn, oats, barley, and grain sorghum.

Table 1. Feed grain production, utilization and carryover[1] [2]

Year Beginning October 1	Production	Utilization[3]		Ending Carryover, October 1[4]
		Domestic	Export	
1950-51	113.1	109.4	6.4	28.6
1951-52	104.8	109.8	4.8	20.1
1952-53	111.0	100.5	5.3	27.0
1953-54	108.3	102.0	3.8	31.7
1954-55	114.1	102.1	5.5	39.1
1955-56	120.8	109.4	8.1	43.2
1956-57	119.3	106.9	7.7	48.8
1957-58	132.4	113.4	9.8	59.0
1958-59	144.1	123.4	12.6	67.5
1959-60	149.5	130.1	12.8	74.6
1960-61	155.5	132.8	12.7	85.0
1961-62	139.8	135.8	17.3	72.2
1962-63	141.7	132.9	16.8	64.4
1963-64	153.8	130.5	18.8	69.3
1964-65	134.2	127.5	21.6	54.8
1965-66	157.4	141.3	29.1	42.1
1966-67	157.6	140.9	22.0	37.1
1967-68	176.0	141.8	23.3	48.3
1968-69	168.9	148.9	18.4	50.2
1969-70	174.6	155.6	21.2	48.4
1970-71[5]	159.0	154.0	18.9	35.0
1971-72[6]	200.4			

[1]Source: Futrell and Wisner (12, p. 8).

[2]All amounts are in million tons.

[3]Utilization in feeding and marketing year beginning October 1.

[4]Carryover at end of feeding year. For example, 28.6 million tons was the carryover October 1, 1951.

[5]Preliminary reports.

[6]August 1 indicated estimates.

Table 2. Wheat production, utilization and carryover[1] [2]

Year Beginning July 1	Production	Utilization		Ending Carryover, July 1
		Domestic	Export	
1952	1,306	661	321	606
1953	1,173	634	220	934
1954	984	611	278	1,036
1955	937	604	346	1,033
1956	1,005	589	549	909
1957	956	592	402	881
1958	1,457	609	443	1,295
1959	1,118	597	510	1,313
1960	1,355	603	662	1,411
1961	1,232	608	719	1,322
1962	1,092	580	644	1,195
1963	1,147	588	856	901
1964	1,283	644	725	817
1965	1,316	731	867	535
1966	1,312	679	744	425
1967	1,522	648	760	539
1968	1,576	754	544	819
1969	1,460	791	606	885
1970[3]	1,378	799	735	730
1971[4]	1,601	780	650	902

[1]Source: Futrell and Wisner (12, p. 9).

[2]All amounts are in million bushels.

[3]Preliminary reports.

[4]Estimated.

Table 3. Soybean productionm utilization and carryover[1] [2]

Year Beginning September 1	Production	Utilization[3] Domestic	Export	Ending Carryover, September 1
1953-54	269.2	243.4	40.1	8.1
1954-55	341.1	269.3	57.3	22.6
1955-56	373.7	306.7	68.6	21.0
1956-57	449.3	355.0	83.7	31.6
1957-58	483.4	383.8	88.4	42.8
1958-59	580.2	430.2	105.0	87.8
1959-60	532.9	429.0	139.9	51.8
1960-61	555.1	445.1	134.7	27.1
1961-62	678.6	478.0	149.4	78.3
1962-63	669.2	521.0	180.5	46.0
1963-64	699.2	490.7	187.2	67.3
1964-65	700.9	526.3	212.2	29.7
1965-66	845.6	589.1	250.6	35.6
1966-67	928.5	612.4	261.6	90.1
1967-68	976.1	633.3	266.6	166.3
1968-69	1,103.1	658.0	286.8	324.4
1969-70	1,126.3	792.0	428.7	230.1
1970-71[5]	1,135.8	831.0	425.0	110.0
1971-72[6]	1,235.5			

[1]Source: Futrell and Wisner (12, p. 10).

[2]All amounts are in million bushels.

[3]Marketing year beginning September 1.

[4]Including residual quantities (usually small) unaccounted for, but apparently represented by handling losses and statistical errors.

[5]Preliminary reports.

[6]August 1 indicated estimates.

cent increase. The value of soybean exports for 1969 was $0.82 billion and was $1.22 billion for 1970, a 49 per cent increase. The value of wheat exports for 1969 was $0.86 billion and for 1970 was $1.14 billion, a 32.6 per cent increase.

Purpose

Since the north central region of the United States accounts for approximately 75 per cent of all feed grain production, and a large percentage of soybean and wheat production, the above trends are going to have pronounced effects on the marketing of grain from the North Central Marketing Area (NCMA). The purpose of this study is to make an analysis of the domestic and foreign movements of heavy grain[1]. This provides a basis for evaluating the impact of various existing policies and future programs on different regions and sections of the nation's heavy grain economy and marketing channels. For example, intelligent policy action concerning heavy grain legislation requires knowledge of district, regional and national effects upon the functional and personal distribution of income of various types of livestock

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[1]Heavy grain: feed grains, wheat, and soybeans.

and grain producers. Conversely, with a change in heavy grain policy, the intelligent adjustment of individual producers depends upon the ability to predict effects of a specific program on district and regional prices as well as other variables.

Since grain is a storable commodity with a low value-to-weight ratio, transportation costs are a significant component of its value whenever grain moves over a route. Therefore, the determining of routing patterns and quantities to be shipped over a route are done by using optimization techniques; in particular a special form of linear programming, the transhipment model. Assumptions are used which reflect present policy. Other assumptions are specified which reflect possible future changes in policies regarding the marketing channel of heavy grains. The effects of a reduction in rail rates for heavy grains from the midwest to other parts of the country, or a reduction in barge rates on the inland waterways exemplify possible changes for the future. In order to evaluate these types of changes a number of different transhipment models are developed using various sets of assumptions.

Method of Analysis

The method of analysis is first to develop a number of transhipment models which optimally distribute heavy grains. The second is to empirically verify these models to determine which ones simulate actual grain shipments.

The purpose of the first method of analysis is to develop a set of models which distribute heavy grains from North Central Marketing surplus production regions to United States and foreign deficit regions while minimizing the total cost of transportation. A transhipment model is used to determine minimum cost routing. The construction of the model requires designation of the following:

1. Region size for each origin (surplus areas).
2. Intermediate points (ports).
3. Region size for each destination (deficit areas).
4. Shipping and receiving points in each region.

The data requirements for the model include:

1. Surplus quantity of grain available at each origin.
2. Deficit quantity of grain required at each destination.
3. Total per ton transportation cost between origins, intermediate points, and destinations.

The total per ton costs of transportation between United States origins and foreign destinations are developed in two segments. The first segment includes the transportation costs over land or domestic routes, and the second is the costs of ocean shipping.

Once the surplus regions, deficit regions, and ports for the model have been established, there are many variations which result from using different data or making alternative assumptions.

There are six models considered in this study; two for feed grains, two for wheat, two for soybeans. For each model there are four objective functions which represent different possible combinations of transportation costs on land, and a maximum of six transportation cost combinations on the ocean.

The purpose of the second method of analysis, verification, is to determine if the normative transhipment model can also be used as a positive model. By normative is meant the flow of grains which ought to take place, and the term positive is used in economics to describe analysis which explains phenomena as they exist, rather than to explain what they ought to be.

A method is needed to indicate if the transhipment model as used here can in effect be a positive tool of analysis. Certain statistical techniques like regression, correlation, coefficient of determination, and hypothesis testing are considered. The data requirements include the actual flows of grain over the ocean for the 1966-67 time period and the transhipment model solutions.

Objectives

The objectives are as follows:

1. Construction of a transhipment model with routing patterns for heavy grains from United States surplus regions to United States deficit regions and ports, and from ports to foreign deficit regions.
2. Estimation of the surplus and deficit quantities of grain for United States and foreign regions.
3. Estimation of the cost of transporting grain from surplus regions to United States deficit regions and ports, and from ports to foreign deficit regions.
4. The determination of different optimal routing patterns using various assumptions.
5. Generation of the spatial price surface implied by the grain price differentials.
6. A sensitivity analysis between solutions which are based on changes in assumptions.
7. Derivation of the opportunity costs of shipping over unused routes under different assumptions.
8. Verification of the model solutions of grain flows by comparing them with 1966 and 1967 marine shipments.

Previous Research

This research is a continuation of work done by Davis (8) and Cayemberg (3). They worked on the Phase I project for the North Central Regional Marketing Committee (NCM-42); Impact of Changing International Trade in Grain in the Marketing of U.S. Grain. Davis' contribution was the development of shipping cost on the ocean for U.S. grain exports. Cayemberg did an analysis of freight rates and ocean shipping of U.S. grain exports.

This thesis centers around the development of Phase II for the NCM-42 committee where domestic and ocean shipments are integrated for a model that is international in scope. Another difference between Phase I and II is that three types of commodities are included whereas before only the distribution of feed grains was considered.

DEVELOPMENT OF THE TRANSHIPMENT MODEL

Background

The transhipment model is a special case of the general linear programming model for which computational procedures have been developed that take advantage of the structure of the model. The transportation model, a special case of the linear programming model, was developed by Hitchcock (15). The origins where goods are produced could only ship to destinations where goods are consumed. He did not allow any shipments to intermediate points which would subsequently ship to final destinations. Hitchcock's paper sketched out the partial theory of a technique foreshadowing the simplex method; it did not exploit special properties of the transportation problem except in finding starting solutions (7). In 1947, T. C. Koopmans added to the development of the transportation model with his research on the potentialities of linear programs for the study of economic problems. His paper, "Optimum Utilization of the Transportation System" (17), based on his wartime experience, along with Hitchcock's formulation were the foundations for the classical case referred to as the Hitchcock-Koopmans Transportation Problem.

A generalized transportation model in which transhipment through intermediate points is permitted was proposed by A.

Orden in 1956 (21).

By using the transhipment model the possibility exists for a lower optimum value of the objective function than if a transportation model is used. The inclusion of intermediate shipping points between origins and destinations creates more possible routes (activities). A feasible solution to the transportation model will be feasible for the transhipment model, but the solution to a transhipment model may be more optimal since it has more activities to choose from when optimizing. Orden's formulation included a material-balance equation for every city such that:

Quantity Shipped In + Produced = Quantity Shipped Out + Consumed

This material-balance equation is the basis for the description of the transhipment model.

Description of the Various Models

There are six different transhipment models developed in this thesis; two for feed grains, two for wheat, and two for soybeans. A tree diagram showing the general routing patterns for feed grains is given in Figure 1. The flow from top to bottom indicates the shipments from surplus regions to deficit regions where the foreign deficit regions are supplied through intermediate ports. The values in

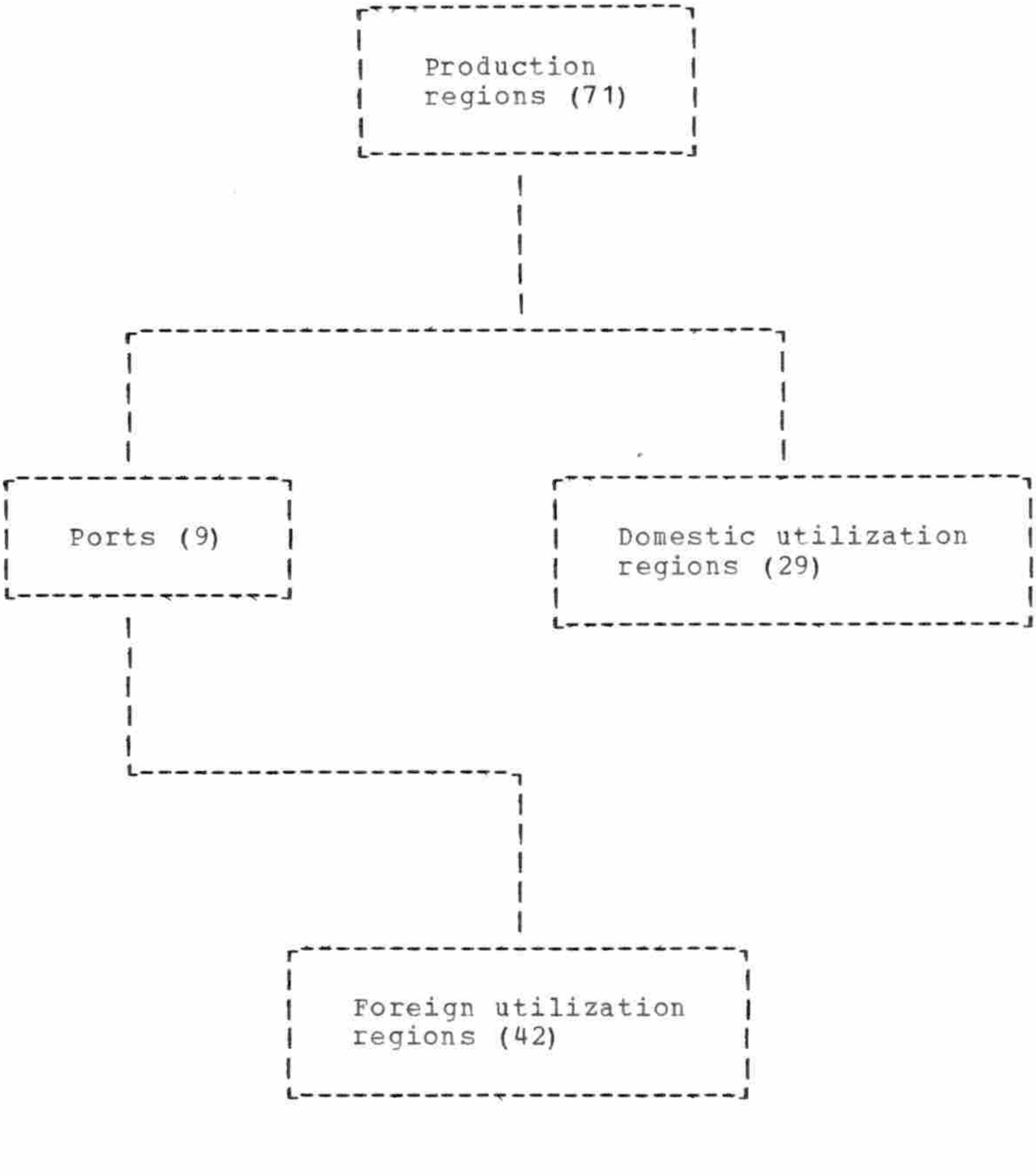

Figure 1: Feed grain model

parenthesis are the number of regions and ports specified for a particular model.

In terms of the material-balance equation the production regions produce, consume, and ship out grain but do not receive any grain. The domestic utilization regions ship grain in, produce, and consume, but they do not ship any out. The ports ship grain in and out but neither produce nor consume. The foreign utilization regions receive grain from the ports and consume it. Since their demand is equated to United States' exports they are not considered as producers or exporters.

A tree diagram is also given for the soybean and wheat models in Figures 2 and 3 with the same interpretation as before.

Assumptions of the model

The transhipment model is a linear programming model with more restrictive assumptions than the general class of problems solved with the simplex method. The assumptions necessary for the application of the transhipment model are (13):

1. The product shipped is homogeneous. That is, the supply of grain at any region or origin serves equally well to satisfy the demands at any destination or deficit region.

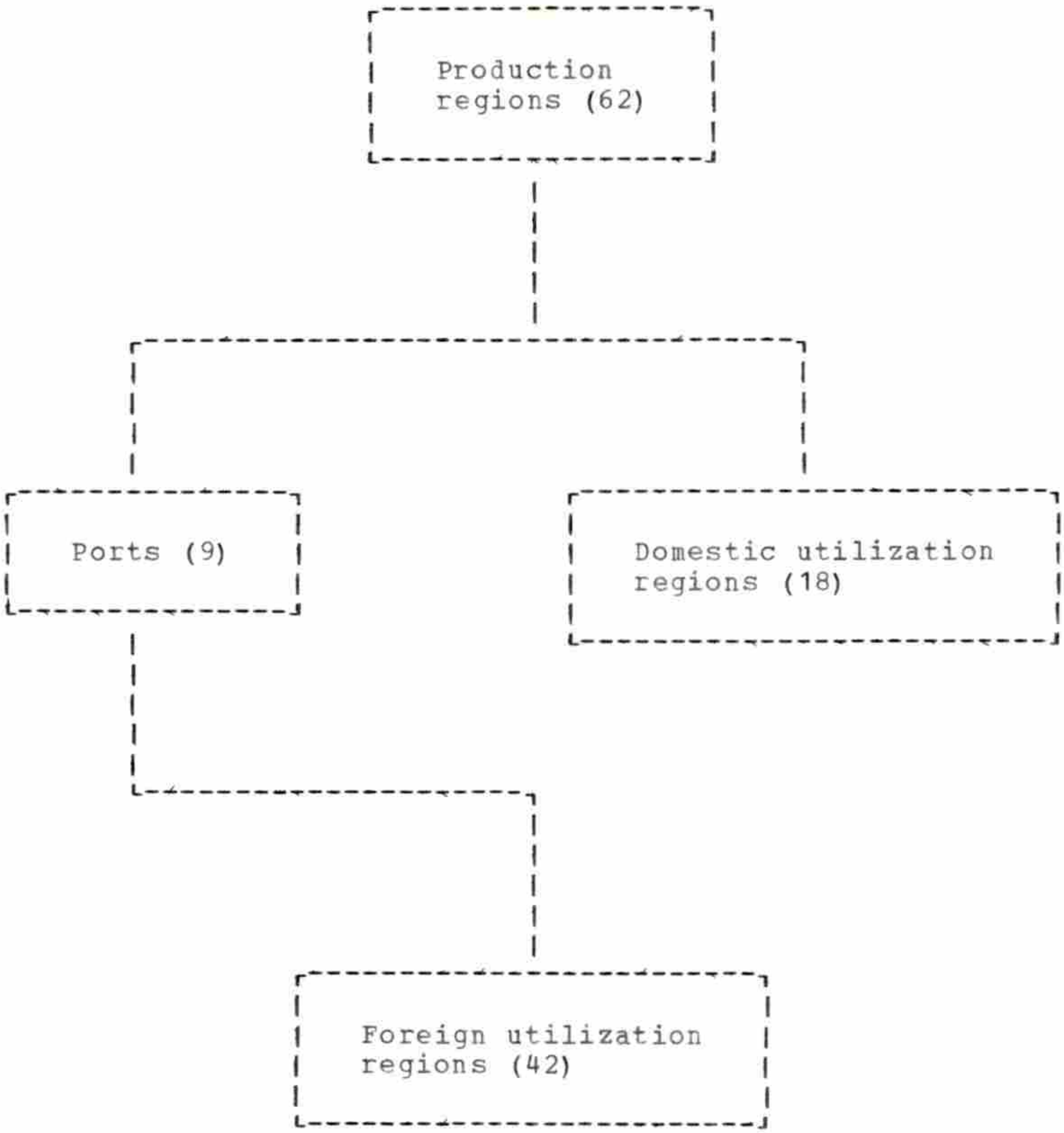

Figure 2: Wheat model

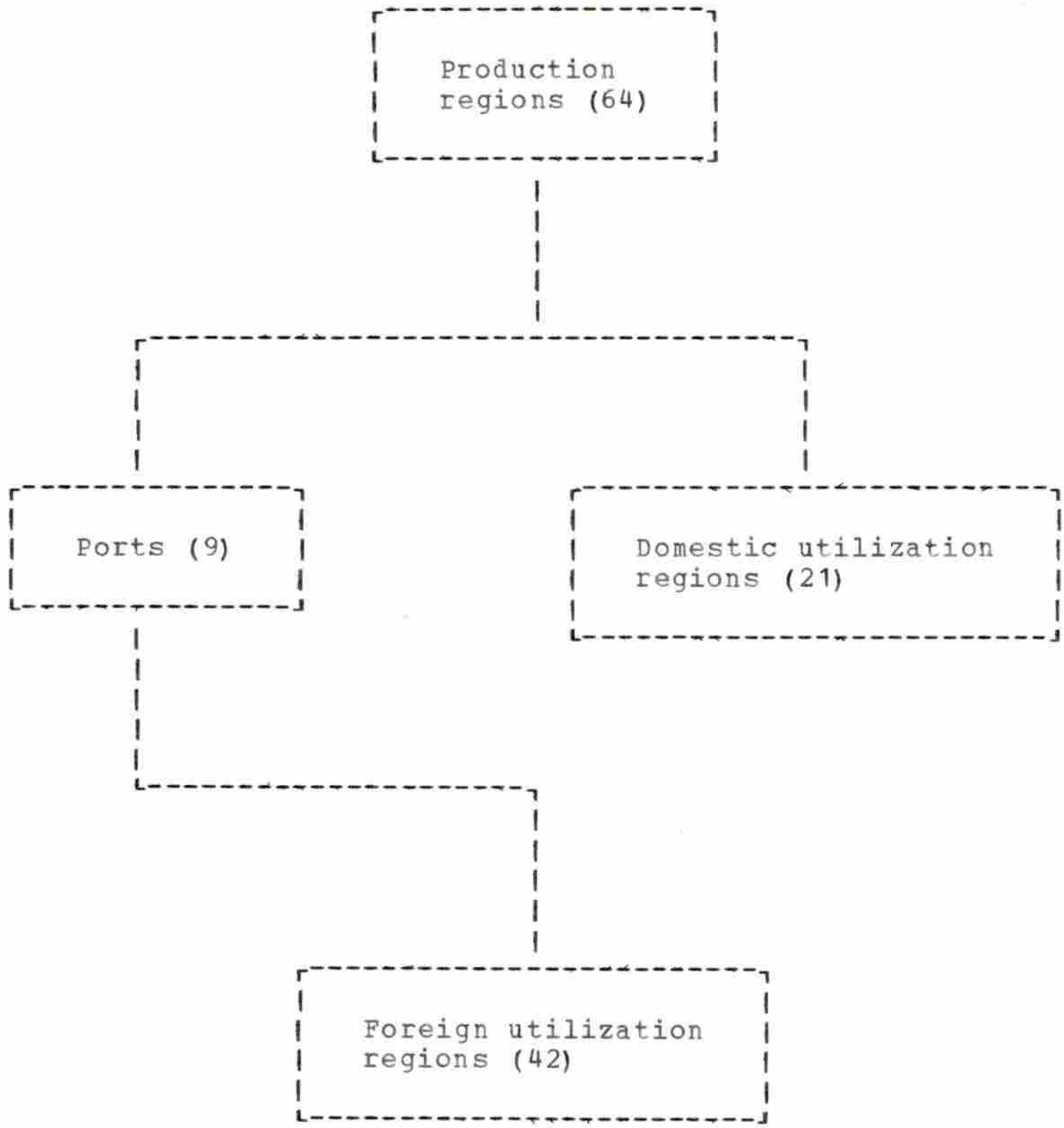

Figure 3: Soybean model

2. The supply of grain available at the various origins and the demands at the various origins and the demands at the various destinations are known, and total demand is equal to total supply. If necessary, demand and supply can be equated by including a dummy origin or destination in the model which are similar to disposal activities in the simplex method.
3. Transhipment through intermediate points, ports of export, is permitted. The amount shipped in minus the amount shipped out for each point is equal to zero.
4. The per ton cost of transporting the grain from origins to destinations is known and is independent of the number of units to be transported.
5. There is an objective to be maximized or minimized. The objective in this model is to minimize total cost of transportation.
6. Transportation from origins to destinations can occur only at non-negative levels. That is, the activities of the model have to be either positive or zero.
7. An entire region may be represented by a point in that region. There are no additional costs in collecting surplus supplies at a point of origin, or

distributing supplies from a point representing a deficit region.

Mathematical formulation of the model

The primal problem requires given cost coefficients and given right hand side values to determine activity levels. These parameters and variables, with their corresponding indices, are described as follows:

$i = 1, 2, \ldots, I$ index of domestic surplus crop reporting districts in the North Central Marketing area, and any surplus regions outside it (origins).

$j = 1, 2, \ldots, J$ index of domestic deficit crop reporting districts in the North Central Marketing area, and any domestic deficit regions outside it (destinations).

$k = 1, 2, \ldots, K$ index of ports of export (transhipment points).

$f = 1, 2, \ldots, F$ index of foreign deficit regions (destinations).

$m = 1, 2, \ldots, M$ index of mode of transportation (size of ship and flag combinations) allowed on the ocean.

b_i known surplus quantity in domestic region i.

b_j known deficit quantity in domestic region j.

b_f known imports from United States to foreign region f.

c_{ij} known cost/ton of shipping from region i to region j.

c_{ik} known cost/ton of shipping from region i to port k.

c_{kfm} known cost/ton of marine shipping from port k to foreign region f by mode m.

x_{ij} quantity shipped from region i to region j (to be determined).

x_{ik} quantity shipped from region i to port k (to be determined).

x_{kfm} quantity shipped from port k to foreign region f. by mode m (to be determined).

The objective function of the primal is as follows:

Minimize

$$1 \qquad C = \sum_i \sum_j c_{ij} x_{ij} + \sum_i \sum_k c_{ik} x_{ik} + \sum_k \sum_f \sum_m c_{kfm} x_{kfm}$$

where C is total transportation cost. The first term on the right of the equality is the total cost of shipping from domestic surplus regions to domestic deficit regions. The second term is the total cost of shipping from domestic surplus regions to ports. The last term is the total cost of shipping from ports to foreign deficit regions.

The objective function is subject to the following constraints:

2 $\sum_j x_{ij} + \sum_k x_{ik} = b_i$ $\quad$ $i = 1, 2, \ldots, I.$

The sum of the quantities shipped from the ith origin to the various j destinations and k ports of export, is equal to the surplus quantity available at the ith origin.

3 $\sum_i x_{ij} = b_j$ $\quad$ $j = 1, 2, \ldots, J.$

The sum of the quantities shipped from the various i origins to the jth destination is equal to the deficit quantity required at the jth destination.

4 $\sum_i x_{ik} - \sum_f \sum_m x_{kfm} = 0$ $\quad$ $k = 1, 2, \ldots, K.$

The sum of the quantities shipped from various i origins to the kth port of export minus the sum of the quantities shipped from the kth port of export to the various f foreign destinations by various modes m is equal to zero.

5 $\sum_k \sum_m x_{kfm} = b_f$ $\quad$ $f = 1, 2, \ldots, F.$

The sum of the quantities shipped from the various k ports of export by various modes m to the fth foreign destination.

6 All the x_{ij}, x_{ik}, and x_{kfm} are non-negative.

One row constraint from equation 4 is excluded to avoid problems of degeneracy. In particular, the excluded constraint is for the port of Chicago. Chicago becomes the base point for the price levels imputed to the various regions in the dual where all prices are relative to the base point Chicago.

The levels of b_i, b_j, and b_f are set so that:

$$7 \quad \sum_i b_i - \sum_j b_j - \sum_f b_f = 0$$

i.e., total shipments out of the surplus regions equal total shipments into thedeficit regions. This condition allows the use of equalities instead of inequalities in the constraints, thereby eliminating the need for dummy activities and also easing the computational burden.

Statement of Data Needs

The transhipment model is concerned with the minimum cost routing of known supplies in surplus markets to deficit markets or regions within the market area. The construction of a model requires designation of the following:

1. Region size at the origin (surplus areas).
2. Intermediate points (ports).

3. Region size at the destination (deficit areas).

4. Shipping and receiving points in each region.

The data requirements for the model include:

1. Surplus quantity of grain available at each origin.

2. Deficit quantity of grain required at each destination.

3. Total per ton transportation cost between each origin and destination.

There is not any definite method for determining region size or basing points within a region. The main criterion is that the regions selected provide a meaningful basis for analysis of the specific problem under study. Choosing a base point requires consideration of 1) location relative to production or consumption concentrations within the region, 2) rail, highway, and ocean vessel transportation facilities, and 3) a point through which shipments occur or might occur without overestimating or underestimating the total shipment costs to the many actual shipment points within the region (24).

Data for a transhipment model is one of the most difficult requirements to meet. Production and consumption estimates or actual figures are necessary for the product under investigation. Bringing in additional or intermediate marketing steps into the analysis increases the data collection problem. Estimates of the quantities available and quantities demanded at each location must be made if actual data is unavailable.

An even more difficult requirement is the determination of a transportation rate for each possible origin-destination combination. In many cases, transportation rates are not readily available or it is difficult to choose one from the multitude of rates that are available. One alternative, in order to be consistent for all rates, is that estimates have to be made based on the distance between basing points and the average cost per mile (8).

Definitions and Data Requirements

Definition of domestic, and foreign regions and ports

United States regions and basing points   The construction of the transhipment model requires specification of region sizes and ports. Figure 4 shows how the North Central Marketing area is divided into crop-reporting districts. The number inside the circle indicates the district number, and the point indicates the basing point within that district. The points outside the North Central Marketing Area are representative of the basing points in other United States regions. The figure is not drawn to scale and therefore does not show the true location of these outside points which are included for graphical purposes. Figure 5 shows the true lo-

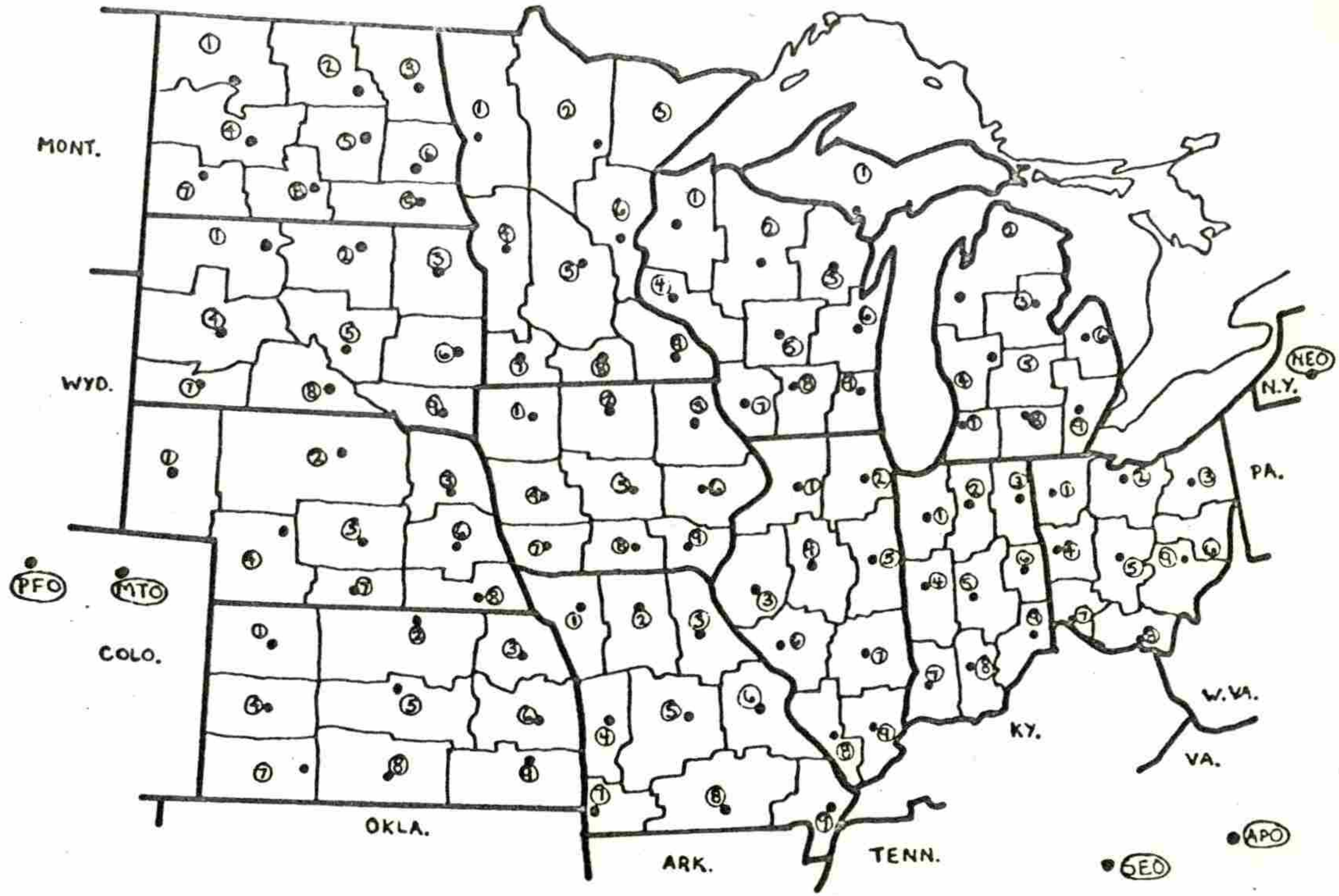

Figure 4. North Central Marketing Area, crop-reporting districts and basing points

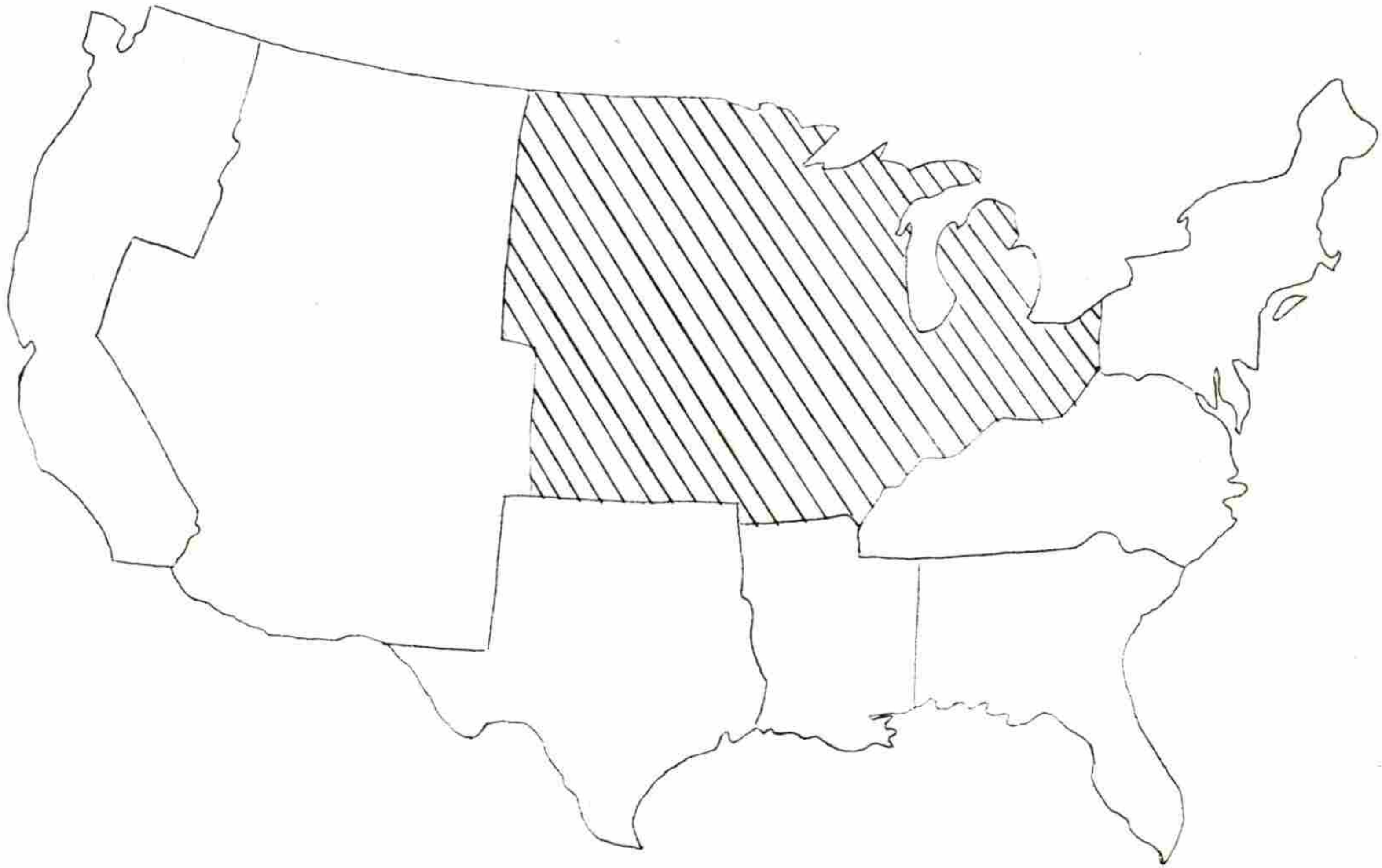

Figure 5. Regions outside the NCMA

cation and size of the regions outside the North Central Marketing Area.

United States ports of export The United States sector of the model has been constructed with crop-reporting districts and regions of states which included a basing point within each one. The ports of exports are also specified on the criterion that they represent a certain export region of the United States. The basing port region of export and the headquarter ports represented in the port region are given in Table 4.

Foreign regions and ports of import The United States exported grains to 126 countries during 1967-1969, of which 42 countries were major importers in terms of the volume of grains under study. A port in each of these 42 countries is chosen as a shipment point. Exports to the remaining 84 countries are added to the exports of the selected 42 countries on the basis of geographical location and ocean proximity existing between the 42 shipment points and the other 84 countries. Thus these 42 regions cover all the exports to the 126 countries. The 42 regions are shown in Figure 6.

In selecting the shipment points of the 42 regions, the following criteria were used: 1) the size of the port, 2) draught, 3) facilities available, 4) and above all, the purpose for which the ports are primarily used and employed.

Table 4. United States ports of export and headquarter ports in each port region

Port region	Headquarter ports included in the region[1]	Computer code
Duluth	Pembina, N. D. Minneapolis, Minn. Duluth Minn.	DUO
Chicago	Milwaukee, Wis. Chicago, Ill.	CHO
Toledo	Detroit, Mich. Cleveland, Ohio	TOO
Philadelphia	Portland, Me. St. Albans, Vt. Boston, Mass. Providence, R. I. Bridgeport, Conn. Ogdensburg, N. Y. Buffalo, N. Y. New York City, N. Y. Philadelphia, Penn. Baltimore, Md. Norfolk, Va.	PHO
Charleston	Wilmington, N. C. Charleston, S. C. Savannah, Ga. Miami, Fla.	CSO
New Orleans	Tampa, Fla. Mobile, Ala. New Orleans, La. St. Louis, Mo.	NOO
Galveston	Port Arthur, Tex. Galveston, Tex. Laredo, Tex. El Paso, Tex. Houston, Tex.	GVO

[1] Source: See reference (25).

Table 4. (Continued)

Port region	Headquarter ports included in the region	Computer code
Los Angeles	San Diego, Calif. Nogales, Ariz. Los Angeles, Calif. San Francisco, Calif.	LAO
Seattle	Portland, Oreg. Seattle, Wash. Juneau, Alaska Honolulu, Hawaii	SLO

The port of import and the countries included in each of the 42 foreign regions are given by commodity in Appendix B, Tables 19, 20, 21.

Domestic surpluses and deficits

The data requirements for the models are surplus quantities of grain available at the origin, and deficit quantities required at the destinations. The total production for the United States is set equal to the sum of domestic feed utilization, domestic processing utilization, and exports. Which is the following:

8 USPD = USFU + USPU + USEX

where:

USPD is total United States production.

USFU is total United States feed utilization.

USPU is total United States processing utilization.

Figure 6. Region sizes in the foreign sector

9 $EX_f = (\sum_y EX_{f,y})/3$ $y = 1967, 1968, 1969.$

10 $USEX = \sum_f EX_f$

where:

USEX is the sum of the exports, based on a three year average, to the f foreign regions.

The production is then allocated among the various regions in proportion to their respective shares on the basis of 1966 data. Domestic feed utilization and domestic processing utilization are allocated to the various regions in a similar manner. This is shown in the following equations:

11 $SPD = \sum_n (PD_n - SD_n)$ $n = 1, 2, \ldots, I+J$

12 $SFU = \sum_n FU_n$ $n = 1, 2, \ldots, I+J.$

13 $SPU = \sum_n PU_n$ $n = 1, 2, \ldots, I+J.$

where:

SPD is the sum of production.

PD_n is the production in the n<u>th</u> region.

SD_n is the seed utilization in the n<u>th</u> region.

SFU is the sum of feed utilization.

FU_n is the feed utilization of the n<u>th</u> region.

SPU is the sum of processing utilization.

PU_n is the processing utilization in the n<u>th</u> region.

14 $RPD = USPD/SPD$

15 $RFU = USFU/SFU$

16 $RPU = USPU/SPU$

where:

RPD is the adjustment ratio for production.

RFU is the adjustment ratio for feed utilization.

RPU is the adjustment ratio for processing utilization.

17 $P_n = RPD(PD_n - SD_n)$ $n = 1, 2, ..., I+J.$

18 $F_n = RFU(FU_n)$ $n = 1, 2, ..., I+J.$

19 $R_n = RPU(PU_n)$ $n = 1, 2, ..., I+J.$

where:

P_n is the production allocated to the various n regions.

F_n is the feed utilization allocated to the various n regions.

R_n is the processing utilization allocated to the various n regions.

This procedure assures equality between total production and total utilization plus exports. Equation 17, through the adjustment ratio RPD, allows production in each region to be just enough to meet the export level in equation 10. If the exports are assumed to be at different levels, then production levels in the domestic regions change through the change in the adjustment ratio RPD to meet these different export levels.

The net surplus or deficit amount for a region is calculated by subtracting feed utilization and processing (processing and seed) utilization from production. That is:

$$20 \quad BAL_n = P_n - F_n - R_n \qquad n = 1, 2, \ldots, I+J.$$

where:

BAL_n is the balance, surplus or deficit, in the nth region.

The total balance equals the total exports and when exports change so does the balance; in this analysis only through changes in production. The surplus and deficit quantities for feed grains in the crop-reporting districts or regions of states are given in Appendix A, Table 16. The table gives the city basing point, the crop reporting district number, the computer code for the solution tables, and the surplus or deficit levels of grain in the United States. Tables 17 and 18, Appendix A, give similar information for soybeans and wheat, respectively.

Foreign deficit requirements

The deficit quantities of grain required by the foreign sector are the amounts exported from the United States to 126 countries during 1967-1969. The 126 countries are represented by 42 regions which cover all the exports to the 126 countries. Appendix B, Tables 19, 20, and 21 give the basing point, the countries included in the region, the computer code, and the deficit quantities of feedgrains, wheat, and soybeans, respectively. The quantities are based on the 1967-1969 average. The sum of the exports given in these tables comprise the term USEX in equations 8 and 10.

Development of Transportation Costs

The total per ton transportation cost between an origin and a destination is developed in two segments. The first segment is the cost of shipping from United States origins to United States deficit region and ports of export. The second segment is the cost of shipping from the ports of export to the foreign destinations.

Domestic transportation costs

The costs of shipping over land from surplus to deficit regions and ports are developed to allow four alternatives.

1. Actual rates for shipments outside the North Central Region. Calculated rates based upon rate functions for shipments within the North Central Region.
2. Calculated rates based upon rate functions with combined truck-barge rate superimposed for shipments to New Orleans.
3. Same as 2. except the scheduled barge rate of the

truck-barge rate is cut in half.

4. Same as 1. except $4/ton rent-a-train rates are superimposed on Champaign, Illinois to New Orleans; and Newton, Kansas to Galveston.

The calculated rates are based on a rate function which uses latitude and longitude as data.[1] This function was used to calculate rates between origins and destinations in the North Central Region. A truck rate based upon rectangular distance is used for distances up to 233 miles in the feed grain model, while the wheat and soybean models allow a truck rate for distances up to 400 miles to avoid an infeasible solution. A rail rate based on air distance is used for longer distances. The air distance estimation procedure employs spherical trigonometry to take into account the curvature of the earth. The rate functions used are as follows:

21 Rail: $C = 2.0 + 0.012 * Da$

22 Truck: $C = 0.8 + 0.018 * Dr$

where, C = rate in dollars per ton

Da = air distance

Dr = rectangular distance

The truck rate function is used in combination with

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[1]Heifner, Richard G., Washington, D.C., United States Department of Agriculture. Description of Phase I model for NCM-42 project. Private communication. 1970.

barge rates to compute truck-barge rates to New Orleans using selected barge ports on the Mississippi and its tributaries.

The barge rate is calculated from each origin to each barge port by adding:

1. the computed trucking cost from the origin to the barge port,
2. the elevating charge, assumed to be $1.00 per ton,
3. and the scheduled barge rate.

Then the lowest cost truck-barge routing is selected.

The truck-barge cost estimating mechanism is also used for calculating truck-rent-a-train rates from Champaign, Illinois to Philadelphia and New Orleans, and from Newton, Kansas to Galveston.

Transportation costs to foreign regions

The second segment of the cost derivation is the shipping on the ocean from United States ports of export to the 42 foreign destination ports.[1] Ocean freight rates for grains are extremely variable because of the short run relationship between the supply of shipping and the demand for such shipping. The difficulty of obtaining actual rates,

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[1]The derivation of ocean shipping costs in mainly from Davis (8) and Cayemberg (3) with additions by Medappa Chottepanda and the author, both in the Economics Department, Iowa State University, Ames, Iowa. 1970.

along with the variablilty of the rates, led to the use of marine cost functions to estimate ocean shipping costs. There are three main factors that go into the derivation of the marine cost functions. These three factors are:

1. ocean distances and speed of the vessel
2. port days
3. canal days

Ocean distances Ocean distances are derived using the nautical mile (6080 feet) as the unit of measure for the distances between each of the 9 United States ports and each of the 42 foreign ports. The shortest navigational distances between the United States and foreign ports are considered. The Suez Canal is assumed to be closed, hence ships bound for Eastern Africa and Western Asia have to sail via the Cape of Good Hope. The distances between United States ports and all foreign ports, except Luanda, are computed based on published references. The distance between the United States ports and Luanda are approximated. The speed of the vessel is assumed to be 14 knots.

Port days The number of days a ship spends in port has a large effect of the total cost of a voyage. The number of days spent in port is sum of three parts: 1) loading days, 2) discharge days, 3) idle days. The number of port days is primarily a function of the port facilities available, particularly the number of cranes and their capacity to load and discharge cargos. The dock facilities and the amount of ocean traffic account for the number of idle days the vessels are kept waiting to unload cargo. There is no standard number of days that a particular type of bulk grain

Table 5. Average number of days for loading a certain size of ship[1]

	15,000 DWT	30,000 DWT	80,000 DWT[2]
Duluth	5	x[3]	x
Chicago	5	x	x
Toledo	5	x	x
Philadelphia	5	7	x
Charleston	5	7	x
New Orleans	5	7	x
Galveston	4	7	x
Los Angeles	7	10	15
Seattle	5	7	10

[1] M. LeRoy Davis thesis (8).

[2] DWT is deadweight ton.

[3] The x indicates that the harbor is too shallow to accommodate that size of ship.

vessel spends in a particular port. However, the number of port days with respect to the 9 United States ports and the 42 foreign ports indicates some consistency in the loading, discharge, and idle days required for the various sizes of ship. The number of port days for United States ports are given in Table 5.

The 42 foreign ports are classified into four groups, each representing those ports which have consistency in port accommodation as well as observed data relating to port days.

The list of groups and ports are given as follows:

Group A: All ports of Asia and Africa except Japan, South Africa, and United Arab Republic.

Group B: Japan, Italy, Poland, South Africa, Israel, East Germany, United Arab Republic, Portugal, Spain, and South America.

Group C: The rest of Europe except the ports in group D.

Group D: Netherlands, Belgium, and West Germany.

The idle days are constant for the three sizes of ship under study. The actual days spent in discharge of 30,000 DWT[1] ships at all the ports capable of handling this size is assumed to be 1 1/2 times the number of discharge days for a 15,000 DWT ship. The actual days taken to discharge a 80,000 DWT ship in the ports capable of handling this size is assumed to be 1 1/4 times the discharge days for a 30,000 DWT ship. Table 6 gives the number of discharge days and idle days for the 42 foreign ports.

Canal days Ships sailing through the Saint Lawrence Seaway or the Panama Canal are assumed to have delays that add to the voyage time. Thus the marine costs are increased. It is assumed that ships going from any United States port

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[1]Dead weight tons.

Table 6. The average number of days at discharge and idle days at the foreign ports by size of ship

	15,000 DWT[1]		30,000 DWT		80,000 DWT	
	Days at discharge	Idle days	Days at discharge	Idle days	Days at discharge	Idle days
Veracruz, Mexico	8	2	12	2	x	x
Cristobal, Panama	8	2	12	2	x	x
Kingston, Jamaica	8	2	12	2	x	x
Port of Spain, Trinidad	8	2	12	2	x	x
LaQuira, Venezuela	8	2	12	2	15	2
Rio De Janeiro, Brazil	8	2	12	2	15	2
Montevideo, Uruguay	8	2	12	2	x	x
Callao, Peru	8	2	12	2	x	x
Valparaiso, Chile	8	2	12	2	15	2
Gothenburg, Sweden	6	1	9	1	x	x
Oslo, Norway	6	1	9	1	x	x
Helsinki, Finland	6	1	9	1	x	x
Copenhagen, Denmark	6	1	9	1	x	x
Liverpool, United Kingdom	6	1	9	1	11	1
Dublin, Ireland	6	1	9	1	x	x
Rotterdam, Netherland	4	1	6	1	6	1
Antwerp, Belguim	4	1	6	1	6	1
Marseille, France	6	1	9	1	x	x
Hamburg, W. Germany	4	1	6	1	6	1
Rostock, E. Germany	6	1	x	x	x	x
Gdansk, Poland	8	2	12	2	x	x
Barcelona, Spain	8	2	12	2	x	x

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1 DWT is deadweight ton.

2 The X indicates that the harbor is too shallow to accommodate that size ship.

Table 6. (Continued)

	15,000 DWT		30,000 DWT		80,000 DWT	
	Days at discharge	Idle days	Days at discharge	Idle days	Days at discharge	Idle days
Lisbon, Portugal	8	2	12	2	15	2
Genoa, Italy	8	2	12	2	15	2
Istanbul, Turkey	8	2	12	2	15	2
Casablanca, Morocco	10	3	15	3	19	3
Tunis, Tunisia	10	3	x	x	x	x
Alexandria, U.A.R.	8	2	12	2	x	x
Tel Aviv, Israel	8	2	12	2	15	2
Dakar, Senegal	10	3	15	3	x	x
Lagos, Nigeria	10	3	x	x	x	x
Capetown, S. Africa	8	2	12	2	15	2
Mombasa, Kenya	10	3	15	3	x	x
Bombay, India	10	3	15	3	x	x
Karachi, Pakistan	10	3	15	3	x	x
Saigon, Vietnam	10	3	15	3	x	x
Manila, Philippines	10	3	15	3	x	x
Hong Kong, Hong Kong	10	3	15	3	x	x
Yokohama, Japan	8	2	12	2	15	2
Montreal, Canada	6	1	9	1	x	x
Luanda, Angola	10	3	x	x	x	x
Sydney, Australia	6	1	9	1	11	1

to any foreign port via either one of these canals will require one extra voyage day.

Marine cost functions After specifying the ocean distances, port days, and canal days a marine cost function is used which was developed by M. LeRoy Davis (8). There are six different marine cost functions, three for United States flag ships based on the size of ship, and three for the foreign flag ships depending on the size of ship. They are as follows:

23 Total cost per ton;[1] 15,000 DWT U.S. flag ship
= 0.889(days in port) + 0.937(at-sea days) + 0.055

24 Total cost per ton; 15,000 DWT foreign flag ship
= 0.317(days in port) + 0.351(at-sea days) + 0.055

25 Total cost per ton; 30,000 DWT U.S. flag ship
= 0.528(days in port) + 0.563(at-sea days) + 0.035

26 Total cost per ton; 30,000 DWT foreign flag ship
= 0.194(days in port) + 0.216(at-sea days) + 0.035

27 Total cost per ton; 80,000 DWT U.S. flag ship
= 0.349(at-sea days) + 0.028

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[1]In dollars per short ton (2000 pounds).

28 Total cost per ton; 80,000 DWT foreign flag ship

= 0.127(days in port) + 0.135(at-sea days) + 0.28

where:

at-sea days = ocean distance/(speed * 24) + canal days

where:

One day is assumed to be 24 hours. Distance is measured in nautical miles. Speed is 14 nautical miles per hour.

These marine cost functions assume the following:

1. A 15,000 DWT ship utilized 90 per cent cargo space outbound, while 3 ,000 and 80,000 DWT ships utilize 95 per cent of cargo space outbound.
2. There is 60 per cent of a normal full load on the return trip.
3. There is an unlimited supply of ships available at ports where they are needed.
4. Only those ports that have harbors deep enough can accommodate the larger sizes of ship. See Table 6.

There are two marine transport alternatives for each commodity considered. It is possible, in one alternative, to ship the commodity by all three sizes of ships. In the other case it is only possible to ship the commodity by a 15,000 DWT ship. A diagram of the models by commodity, the marine transport alternatives, and the various objective functions are given in Figure 7. There are 24 solutions when all models and variations are considered.

Commodity	Model	Marine transport alternatives	Objective function name	Interior rates	Solution number
Feed Grains	I	15,000 30,000 80,000 DWT ships	CS1	Actual rates as reported by McDonald for shipments to destinations outside the North Central Region. Calculated rates based upon rate functions within the North Central Region.	1
			CS2	Calculated rates based upon rate functions with calculated truck-barge rate superimposed for shipments to New Orleans.	2
			CS3	Same as 2 except scheduled barge rate is cut in half	3
			CS4	Same as 1 except $4/ton rent-a-train rates are superimposed on Champaign, Illinois to Philadelphia, Champaign, Illinois to New Orleans, and Newton, Kansas to Galveston.	4
	II	15,000 DWT ships only	CS1	Same as I	5
			CS2		6
			CS3		7
			CS4		8
Wheat	III	Same as I	CS1	Same as I	9
			CS2		10
			CS3		11
			CS4		12
	IV	Same as II	CS1	Same as I	13
			CS2		14
			CS3		15
			CS4		16
Soybeans	V	Same as I	CS1	Same as I	17
			CS2		18
			CS3		19
			CS4		20
	VI	Same as II	CS1	Same as I	21
			CS2		22
			CS3		23
			CS4		24

Figure 7. Models, assumptions, and solution numbers

The first alternative allows a total of six possible cost per ton rates for each ocean route, that is, three sizes of ship with two different types of flag for each size. This leads to the possiblity of six modes for each route on the ocean as represented by m in equations 4 and 5 of the mathematical model. In the models that allow the six modes for each route, some of them are not used because a certain size of ship can not be accommodated in United States or foreign harbor. A particular harbor may not be deep enough to allow a larger ship to enter it so this possible mode-route is not allowed to exist. Other harbors may be deep enough to accommodate the largest size of ship so all six mode-routes are allowed.

The second marine transport alternative allows only one size of ship, thus two possible cost per ton rates for each ocean route.

The corresponding interior rate options are also given. When the combinations with the marine transport alternatives are considered there are eight possible objective functions for each commodity.

Routes

The criterion for choosing to include a route (variable in the model) is as follows: 1) distance, 2) cost/ton, 3) and if an actual route does exist. The computer codes given in Appendix A, Tables 16, 17, 18, are used in constructing the variable names for the domestic routes. If a region is a surplus area, its computer code forms the first half of a variable name, say MC5.... A deficit region's computer code forms the second half, say ...MC3. The result being MC5MC3. An example of a route not chosen is OH4PF0. In this case the distance is too far which results in a high cost per ton so it is not considered as a feasible route.

Shipping on the ocean is made up of routes from United States ports to foreign regions. They are constructed in a similar manner as before. The computer code for the United States ports of export, Table 4, forms the first part of a variable name, say DU0.... The computer code for the foreign regions, Appendix B, Tables 19, 20, and 21, forms the second part, say ...UK0.... The mode, size of ship and flag combination, forms the last part, say ...1. The mode is a number from 1 to 6 and corresponds to the cost functions given by equations 23 - 28. A resultant mode-route is, for example, DU0UK01. The total number of routes possible is 378 (9 ports * 42 regions), and for each route there are 6 possible modes making possible a maximum of 2268 (378 routes * 6 modes) mode-routes. However, not all mode-route combinations are allowed over some routes because of harbor depth limitations for the larger sizes of ships. Other routes may have harbors that are deep enough to allow the largest size of ship so all six mode-routes were allowed.

The variable names representing routes are given in Appendices C, and D, along with the solutions to the models and the opportunity costs, respectively. Appendix C gives the variables in the solutions and Appendix D gives the variables that are not in the solutions. These tables list all possible domestic routes and marine modes-routes considered for the models.

MODEL VERIFICATION

A spatial equilibrium model is typically used for normative purposes. In some cases this can be misleading and result in policy recommendations that are difficult to achieve. The use of a model for positive purposes requires that it be validated using various verification procedures. The problem of "what is" a valid model is a difficult one to answer. There are four basic positions on verification with multistage verification being the most applicable. Incorporated in this later procedure are the historical verification and forecasting ability of a model. Appropriate statistical techniques are available which increase the model builders' information, but ultimately the user must decide whether or not it is a valid model.

A Methodological Issue

The normative framework

In general terms, a spatial equilibrium problem is one of maximizing the sum of consumer plus producer surpluses in spatially separated markets, less transfer costs. Implicitly, then, the problem has normative implications associated with the solution in that it gives what ought to exist for efficient allocation of resources.

Lefeber (18) is more direct in stating the problem in a normative framework:

> The setting of the entire analysis is a purely competitive one in the sense that no individual firm or owner of resources can affect the market in which he is dealing... the reason for assuming a perfectly competitive system is to provide a theory of optimal spatial allocation of factors and distribution of final goods. If such a theory can be developed, the extent and significance of monopolistic deviation can be appraised, and planning for corrective measures becomes possible.

Thus, Lefeber's motive for deriving a theory of spatial competition is to provide a norm against which the efficiency of actual markets can be judged. He specifically mentions monopoly, but to be complete one should specify other possible aberrations from perfect competition such as ignorance, irrationality, etc.

Measuring the efficiency of spatially separated markets is a challenging problem. However, the direction that much of the empirical research being done with spatial equilibrium models, of which the transhipment model is a subset, needs to be questioned. First, research extended in the direction of measuring efficiency of separated markets is scientifically unsatisfying because it gives up the only objective measure of the soundness of a model - namely, how well it predicts. Second, the normative direction that much of the empirical research in spatial equilibrium has taken has led away from research that is needed to answer important questions. Concerning policy implications; the conscious or unconscious use of a normative spatial equilibrium model for positive purposes resulting in specific policy recommendations can lead away from more efficiency in spatially separated markets.

Henderson's study of the coal industry

In order to elaborate on these points Henderson's (13) study of the coal industry is cited.

Henderson's approach begins to come clear in the following quotes (14, pp. 3-4):

> Aside from their somewhat dubious value as approximations of actual situations, the results of perfect competition serve as implicit, if not explicit, welfare norms for many economists.
>
> No industry conforms exactly to all of the conditions and results of perfect competion and the question to be answered in the analysis of particular industy is not if it satisfies these conditions and results but rather how closely it satisfies them.

The objective of the empirical study undertaken by Henderson is succinctly stated (14, p. 6).

> The present monograph is primarily devoted to a study of the deviations of the actual results of the bituminous coal industry from perfectly competitive norms.

The major assumptions that Henderson proposes are outlined as follows:

1. The United States is divided into fourteen districts (14, p. 43).
2. Because of two methods of mining, the model contains twenty-two deposits and fourteen consumption locations (14, p. 43).
3. Regional demands are assumed completely inelastic and given by consumption data (14, p. 44).
4. Regional capacities for producing coal are calculated by extrapolating average output for active days to 280 days (14, p. 45).
5. Unit extraction costs were estimated for each year of the study and were assumed independent of the level of output (14, p. 48).
6. Unit transport costs (assumed independent of volume) are estimated and added to extraction cost so that a figure is obtained that represents unit costs of deliveries from all production to consumption locations (14, p. 49).
7. A transport cost model is solved for 1947, 1949, and 1951 using the basic data as described (14, p. 54).

Henderson dismisses the idea of "testing" the results of his model by stating (14, p. 54):

> If one fits a regression equation to a series of historical data in order to predict the value of some variable, one usually tests its appropriateness by determining how well it 'predicts' the past values of the variable. A similar testing procedure cannot be utilized for the present model since its solutions do not 'predict' the actual values of the delivery levels. The solutions of the model give the values of the delivery levels which would have prevailed if total costs were minimized.

The comparison of the results of the models with real world data might lead one to conclude that the nonconformity of the model with the data shows the degree of "wrongness" of the real world, or conversely, the degree of "rightness" of the model.

Two measures of efficiency are derived. Using one of the measures, the output efficiency index, Henderson reaches the conclusions that for the years 1947, 1949, and 1951, the bituminous coal industry was 88.2, 79.1, and 81.9 per cent efficient (14, p. 84).

Difficulties with the normative approach

The nonconformity of the real world is a measurement subject to error. This error can be caused by two main factors, 1) error in measurement of real world data, and 2) error in the model structure. The first factor is not considered in this study. The second factor, error in the model structure is very important. It is a factor that depends at least on three types of uncertainty.

1. The estimation of the coefficients may be estimates obtained from engineering cost studies or from statistical data and therefore subject to error. If they are known with certainty at one point in time they may change or be different for another point in time.
2. The multiplicative structure of a coefficient times a variable in the objective function and the constraints. At what levels of a variables value do economies of scale occur.
3. The aggregation or disaggregation of the system being abstracted. Are there enough activities (variables) included in the objective function and constraints to adequately explain the system being analyzed. Similarly are there enough constraints in the model.

Hypothetically, more or less constraints could be included in a spatial equilibrium model until the solution exactly equals its real world counterpart. The correspondence of a solution with reality is only a necessary condition for simulation. The sufficient condition is that changes in the real world are exactly reflected by changes in the model. In other words the sensitivity of the model is such that it reflects real world changes exactly.

The crux of the objection to Henderson's study lies in the assumptions, as it does in any spatial equilibrium problem. Another researcher, by realistically assuming extraction and transfer costs as functions of volume or perhaps allowing for some elasticity of regional demand or perhaps accounting for competing products, etc., might have concluded that the bituminous coal industry was 92.6 efficient in 1951. hypothetically, our cheapest means of economic growth may be to respecify and reestimate economic models to reach ever higher levels of market efficiency.

These objections point out that in an area of research confounded by multiple, interdependent hypotheses, satisfactory criteria for judging the "reasonableness" of a model are lacking. The normative approach discards from the outset the single objective criterion by which good models can be separated from bad models - the criterion of prediction.

The important question of policy implications derived from the Henderson study and other similar studies is also subject to a certain amount of doubt. If the efficiency interpretations, 88.2, 79.1, and 81.9 per cent efficiency of the bituminous coal industry for 1947, 1949, and 1951, are taken literally, then a central control board, using Henderson's model, could make the coal industry 100 percent efficient. This would have resulted in a savings of about $250 million in 1951 (14, p. 86). However, Henderson himself rejects this (14, pp. 102-103):

> Nationalization would provide a single control, but it has not provided a solution for the problems of coal in the United Kingdom, and it is unlikely that it would provide a solution for the United States... The defects of pricing and allocation as performed in the free market are not necessarily solved by the abolishment of free pricing and allocation. Pricing in the United Kingdom has proven a formidable problem; pricing in the United States would be even more difficult.

The expression of doubt that efficient pricing could be achieved in the United States coal industry through nationalization indicates that the models heretofore considered as normative cannot really be trusted as norms. This suggests a subjective test for normative models. Is one willing to substitute the "what ought to be" for the "what is"? Henderson appears to be unwilling to do so. Thus the conscious or unconscious use of normative models for positive purposes resulting in policy recommendations can be a misleading tool.

The Problem of Verification

Many important questions occur that require the ability to understand and quantify interrelationships among geographically separated units of the economy. The typical spatial equilibrium model "predicts"[1] a number of variables such as interregional flows, regional prices, production, etc., depending upon the ambitiousness of the particular study. The answer to these questions can be obtained with the use of spatial equilibrium models which have been verified with reality. The main problem of this type of analysis is how to go about "verifying" a model. One reason for avoiding the subject of verification is that the problem of verifying a model remains today perhaps the most elusive of all the unresolved problems associated with computer simulation techniques. It is in reality no different from the question of verification when applied to any type of hypothesis or model, whether it is expressed as a verbal model, a physical model, a mathematical equation, or a computer program.

To verify or validate any kind of model means to prove the model to be true. But to prove that a model is "true" implies 1) that a set of criteria have been established for differentiating between those models which are "true" and those which are not "true", and 2) that these criteria can be readily applied to any given model. Yet the concept of

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[1]The term predicts as used in the text can be considered synonymous with estimates, but different from forecasting which is predicting the future.

"truth" has successfully eluded philosophers and theologians since the history of mankind. To decide upon a particular set of criteria that must be satisfied before there can be "truth" suggests that one must choose a subset of rules, call them truth rules, from an almost infinite set of rules handed down by philosophers, theologians, and metaphysicians. When verification is placed in this perspective, the problem is completely overwhelming because it may be argued that man is incapable of recognizing "truth" at all, even if "truth" exists.

However, there is the possibility that persons can agree on a concept of verification for a certain limited class of statements and the possibility of indirect verification of other statements (20, pp. 310-319).

Positions of Economic Verification

There are four major methodological positions concerning the problem of verification in economics. They are 1) synthetic apriorism, 2) ultraempiricism, 3) positive economics, and 4) multistage verification; which are as follows:

Synthetic apriorism This position asserts that economic theory is merely a system of logical deductions from a series of synthetic premises of unquestionable truth (2, p. 612).

Ultraempiricism This is at the opposite end of the methodological spectrum and is the complete opposite to synthetic apriorism. Ultraempiricism refuses to admit any postulates or assumptions in economics that cannot be independently verified. This extreme form of logical positivism asks that one begins with facts, not assumptions (2, pp. 612-613).

Positive economics This asserts that the validity of an economic model depends not on the validity of the assumptions on which the model rests but rather on the ability of the model to predict the behavior of the endogenous variables that are treated by the model. However this position is assailable on the grounds that the empirical testing of the predictions is the sole criterion of validity. This implies that it makes no difference as to what extent the assumptions of the model may falsify reality (2, pp. 612-613).

Multistage verification This position incorporates the methodology of synthetic apriority, ultraempiricism, and positive economics. It is essentially an eclectic approach to the problem of verification requiring that each of the aforementioned methodological positions is a necessary condition for validating simulation experiments but that neither of them is a sufficient condition for solving the problem of verification.

The first stage of this procedure requires the formulation of a set of postulates of hypothesis describing the behavior of the system of interest.

The second stage of the procedure calls for an attempt to "verify" the postulates on which the model is based, subject to the limitations of existing statistical tests such as the t-test, F-test, chi-square test, distribution-free tests, etc. Whether a postulate is verified completely or not is difficult to answer, but the "best" possible statistical tests available can be applied to these postulates.

The third stage of this verification procedure consists of testing the model's ability to predict the behavior of the system under study. However, the accuracy of the prediction is not the sole criterion for validation as in the positive economics approach. This procedure attaches equal weight to the validity of the assumptions of the model and the predictive capabilites of the model.

Methods of Verification

There are two alternative approaches available to test the degree to which data generated by simulation models conform to reality. They are 1) historical verification, and 2) verification by forecasting.

Historical verification

Several approaches to historical verification have been suggested by operations researchers and economists. Clarkson (4), referring to his experiences with simulating investment portfolio selection procedures has suggested a general method to attack the problem of historical verification (4, p. 34).

> In the case of ... simulation models, the model as a whole can be subjected to statistical tests by matching the time series [activity levels] generated by the model against the actual time series [activity levels] of the variables [routes] under consideration. In this way a measure of "goodness of fit" can be obtained and the model as a whole can be confirmed on its ability to predict the time series [activity levels].

As Clarkson suggests, a measure is needed which gives the "goodness of fit" when attempting to fit data generated by computer simulation experiments to real world data. Cohen and Cyert (5) have outlined the nature of this problem and have suggested a general procedure for solving it (5, pp. 112-127).

> The likelihood of a process model incorrectly describing the world is high, because it makes some strong assertions about the nature of the world. There are various degrees by which any model can fail to describe the world, however, so it is meaningful to say that some models are more adequate descriptions of reality than others. Some criteria must be devised to indicate when the time paths [activity levels] generated by a process

> model agree sufficiently with the observed time paths [activity levels] so that the agreement cannot be attributed to mere coincidence. Tests must be devised for the "goodness of fit" of process models with the real world. The problem of model validation becomes even more difficult if available data about the "actual" behavior of the world is itself subject to error.
>
> Although the final details have not yet been adequately developed, there appear to be ... possible ways in which the validation problem for process models can be approached.... [Specifically]... simple regressions of the generated series [activity levels] as functions of the actual series [activity levels] can be computed, and then we can test whether the resulting regression equations have intercepts which are not significantly different from zero and slopes which are not significantly different from unity.

Thus, the historical verification of computer simulation models can be based on statistical techniques that give a measure of the "goodness of fit" of generated model output with real world or actual data. But the question arises, when is the "goodness of fit" between model output and actual data sufficient enough so that the model is an adequate or "most" adequate description of reality? The level of sufficiency of "goodness of fit" would have to be decided upon by the model builder and would be, among other things, a function of the resources available and the complexity of the model.

Forecasting

The ultimate test of a computer simulation model is the degree of accuracy with which the model predicts the behavior of the actual system, being simulated, in the future. The possibility that computer simulation models may be able to predict the future is the major justification for the use of computer simulation as a tool of analysis. However, not all computer simulation models are capable of yielding accurate forecasts about the future. In fact the number of computer simulation studies that claim even a modicum of success are meager (20, p. 318). The reason for this can be seen in the comparison of traditional econometric model2 and computer simulation models.

The traditional econometric model is typically a one-period-change model. Any lagged values of the endogenous variables are, in effect, treated as exogenous variables. They are assumed to be predetermined by outside forces rather than by earlier applications of the model mechanism. The output of econometric models are the values of the endogenous variables for a given time period. To determine the values of the endogenous variables for the next time period requires that new values be assigned to the lagged endogenous variables. For this reason, most econometric models are regarded as describing the changes which take place in the world from one period to another.

The mechanisms of a computer simulation model, together with the observed time paths of the exogenous variables, describes a closed dynamic system. Closed in the sense that the values of the lagged endogenous variables are the values previously generated by the system. Thus, computer simulation models may be forced to operate with errors in the values of the endogenous variables made in the previous periods. There is not, in this case, any correction at the end of each period to assure correct initial conditions for the next period as in econometric models (5, p. 112-127).

The use of a computer simulation model, or any type of a model, for predicting future behavior requires consideration of three basic forms of forecasts (11).

Unconditional forecasts   The unconditional forecast seeks to predict what will happen to the endogenous variables in some future period, and is the most hazardous forecast to make. If it is to be accurate, then the functional relations must remain valid in the period of extrapolation, and the predetermined variables in the model must have been predicted accurately.

Conditional forecasts   The conditional forecast is assumed valid only if the condition that predetermined variables take on certain stipulated values. Otherwise it is the same as unconditional forecasts. Many plausible combinations of predetermined variables can be run through the model resulting in set of conditional forecasts. This set of forecasts can provide an indication of the range that the endogenous variables may take on, and also of their sensitivity to fluctuations in the predetermined variables. In this case the predetermined variables may have been previously forecasted.

Target or plan   The model may be used to determine a plan or target for future operations. Desired levels of the endogenous variables are selected on the basis of external conditions. The problem then is one of determining a set of feasible combinations of the predetermined variables which will give the desired result. In other words, a plan or target is set in terms of the endogenous variables, and feasible combinations of the other variables are sought which will result in the plan. This type of forecast is an inversion of the other two forms.

Statistical Techniques for Verification

The purpose of using some statistical technique for verifying a model is to establish criteria by which the model can be judged valid. The criteria chosen depends upon the model builder and the purpose for which he wants to use it. If the model builder has difficulty in establishing these criteria the statistical techniques are still useful to him. They will give him a certain amount of information regardless of whether or not the model is judged valid. At that point revisions could be made hopefully in a direction which would make the model more adequate. This process of applying statistical techniques to gain information and making subsequent revisions could continue until the model achieves a certain degree of adequacy or validation desired by the user. In the process criteria may be established by which the model is judged valid.

Recall that the transhipment models developed in chapter two have twenty-four different optimal solutions depending on the set of assumptions used. The activity levels of shipping from the ports to the foreign destinations are compared with their corresponding actual shipments over the ocean for the years 1966 and 1967. The purpose for doing this is twofold. First, it determines if a typically normative transhipment model can be used as a positive model. Secondly, it is used to verify the model and establish how well it abstracts reality.

There is a wide range of statistical techniques available for comparing model generated solutions with actual data for the purposes of gaining information and verification. Some of these techniques are 1) regression, 2) correlation, 3) coefficient of determination, 4) hypothesis testing, 5)

Theil's inequality coefficient (22), 6) Chi-Square, and 7) Kolmogorov-Smirnov. The first four techniques are applied to the models developed in chapter two; which are as follows:

Simple linear regression The simple linear regression equation is:

29 $Y = a + bX + u$

where the dependent vector Y is the actual shipments of grain over ocean routes. Each element of the Y vector represents the quantity of grain that flows over a particular route. The independent vector X is a subset of the solution of a transhipment model. The subset is the activity levels which represent flows of grain over ocean routes. Each element of the X vector represents the quantity of grain that flows over a particular route. The U vector is the error term.

Estimates for a and b are determined using the method of least squares. Ideally, if a transhipment model solution is exactly equal to the actual shipments, then intercept "a" equals zero and slope "b" equals one, and the model describes grain flows as they actually occurred. Plotting X and Y, and comparing with a forty-five degree line gives an indication of how close the model comes to the actual data.

Correlation The correlation coefficient R is given by the following equation:

$$30 \qquad R = \frac{\sum (X - \bar{X})(Y - \bar{Y})}{\sqrt{\sum (X - \bar{X})^2 \sum (Y - \bar{Y})^2}}$$

which explains the degree of linear relationship between two variables. Its range is from minus one to plus one, where a plus one indicates a perfect linear relationship and a minus one indicates a perfect inverse relationship of the two variables. However, the correlation coefficient does not indicate any cause and effect relationship.

Coefficient of determination The coefficient of determination is explained as follows:

$$31 \qquad r^2 = \frac{\sum (\hat{Y} - \bar{Y})^2}{\sum (Y - \bar{Y})^2}$$

$$= \frac{\text{variation in Y explained by regression}}{\text{total variation in Y}}$$

or, it is the proportion of the total variation in Y explained by fitting the regression. The range of r-squared is also from zero to plus one. A value of plus one indicates that the total variation in Y is explained by the regression, while a zero indicates that none of the variation is explained by the regression.

<u>Hypothesis testing</u> A test of the hypothesis:

Ho: $a = 0,\ b = 1$ is

$$32 \qquad \frac{1/2 \left[(a-0,\ b-1) \begin{pmatrix} n & \sum x \\ \sum x & \sum x^2 \end{pmatrix} \begin{pmatrix} a-0 \\ b-1 \end{pmatrix} \right]}{(1 - r^2) \sum (Y - \bar{Y})^2 / (n - 2)}$$

which follows an F distribution with 2 and n-2 degrees of freedom. This test is used on those comparisons which have values for r^2, R, and b relatively close to one.

In summary, there is a difference in the use of a spatial equilibrium model for positive versus normative purposes. The latter is the most frequently used. The method of using a norm, established by a model, to judge the real world and recommend policy alternatives can be misleading. In particular, the assumptions that go into a normative model may not account for all the important factors underlying reality. Or, it may be impossible to carry out the recommendations. Another criterion for judging a model is its predictive power, that is, can the model be used for positive purposes. The development of spatial equilibrium models that are capable of either being accepted or rejected by empirical evidence require that adequate verification procedures be made available and subsequently applied. The multistage verification position seems to be the most appropriate means for constructing and testing a model's validity. Incorporated in this procedure are historical verification of the model and the acid test, its forecasting ability. Statistical techniques are available which give the model builder more information so he can judge the level of validity of a model, but in the final analysis the user must decide whether to accept or reject it.

RESULTS AND INTERPRETATIONS

Introduction

There is a considerable amount of results from deriving 24 different solutions with approximately 100 to 150 activity levels associated with each solution. Correspondingly, there are approximately 1500 to 2000 activity levels, non-basic variables, that have an opportunity cost term for each solution. For each optimal solution to a primal problem there is an optimal solution for a dual, called "shadow prices". Again, there are from 100 to 150 shadow prices to go with each of the 24 solutions. The presentation of all of this massive amount of output is unnecessary. In order to limit its size a subset of the 24 solutions has been chosen. Solutions numbered 1, 2, and 3 of Model I, see Figure 7, and solutions 17, 18, and 19 of Model V, are presented along with their associated opportunity costs and shadow prices. The particular solutions are presented because of their difference in assumptions about interior freight rates. A common occurrence is the similarity of the first and fourth solution in each set. There is very little difference in these two solutions, if any. As will be shown later on in the empirical verification section, the six solutions presented contrast with respect to their goodness of fit; but all of them fit better under the marine transport assumption allowing all sizes of ships.

These are the six optimal solutions presented, three for feed grains and three for soybeans. Each solution is discussed with reference to three maps, one for movements to domestic deficit regions, one for movements to ports of export, and one for the implied price surface. Two solutions, number 3, Model I for feed grains, and number 19, Model V for soybeans, have maps which represent movements to foreign deficit regions.

Each of the six solutions has a table that gives the optimal quantities of grain that move both to domestic and foreign destinations. Another table gives the opportunity costs for not shipping any grain over nonoptimal routes. It should be noted that in each solution there are alternative optimal activity levels which can generally be recognized by a zero opportunity cost. The total transportation cost, value of the objective function, is given for each solution.

The optimal solutions to the different models is only a part of the results. The other part is the empirical verification results. All twenty-four model solutions are compared with their real world data counterpart for the years 1966 and 1967. Actually, a subset of the activity levels that make up an optimum solution is analyzed. The movement of grain on the ocean is the subset considered. It is almost impossible to obtain detailed enough data on the domestic movement of grain for a comparison in the domestic sector of the models. The comparison of ocean movements of grain for each year is done using statistical methods where the results are regression coefficient estimates, subject to an F-test, and coefficients of determination. None of the alternative optimal activity levels are considered in the statistical analysis because of expense.

Definitions

An optimal solution is fairly easy to understand, the opportunity costs and implied price surface are more difficult, so a separate economic interpretation of their meaning is appropriate.

Optimal solution

An optimal solution gives a set of values for the variables so that they meet the requirements of the constraints and also are the set of values that optimize the objective function. The transhipment model determines a set of values such that the surplus supplies at different origins meet the deficit demands at different destinations. Shipment through intermediate points is allowed where both supply and demand are zero. The objective function requires that the total transportation cost be a minimum subject to the constraints.

Opportunity costs

The opportunity cost of not shipping over a particular route is interpreted as the dollar increase in the value of the objective function for each unit that is forced to go over that route; thus changing a previously optimal solution. For example, the route SP0LA0 may not have entered an optimal solution and thus may have an opportunity cost of $2.25. Subsequently, if one ton of feed grain is forced to move over that route then the value of the objective function would increase by $2.25. Any route with an opportunity cost of zero will leave the value of the objective function unchanged and therefore can be considered as an alternative optimal solution vector.

Implied price surface

The solution to the dual of the transhipment model yields shadow prices which can be interpreted by looking at a simple example of a dual to a transportation model.

33 Maximize

$$z = \sum_j v_j y_j - \sum_i u_i y_i$$

34 subject to

$$v_j - u_i \leq c_{ij}$$

where:

v_j = value per unit at destination j.

u_i = value per unit at origin u.

Where u_i and v_j are unrestricted in sign.

The first term of the objective function is the total value of the commodity at destination j, and the second term is the total value at the origin i. Thus the solutions to the dual are the values of v and u that maximize total gain in value of shipments subject to nonpositive profits on each shipment.

One row constraint is omitted from the transhipment model developed in chapter two, the one for domestic shipments to Chicago. So, Chicago has a per unit value of zero and serves as the base for determining all other prices relative to the price at Chicago. For example, the price at Chicago may be \$50. per ton (\$1.50 per bu.), the solution to the dual may indicate that IA5 has a per ton value of -\$3.80 relative to a base price of zero at Chicago. The price that is implied at IA5 is \$46.20 per ton (\$1.38 3/5 per bu.). This is how the solution to the dual results in an implied price surface relative to some base.

The price that is implied at a particular region, say IA5, may change from one solution to another. If IA5 ships grain to a different destination there is usually a change in the cost coefficient associated with the new route. Thus, by equation 34, the values of the unknown variables v and u can change from solution to solution. It should be noted that these are not market prices but values, determined by the dual, that imply certain prices for a commodity, It is entirely possible that the prices implied by the dual do not reflect reality at all. Perhaps, as discussed for the primal in chapter three, it is because the assumptions for determining the cost coefficients are not realistic.

Optimal Distribution of Feed Grains

There are six optimal solutions presented, three for feed grains and three for soybeans. Referring to Figure 7 and Tables 22, 23, 24, will help in understanding the discussion of the different solutions.

Solution 1

Solution number 1, Model I, is for optimal distribution of feed grains where ocean shipping is allowed on all three sizes of ships. With the larger sizes of ships allowed, and thus more activities, the lower the cost per ton of shipping a commodity and the possibility of a lower total transportation cost. The domestic rates are based on actual rates for shipments to destinations outside the North Central Marketing Area (NCMA), and rate function for shipments within the NCMA.

Domestic shipments The map of domestic flows for solution number 1, see Figure 8, shows some consistency for the direction of feed grain movement. That is, the Pacific and Mountain regions are supplied by the southwestern section of the NCMA, the Delta region is supplied by the middle southern section, the Southeast and Appalachia regions are supplied from the southeastern section, and the Northeast region is supplied by the northeastern section. However, some of the regions are supplied from origins more distant than is the general case. The Appalachia region pulls 10.5 per cent of its feed grain from SD9, see Table 22 of Appendix C, and Table 16 of Appendix A. The Southeast region pulls 5.8 per cent of its feed grain from MN5, and 14.5 per cent from MN7. The Northeast region receives 22 per cent of its feed grains from IA2, and 9.5 per cent from IA6. The shipments inside the NCMA are all made from origins relatively close to the deficit areas.

Shipments to ports The movement of feed grains to the ports of export shows some consistency, see Figure 9. The majority of the grain is exported through the Chicago port region, see Table 7, followed by the Galveston port region.

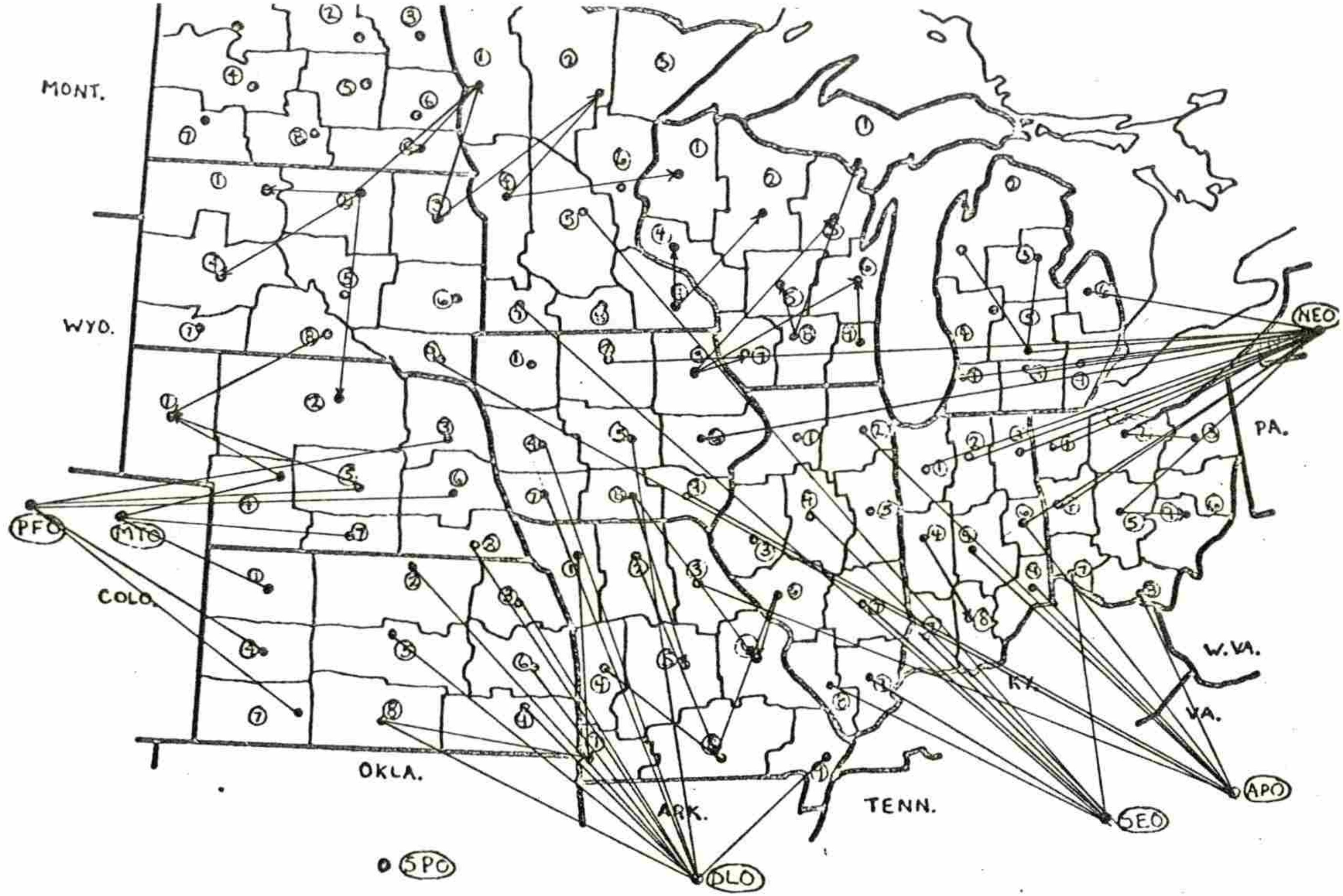

Figure 8. Solution 1, domestic flows from surplus to deficit regions

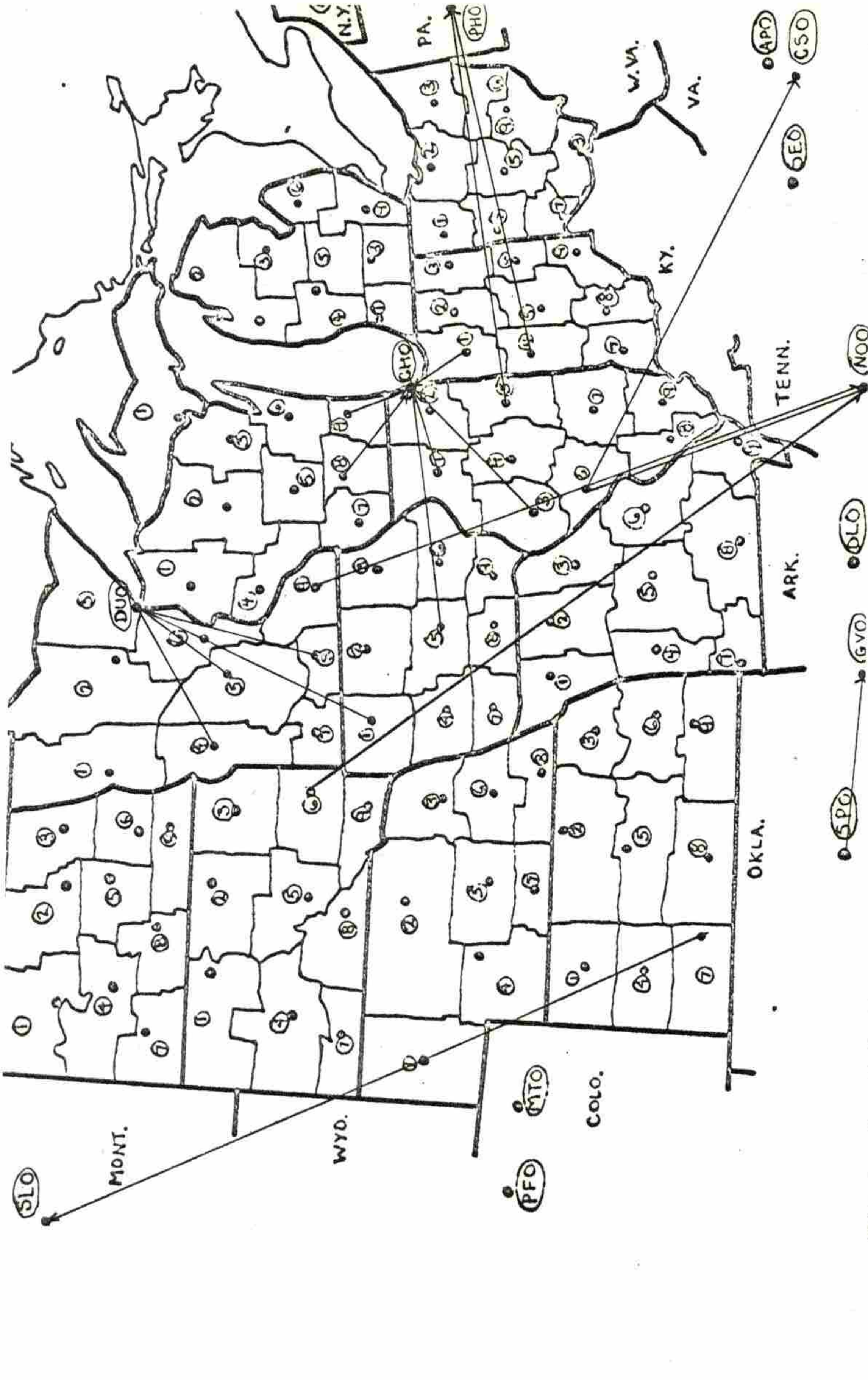

Figure 9. Solution 1, domestic flows from surplus regions to ports

Table 7. Per cent of total feed grain exports that pass through a port region, solution number 1

Port region	per cent
Duluth	19
Chicago	29
Philadelphia	19
New Orleans	8
Galveston	23
Seattle	2

The Duluth and Philadelphia regions are very close in exports, and finally New Orleans and Seattle. It appears that the ports in the Great Lakes region and the east coast account for 67 per cent of the exports with the Galveston and New Orleans regions accounting for 31 per cent; a little less than half of the former regions. The odd occurrence is that New Orleans and Seattle pull grain from relatively far distances.

The optimal quantities of feed grain that moves over these domestic routes and the ocean routes are given in Table 22 of Appendix C; the units are 1000 short tons. The opportunity costs of not moving grain over another route, non-optimal, are given in Table 28 of Appendix D.

Price surface The implied price surface for solution number 1, Model I, see Figure 10, gives the price per short ton in a region relative to a base price of zero at Chicago. The conversion factor of dollars per ton to cents per bushel is \$1 per ton equals 3¢ per bushel, where 1 bushel weighs 60

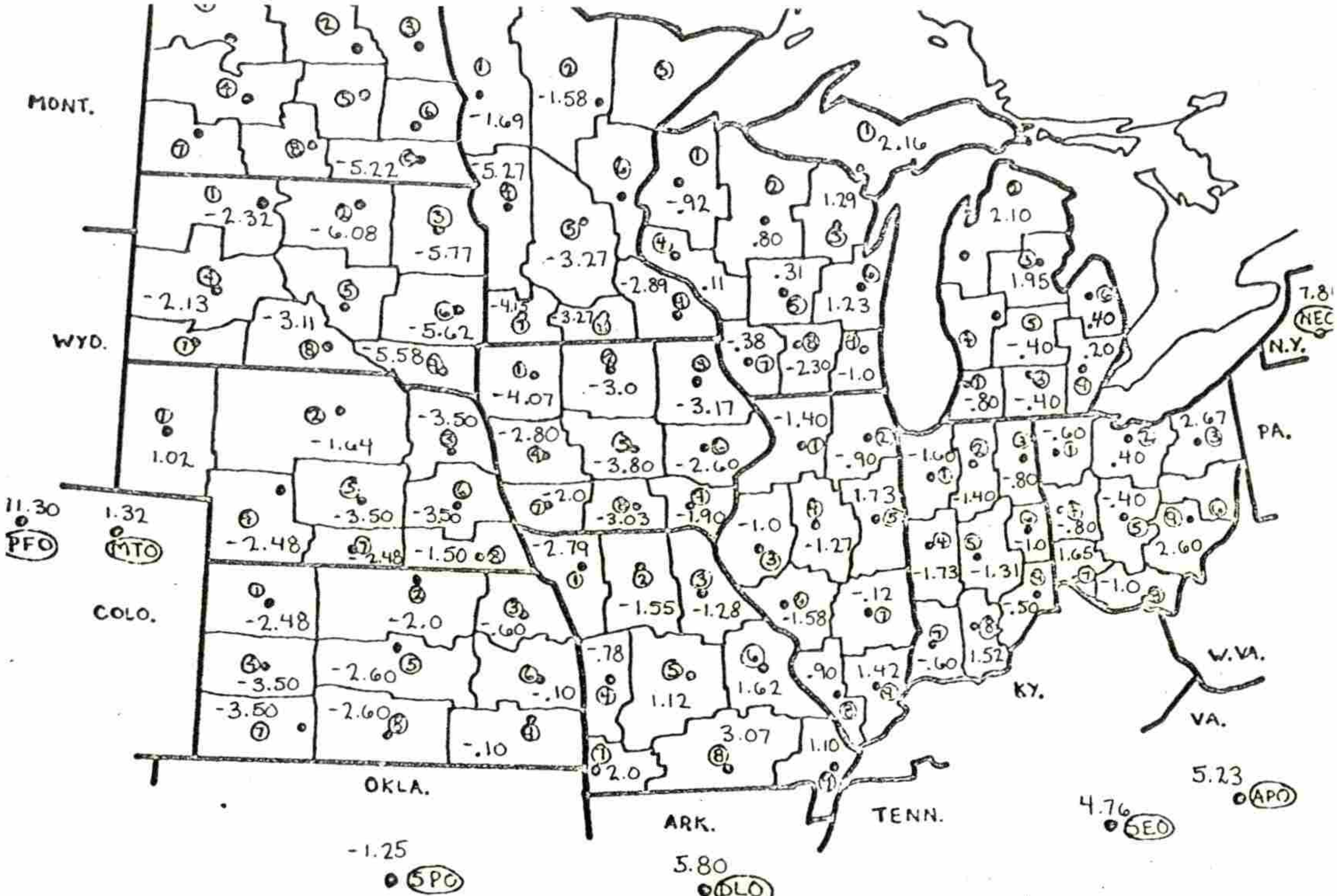

Figure 10. Solution 1, implied price surface relative to Chicago ($/ton)

pounds. Take, for example, the shipments from IA5 to DLO or IA5DLO; then relative to a Chicago base price which might be \$1.40 per bushel, the value of the feed grain at IA5 is \$1.28 3/5 and the value at DLO is \$1.57 2/5. The difference is \$0.28 4/5 which equals the cost coefficient (\$9.60 per ton) for the IA5PLO route. Thus, by equation 34, the constraint of the dual is satisfied in this case, and there is a nonpositive profit for transporting the grain from IA5 to DLO. The interpretation of the implied price surface is fairly general in nature. The closer a region is to a port of export or deficit area the higher the implied price, that is, base price minus dual solution value. The further away from a deficit area a surplus, a region is, the lower the price and the more that goes to transportation costs. Observe ND9, MN4, SD2, SD3, SD6, SD9, MN7, and IA1 which are relatively far from any deficit region.

Solution 2

Solution number 2, Model I, assumes that ocean shipping allows all three sizes of ships. The domestic rates are based on rate functions with calculated truck-barge rates superimposed for shipments to New Orleans.

Domestic shipments The map of domestic flows for solution number 2, see Figure 11, shows that the grain for the deficit areas is supplied from nearby surplus regions. The

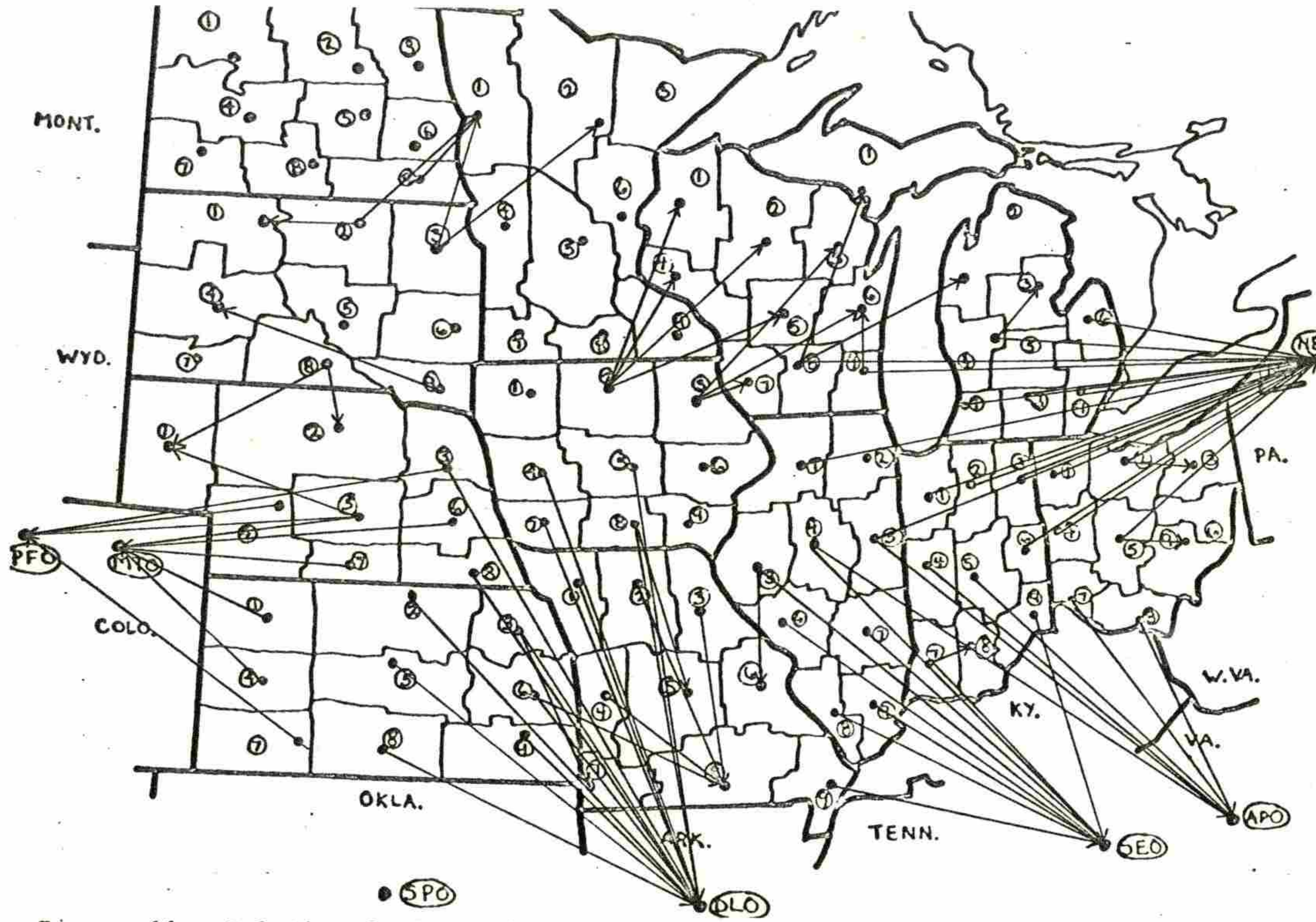

Figure 11. Solution 2, domestic flows from surplus to deficit regions

cause of this pattern is due to the use of rate functions which has distance as the independent variable. Thus in minimizing the cost of transportation the model solution implicitly minimizes the distance grain must travel to meet any deficit demands. The result is a locus of "break even" points where grain moves in opposing direction. The break even line for north-south shipments runs through the upper part of Iowa, Illinois and Indiana, and the lower part of Ohio. The east-west break even line is the Mississippi River except for movements from northern Iowa into Wisconsin and Michigan. Another east-west break even line goes through the eastern part of Nebraska and the western part of Kansas.

Sensitivity The comparison of solution number 2 with solution number 1, Figures 8 and 11, clearly indicates that the use of actual rates for shipment to destinations outside the NCMA causes a few long hauls to be made whereas the use of rate functions eliminates these longer movements. The longer movements for number 1 may be a result of special rate privileges. Many of the movements in solution number 2 are similar to the movements in number 1 which indicates that the rate functions approximate the actual rates quite well.

Shipments to ports The movements to the ports of export for solution 2, Figure 12, shows that there are some long distance shipments to New Orleans, a possible result from using a truck-barge rate combination. Duluth pulls

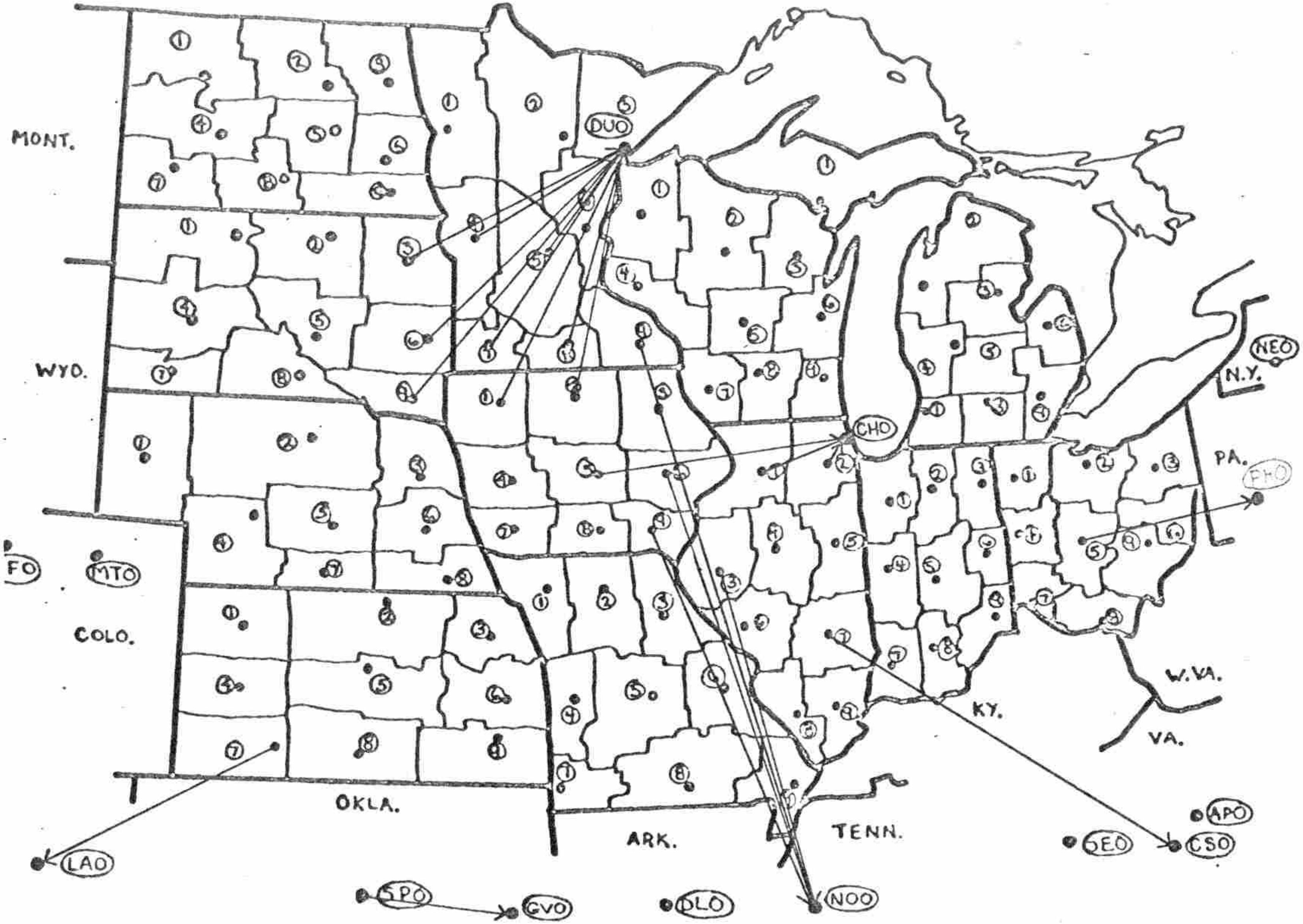

Figure 12. Solution 2, domestic flows from surplus regions to ports

grain in from a number of regions. Duluth leads with 38 per cent of the exports followed by Chicago with 27 per cent. See Table 8. The Great Lakes ports make up 65 per cent of total exports while the Gulf region handles the remaining 35 per cent. Galveston exports almost twice as much as New Orleans in this solution.

Table 8. Per cent of total feed grain exports that pass through a port region, solution number 2

Port region	per cent
Duluth	38
Chicago	27
New Orleans	12
Galveston	23

Sensitivity The comparison of the movements to ports for solutions 1 and 2, Figures 9 and 12, shows that for number 2 a few more shipments are made to New Orleans possibly because of the truck-barge rate combination allowed. However, the exports out of New Orleans only increases by 4 per cent, taken from Chicago and Seattle. Duluth doubles the percentage of total exports it handles, probably taken from Philadelphia while Galveston remains the same. The main shift in flows to ports for export is from Philadelphia to Duluth as a result of using rate functions over actual rates. Otherwise solutions 1 and 2 for flows to ports are similar, indicating that the rate function approximate the actual rates quite well.

The optimal quantities of grain that moves over these domestic routes and ocean routes are given in Table 23 of Appendix C. The opportunity costs are given in Table 29 of Appendix D.

Price surface The price surface of solution 2 compared to solution 1, Figures 13 and 10, indicates that prices are lower in Nebraska, Kansas, Iowa, Missouri and Illinois. Wisconsin prices are all lower except for one region. South Dakota has lower prices in the middle and southern part of the state as does Minnesota. Michigan has higher prices except in the western regions, and Indiana has higher prices except in the western and southern regions. Ohio has all higher prices except for the southwest corner region.

Solution 3

Solution number 3, Model I, assumes that all three sizes of ships are allowed on the ocean. The domestic rates are calculated rates based on rate functions with calculated truck-barge rates superimposed for shipments to New Orleans. The scheduled barge rate is cut in half.

Domestic shipments The map of domestic movements, see Figure 14, is very realistic with respect to the direction of movement. A "break even" line where grain flows in opposing directions indicates that deficit regions are supplied by their nearest surplus regions; caused by the rate

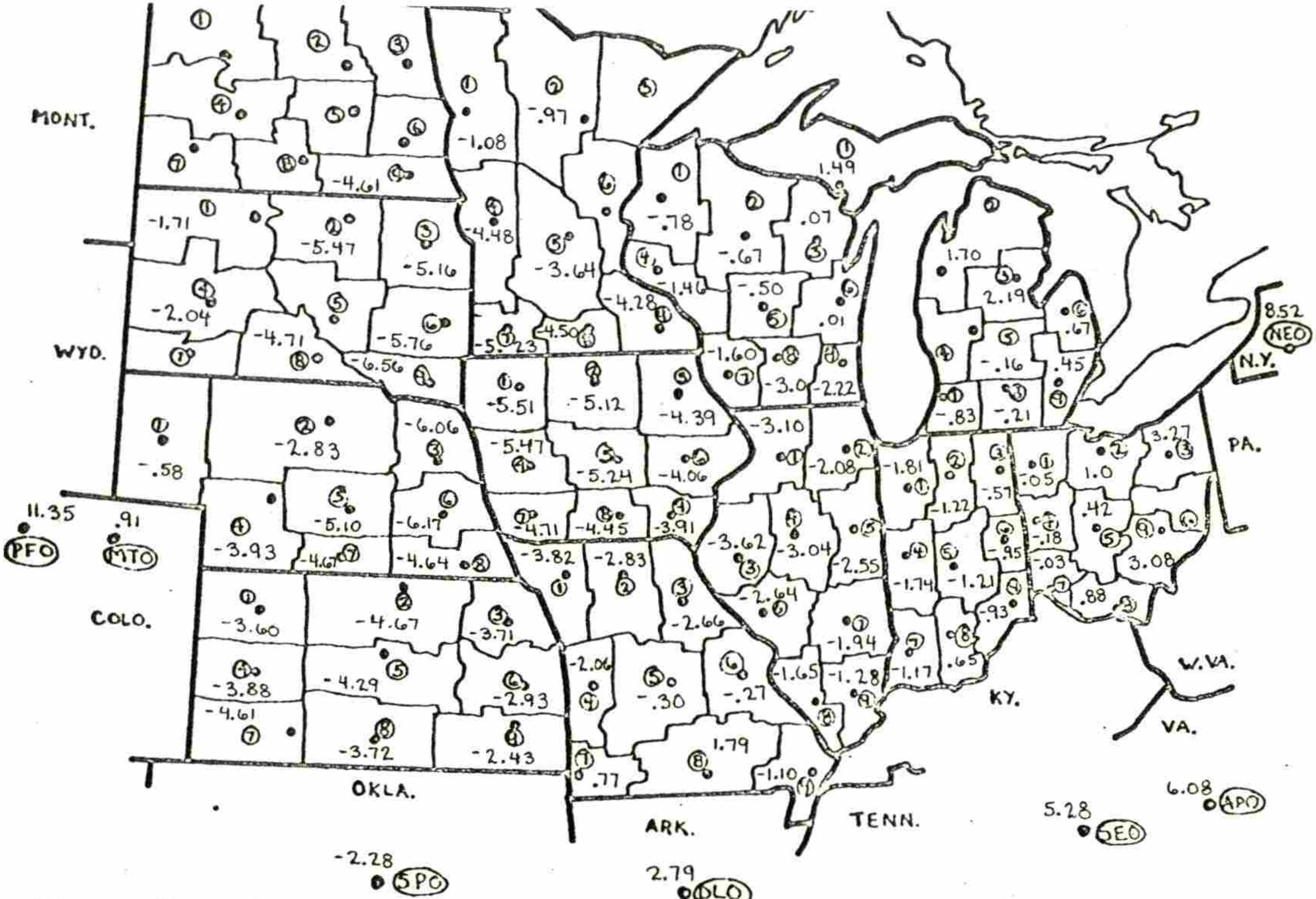

Figure 13. Solution 2, implied price surface relative to Chicago ($/ton)

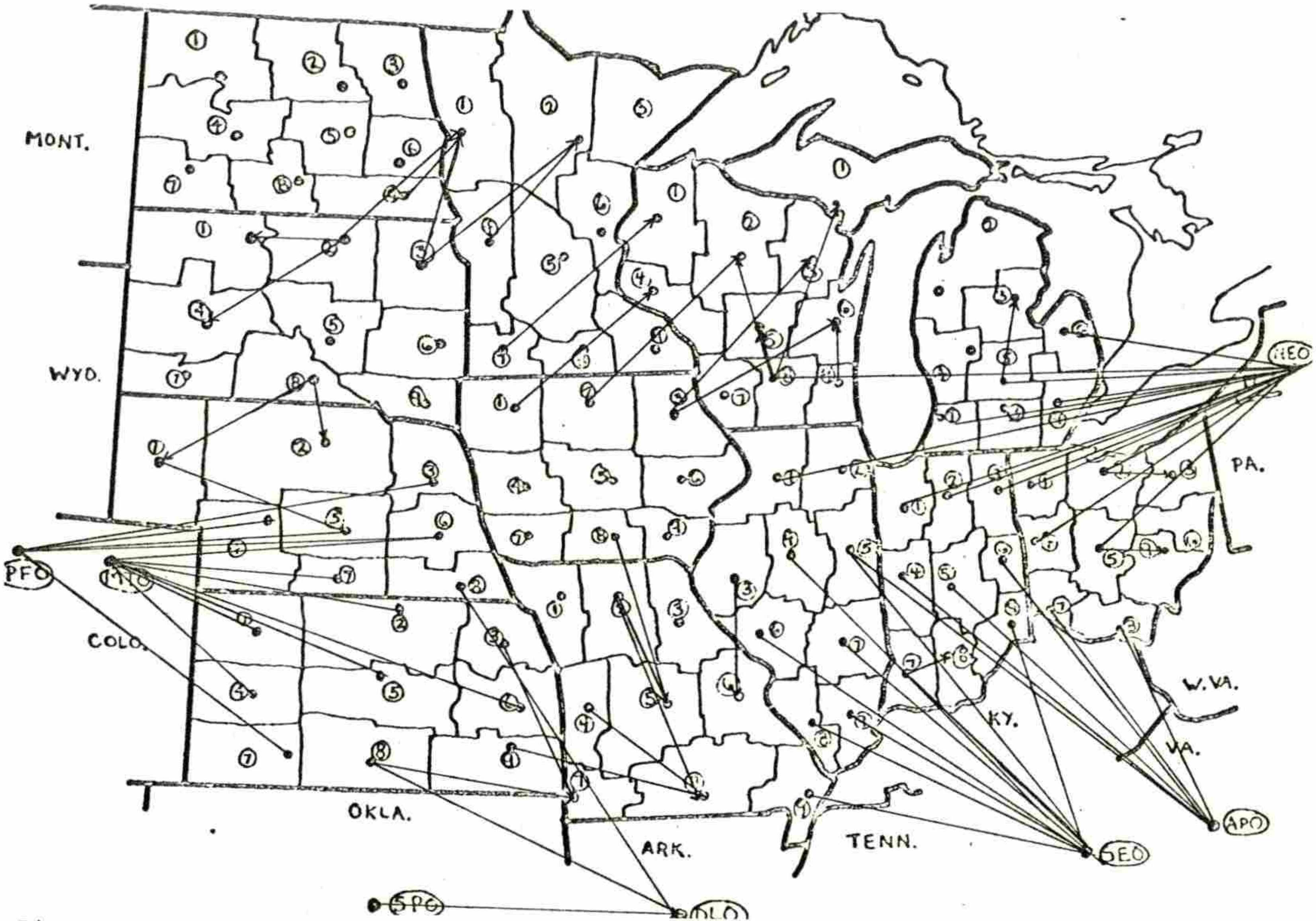

Figure 14. Solution 3, domestic flows from surplus to deficit regions

function rather than actual rates. One interesting feature is that five of the Iowa regions do not supply any domestic deficit regions. This seems reasonable because Iowa is centrally located in the NCMA and the deficit regions are supplied by the surplus regions surrounding Iowa.

Sensitivity Recall from solution 1 the assumption that actual rates are used for shipments to destinations outside the NCMA and calculated rates otherwise. Only calculated rates are used in solution 3. The map for solution 1 shows that there are a few long distance shipments made while the map for solution 3 indicates that these long distance movements are eliminated. See Figures 8 and 14. The two solutions are otherwise almost identical. A possible explanation of the difference might be that the actual rates are special rates given by the shippers and thus the deficit region can receive grain from a more distant surplus region. The movements of grain that are similar in direction indicates that the rate functions approximate the actual rates fairly well.

Also note that in solution 1 the Delta region is supplied heavily from Iowa, Kansas, and Missouri while in solution 3 it is supplied mostly by the Southern Plains region. This is a result of the halved barge rate and thus leaves Iowa and Missouri free to supply New Orleans.

The comparison of solution number 2 with number 3, Figures 11 and 14, shows the effects of halving the scheduled barge rate to New Orleans, In solution 2 the Delta region is supplied heavily from Iowa, Missouri, Kansas, and Nebraska, while in number 3 it is supplied by the Southern Plains region with one shipment each from Nebraska and Kansas. Also, is solution 3, five of Iowa's regions do not ship to any domestic deficit areas. Thus the halved barge rate in solution 3 creates the possibility of New Orleans being supplied heavily by Iowa and Missouri.

Shipments to ports   The movement of feed grains to ports of export, see Figure 15, indicates that it goes in two directions, either to Duluth and Chicago or New Orleans. Eight out of the nine regions in Iowa make up 55 per cent of the exports that go through the New Orleans port region. The regions IA4, IA5, IA6, IA7, and IA9, which shipped nothing to domestic deficit regions, make up 42.5 per cent of the grain going through New Orleans. The reason for this pattern of movement is because the barge rate to New Orleans is cut in half. New Orleans exports almost 50 per cent more of the total exports than Duluth and almost 60 per cent more than Chicago. See Table 9. It is the major port region of export because of the halved barge rate. Combined with Galveston the Gulf Coast region exports a little over 70 per cent of the grain while the Great Lakes region exports a little under

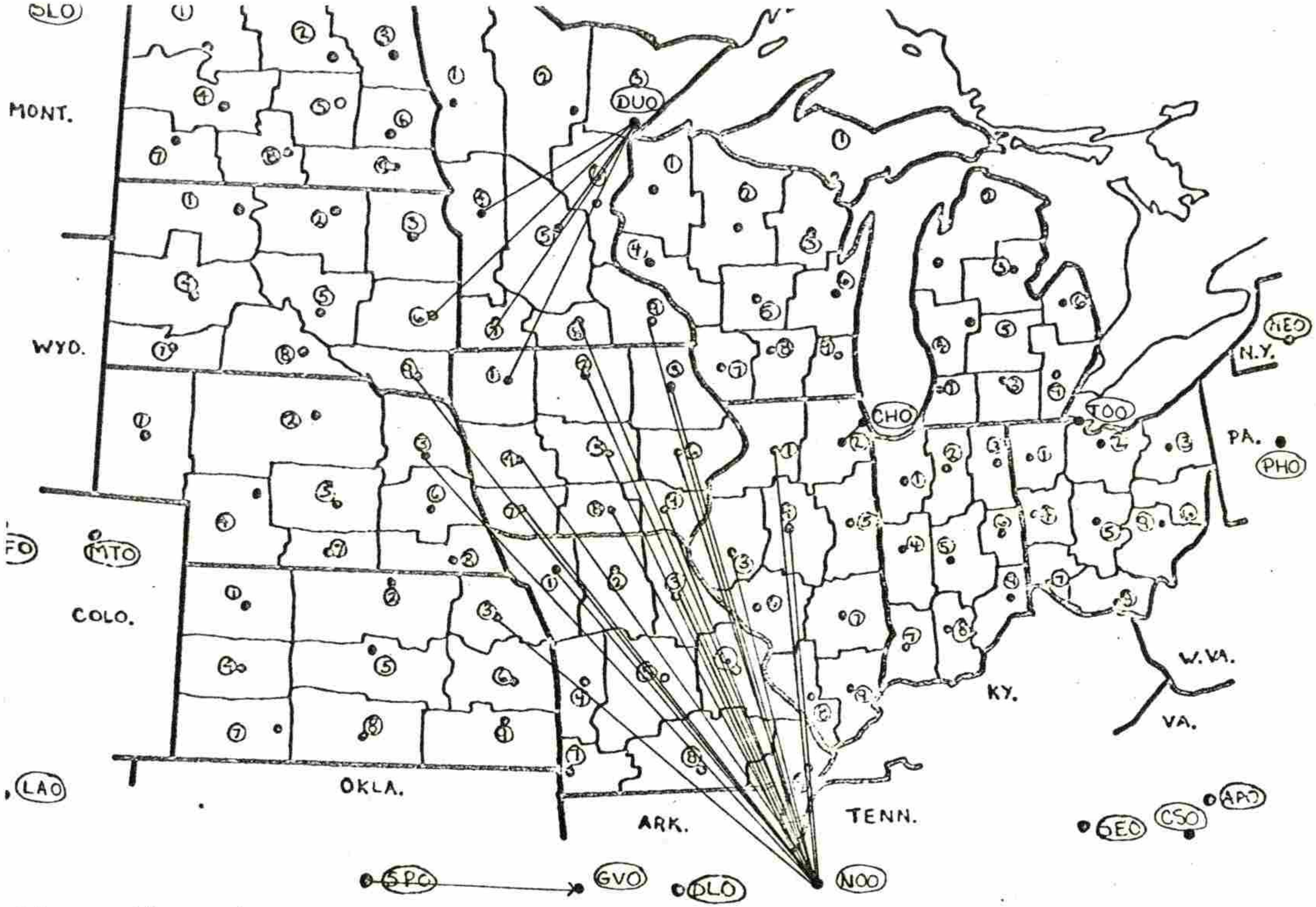

Figure 15. Solution 3, domestic flows from surplus regions to ports

30 per cent.

Table 9. Per cent of total feed grain exports that pass through a port region, solution 3

Port region	per cent
Duluth	19.9
Chicago	9.6
New Orleans	69.4
Galveston	1.1

Sensitivity By comparing solutions 3 with solution 1 for the movements of grain to the ports, Figures 9 and 15, the effects of cutting the scheduled barge rate in half can easily be seen. The comparison also shows that in some cases the actual rates for solution 1 may be special rates because of some longer shipments to the ports. The calculated rates along with the halved barge rates seems to eliminates these long hauls. One implication might be that a barge rate significantly lowered will outweigh special rates given for shipments over land.

It can also be seen that in solution number 3 New Orleans, which exports a large per centage of total exports, is supplied heavily from Iowa, Missouri and Illinois. Galveston is supplied by the Southern Plains region but exports a very small percentage. The opposite is true for solution 1. Galveston, supplied largely from the Southern Plains, exports almost three times as much as New Orleans. The result of halving the barge rate causes the Delta region to be supplied heavily by the Southern Plains as opposed to being supplied by Iowa, Kansas, and Missouri, thus freeing these states to supply New Orleans for exports.

Comparing solution 3 with solution 2 for flows to ports, Figures 15 and 12, indicates that even with calculated rates used in both 2 and 3 the halving of the barge rate significantly shifts the majority of exports from the Great Lakes region to the Gulf. Compared to solution 2 New Orleans increases its percentage of total exports by almost six times while Duluth is cut in half and Chicago to one-third. Galveston receives much less from the Southern Plains region which is now supplying the Delta region very heavily causing Galveston to decrease its exports by 22 percent. Since the assumptions that are used for solution 2 are the same as those used for solution 3 except for the halved barge rate to New Orleans this can be considered the key factor which causes the significant shift in movement of grain for export from the northern ports to New Orleans.

Price surface The implied price surface for solution number 3 when compared to number 1, Figures 16 and 10, indicates that a lower price is paid for grain in Nebraska, Kansas, Iowa, Missouri, Wisconsin, and Illinois. The lower half of Minnesota receives a lower price in this case too. North Dakota prices are higher as are South Dakota prices in the northern regions. The Michigan prices are higher except

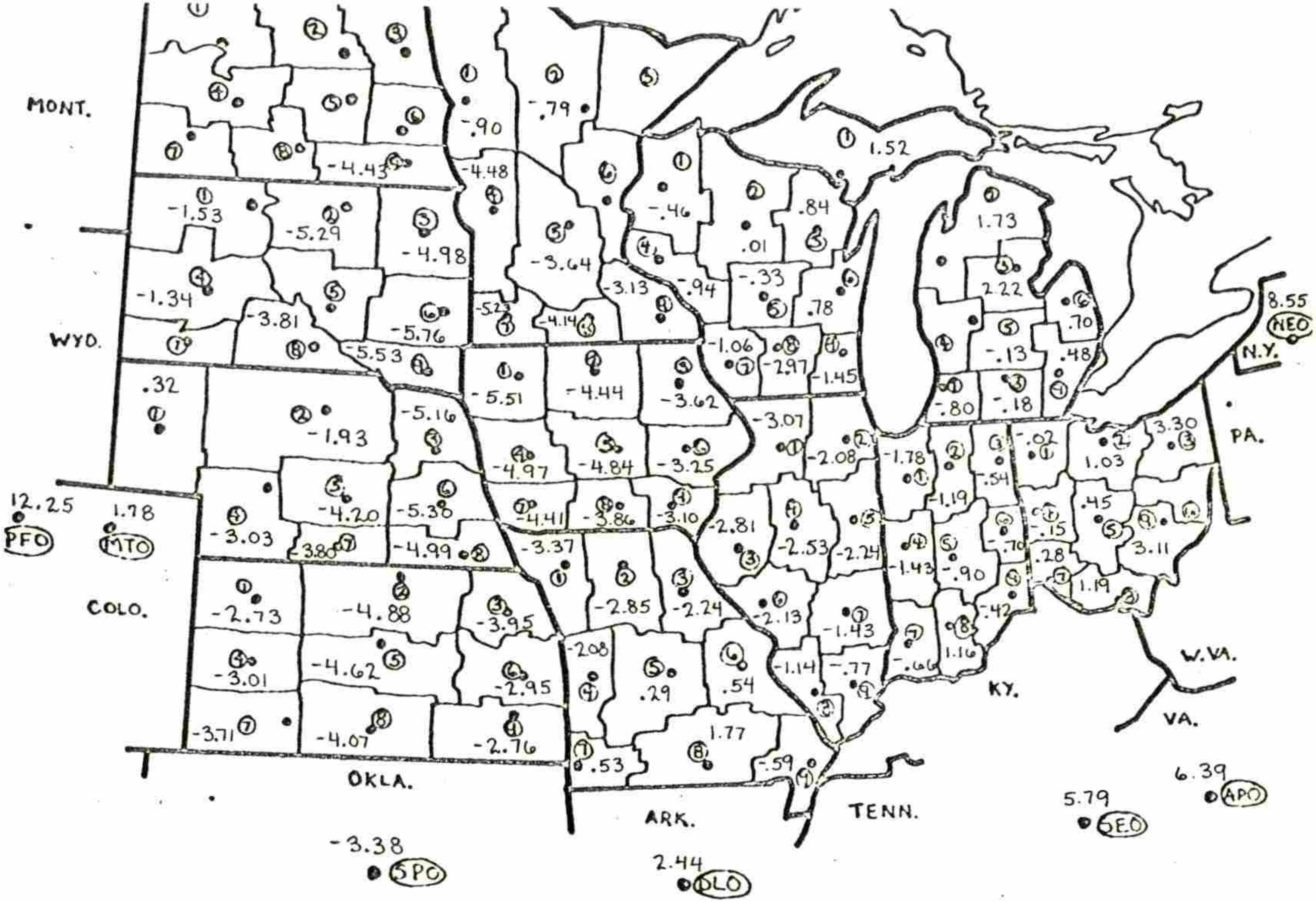

Figure 16. Solution 3, implied price surface relative to Chicago ($/ton)

in two northern regions, similarly for Ohio in the southwest corner region. Indiana has higher prices except in the south and northwest corner.

When solution number 3 is compared with number 2, Figures 16 and 13, the indicated price is higher in most cases, and close in the others. North Dakota, South Dakota, Minnesota, Iowa, Wisconsin, Illinois, Michigan, Indiana, and Ohio, all have a higher or the same price implied in every region except one. Kansas and Missouri are mixed.

International shipments This solution also has maps for the movement of feed grain from the ports of export to the foreign deficit regions. See Figures 17, 18, 19, and 20. The movements on the ocean are consistent with the domestic movements. New Orleans supplies all of the South American regions and five out of eight African regions plus Israel. Duluth supplies one and Chicago the other two in Africa. Duluth and New Orleans are fairly equal in shipments to northern Europe with Duluth shipping to four of the regions and New Orleans to five. The United Kingdom is the largest importer of grain from Duluth followed closely by Canada. In Europe, Italy is the largest importer from New Orleans followed by West Germany and then The Netherlands. Galveston ships a small amount to three European regions. The Netherlands receives the largest amount of grain from Chicago with Toledo as an alternative optimum route. In southern

Figure 17. Solution 3, flows from U.S. ports to South America

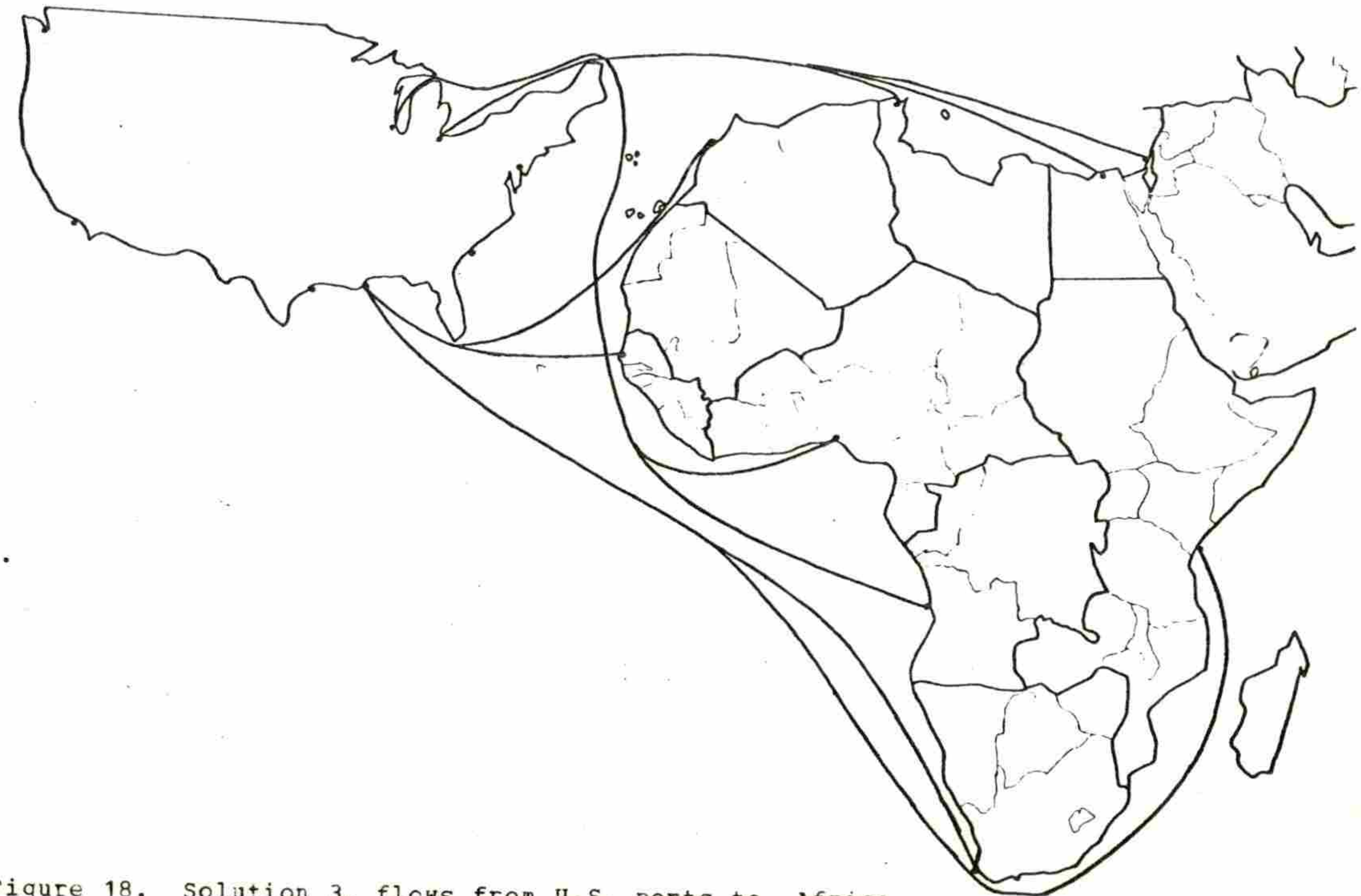

Figure 18. Solution 3, flows from U.S. ports to Africa

Figure 19. Solution 3, flows from U.S. ports to Europe

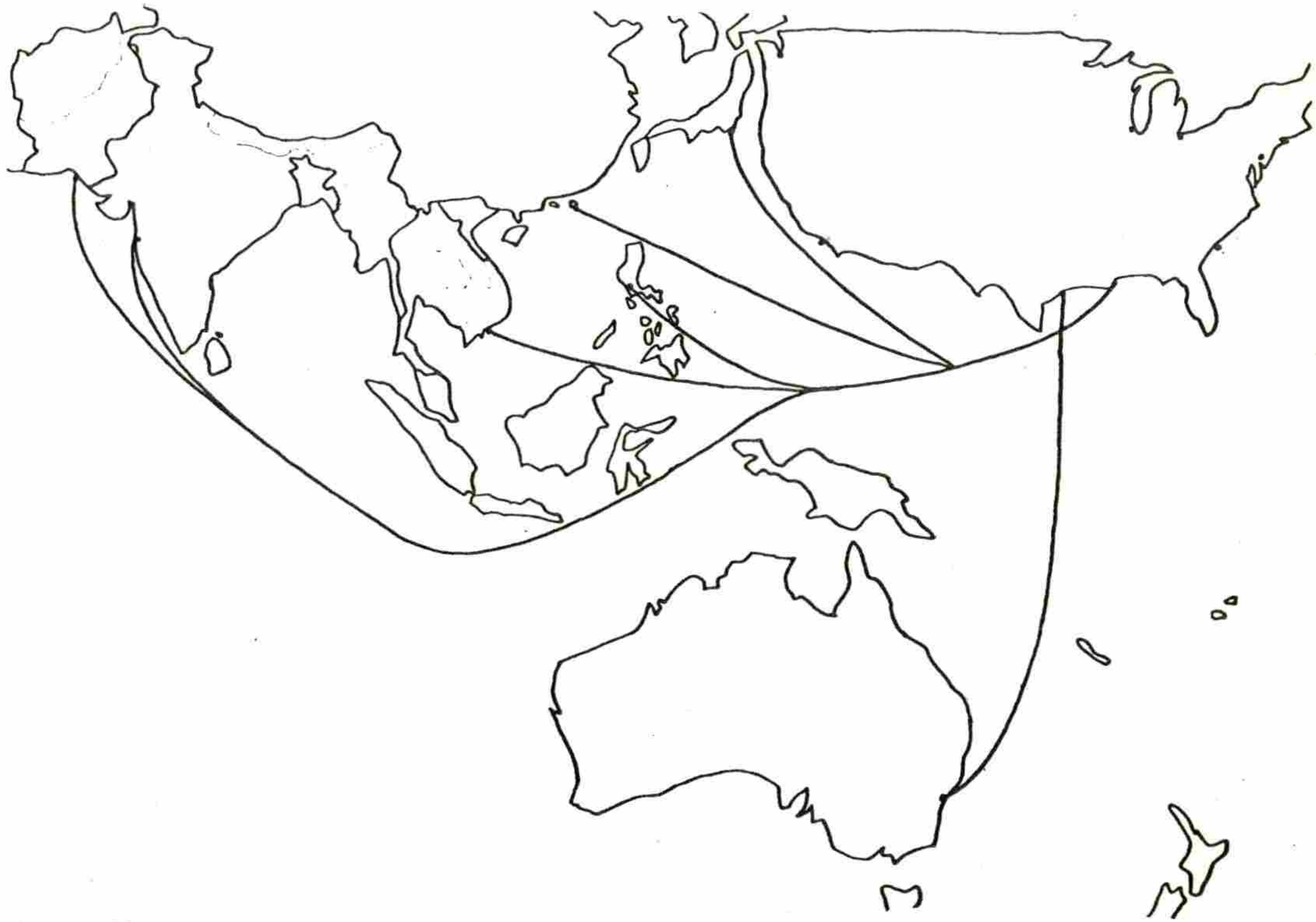

Figure 20. Solution 3, flows from U.S. ports to Asia

Europe, New Orleans ships to five regions, four of them in the Mediterranean. Eastern and western Asia receive all of their grain from New Orleans and Galveston with Seattle as an alternate route to Japan. New Orleans is the major supplier with five regions as its destinations. Galveston supplies a small amount to two regions. The Japan region receives the largest shipment out of New Orleans taking about 38 per cent of the grain available. The optimal quantities of feed grain that moves over these domestic and ocean routes are given in Table 24 of Appendix C. The opportunity costs are given in Table 30 of Appendix D.

Total cost of transportation The total cost of transportation for each solution is given in Table 10. Each is the minimum value of the objective function based on the various cost assumptions and subject to the constraints.

Solution 1 which has all sizes of ships on the ocean, and actual freight rates for domestic shipments has the lowest total cost. Recall that the majority of grain for export in this solution goes through the Great Lakes ports.

Solution 2, with costs based on rate functions has the highest cost of the three. Again the majority of the exports go through the Great Lakes ports. This demonstrates that depending on the assumptions applied to a model, the value of the objective function can vary by a significant amount. And each set of assumptions applied to these two models seem to be reasonable. This is why it is difficult to judge whether one model is more useful than another solely on this information.

The third solution, which is based on the same assumption as solution 2 except the barge rate to New Orleans is cut in half, indicates a reduction in total cost when compared to solution 2. This reduction can be attributed to the halved barge rate.

Table 10. Minimum total cost of transportation for feed grains

Solution number	Total cost
1	$522,414,089.30
2	587,798,445.70
3	573,150,828.40

Optimal Distribution of Soybeans

The optimum distribution of soybeans is presented for solutions numbered 17, 18, and 19. Referring to Figure 7 and Tables 25, 26, 27, will help in understanding the discussion of the different soybean model solutions.

Solution 17

Solution number 17, Model V has the assumption that all three sizes of ships are allowed for marine transport alternatives. It assumes for domestic transportation that actual rates are used for shipments to destinations outside the North Central Marketing Area (NCMA) while calculated rates based on rate functions are used for shipments within the NCMA.

Domestic shipments The map of domestic flows, see Figure 21, shows that the two regions in Iowa are supplied almost entirely from within Iowa except for shipments from nearby Nebraska, 25.4 per cent, and South Dakota, 1.4 per cent. The region in Kansas is supplied from nearby also, pulling some in from Nebraska. Similarly for Missouri. Illinois seems to pull in soybeans from greater distances but this is possible since it is using about 2 1/2 times as much as Iowa. The other regions in Indiana and Ohio are supplied from within the state or at least from nearby the border. The deficit regions outside the NCMA receive grain from their closest surplus region except for shipments form IA7 to APO which supplies 24.6 per cent of the grain required at APO.

Shipments to ports The shipments to the ports of export all come from geographically close regions to the ports, see Figure 22. The break even line runs through central Iowa, and splits going northeast through Wisconsin, southeast through Illinois, and on across Indiana and Ohio. New Orleans is supplied heavily from Missouri and Illinois with some from Iowa, Ohio, Nebraska, and Kansas. New Orleans exports 64.8 per cent of total soybean exports. See Table

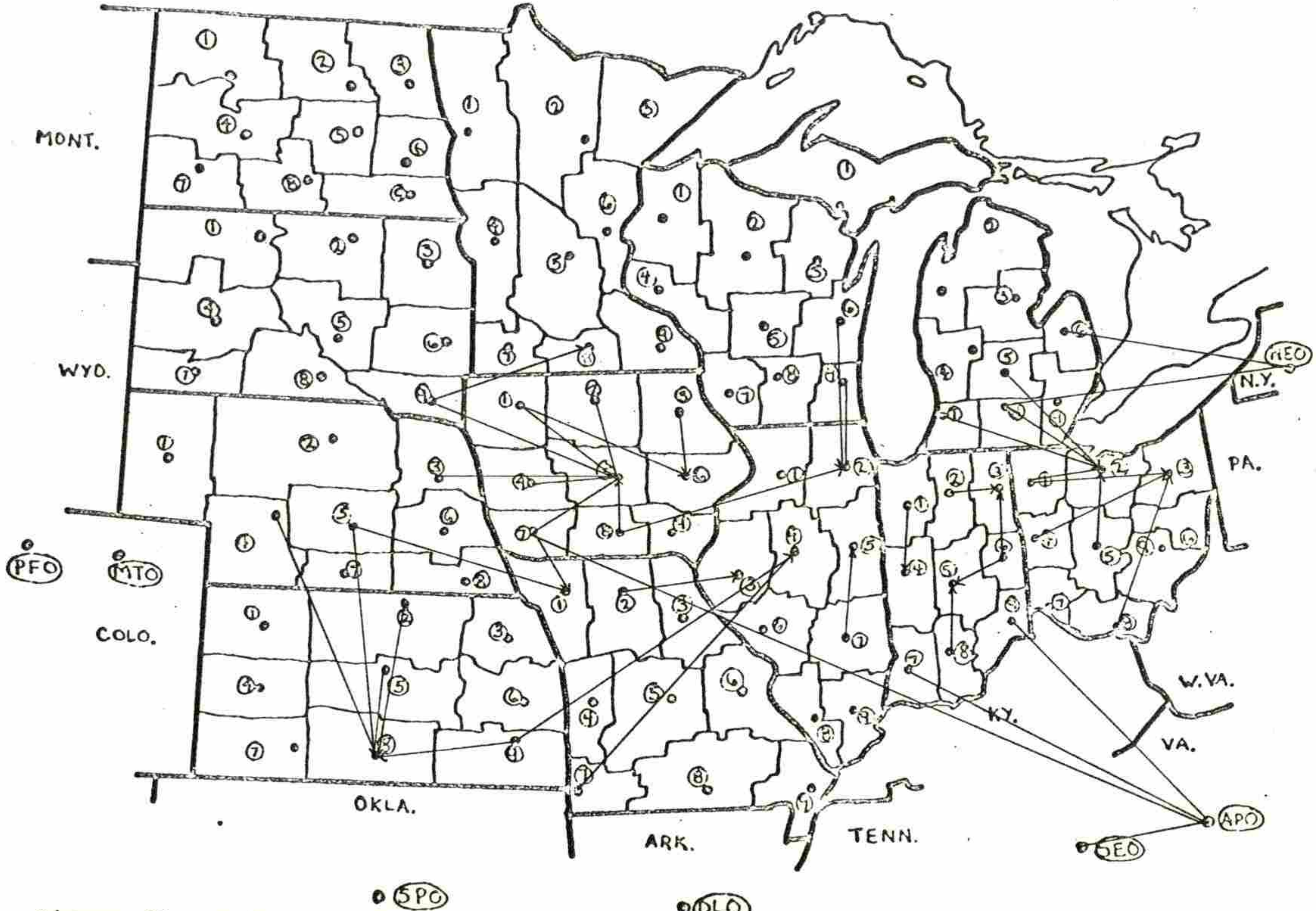

Figure 21. Solution 17, domestic flows from surplus to deficit regions

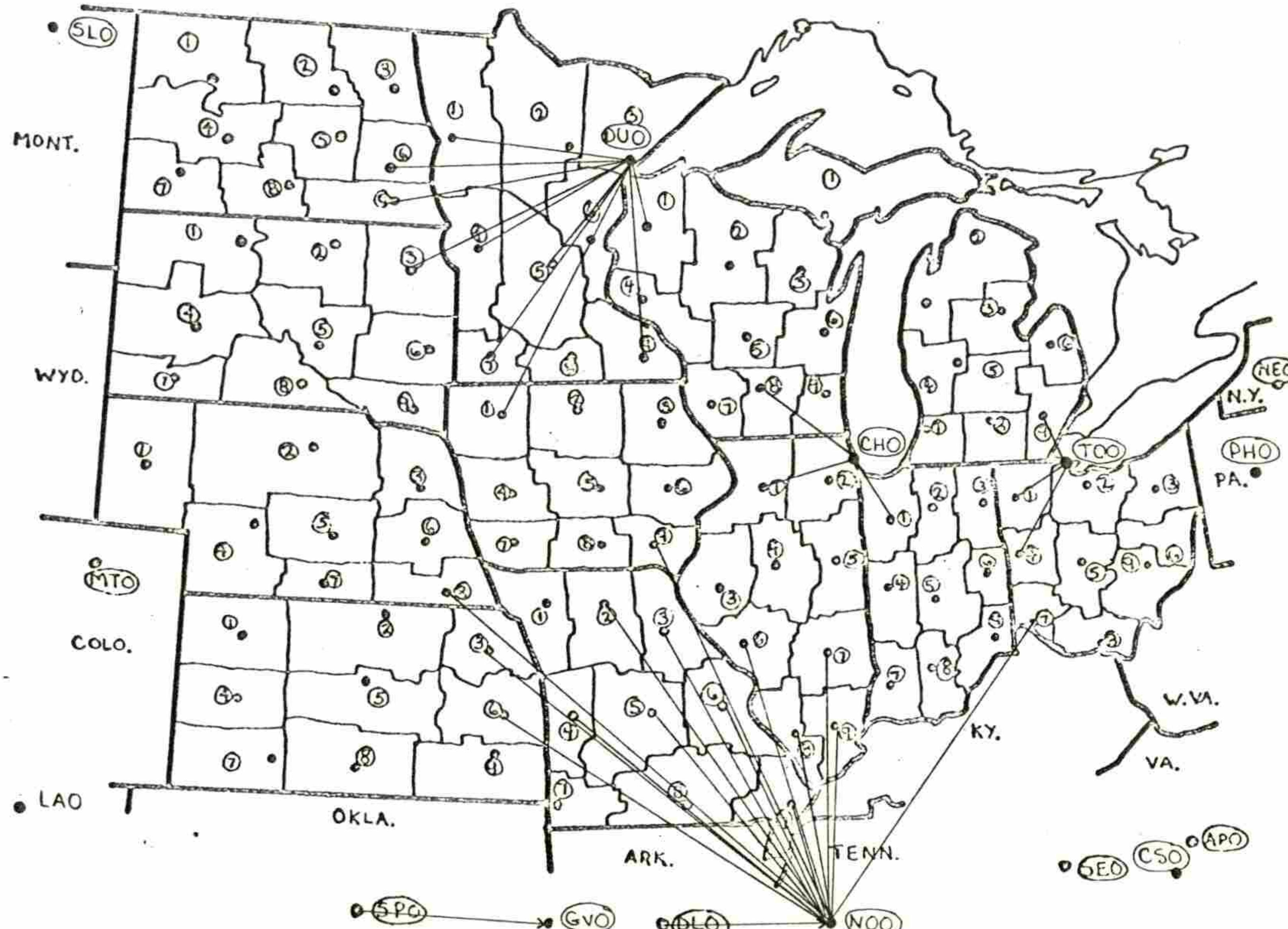

Figure 22. Solution 17, domestic flows from surplus regions to ports

11. This is over three times the exports going through Duluth and twice as much as goes through the Great Lakes ports combined.

Table 11. Percent of total soybean exports that pass through a port region, solution 17

Port region	per cent
Duluth	19.4
Chicago	8.6
Toledo	5.2
New Orleans	64.8
Galveston	2.0

The optimal quantities of soybeans that move over these domestic routes and the ocean routes are given in Table 25 of Appendix C. The opportunity costs are given in Table 31 of Appendix D.

Solution 18

Solution number 18 for the soybean models assumes that all three sizes of ships are allowed on the ocean. It also assumes that interior rates are calculated rates based on rate functions with calculated truck-barge rates superimposed for shipments to New Orleans.

Domestic shipments The map for domestic flows see Figure 24, indicates that Iowa is supplied form within the state except for 28 per cent for IA5 supplied from Nebraska. Illinois is supplied form within except for one long shipment

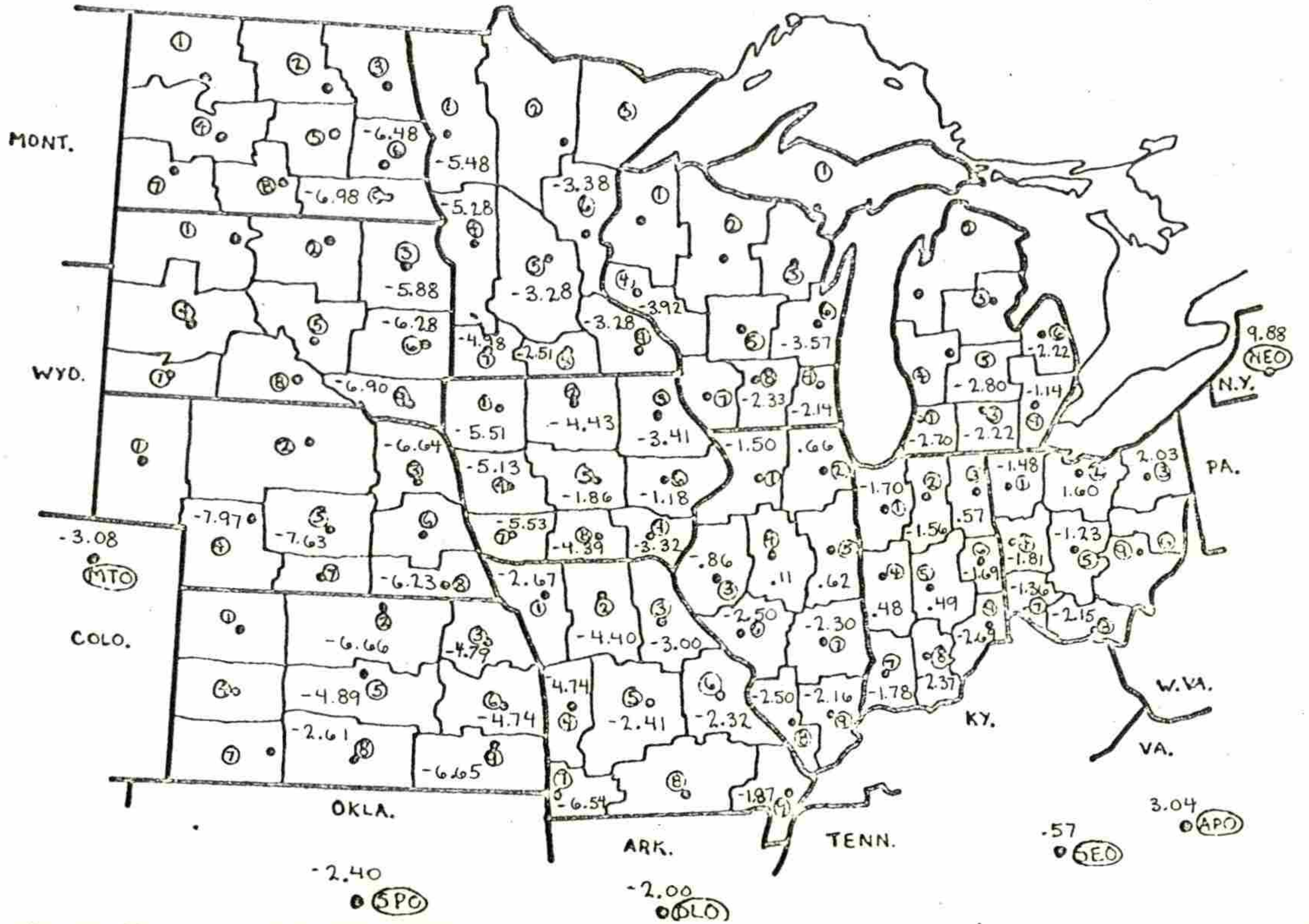

Figure 23. Solution 17, implied price surface relative to Chicago ($/ton)

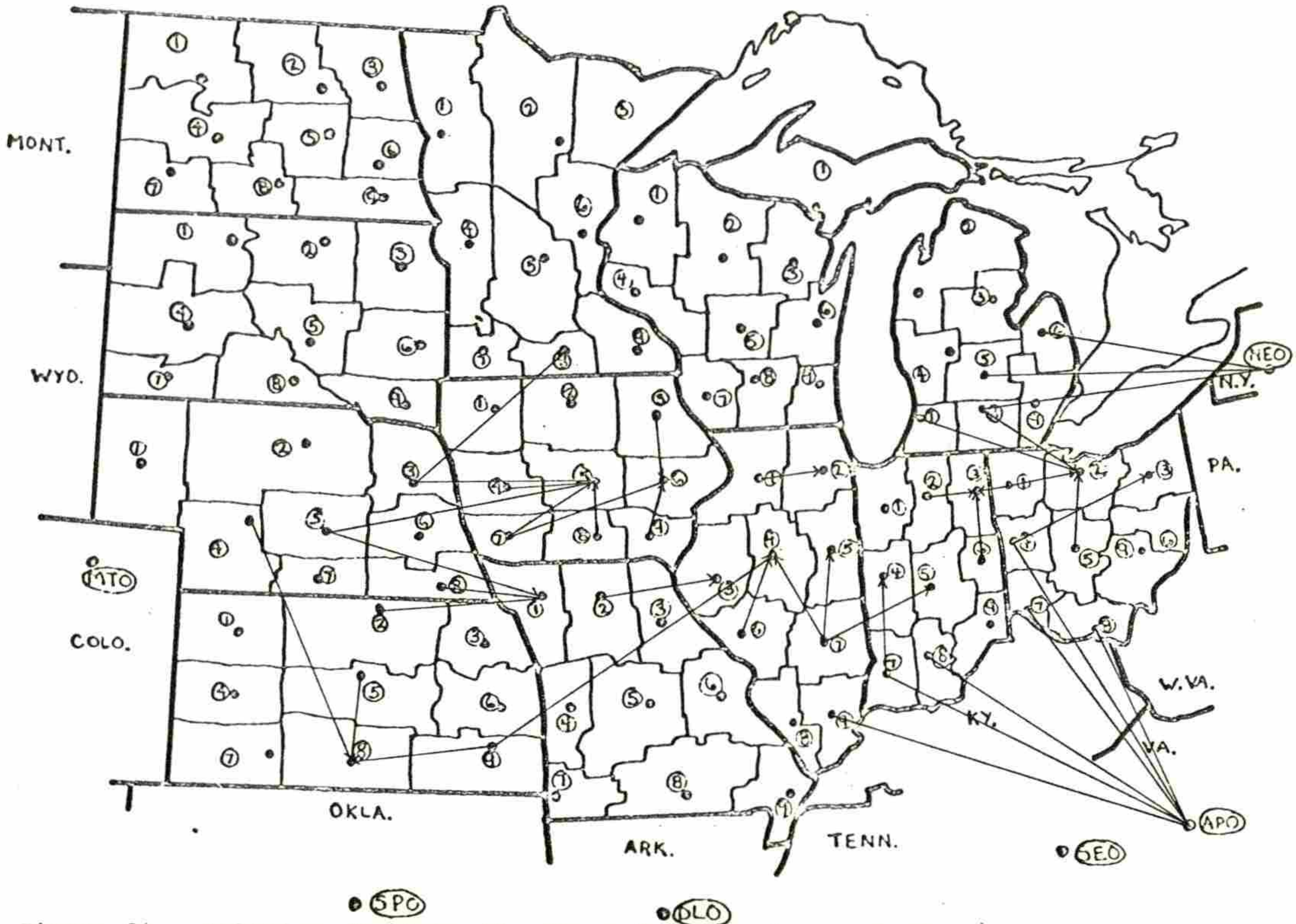

Figure 24. Solution 18, domestic flows from surplus to deficit regions

from Kansas. The other deficit regions are supplied from surplus regions that are nearby as a result of using the rate functions.

<u>Sensitivity</u> Comparing solution 18 to solution 17 for domestic movements, Figures 24 and 21, shows that four of the longer shipments are eliminated in 18. They are the one from IA7 to AP0, one from MO7 to IL4, one from NB5 to KA8, and from IA8 to IL2. The reason for the longer shipments in solution 17 may be due to special rates. In solution 18 the rate is dependent of distance in the rate function resulting in the reduction of long distance hauls.

<u>Shipments to ports</u> The map for movements to the ports of export in solution 18, see Figure 25, indicates that the ports are supplied by states which are very close. The longest shipment required is over a two-state distance. The break even line is now becoming a fairly wide band and it follows the same pattern as in solution 17. The exports that flow through the ports, when divided into Great Lakes and Gulf, are becoming more even. See Table 12. New Orleans still accounts for the largest percentage but Duluth is coming closer. The Great Lakes ports export about 42 percent of total exports while the Gulf ports handle the rest.

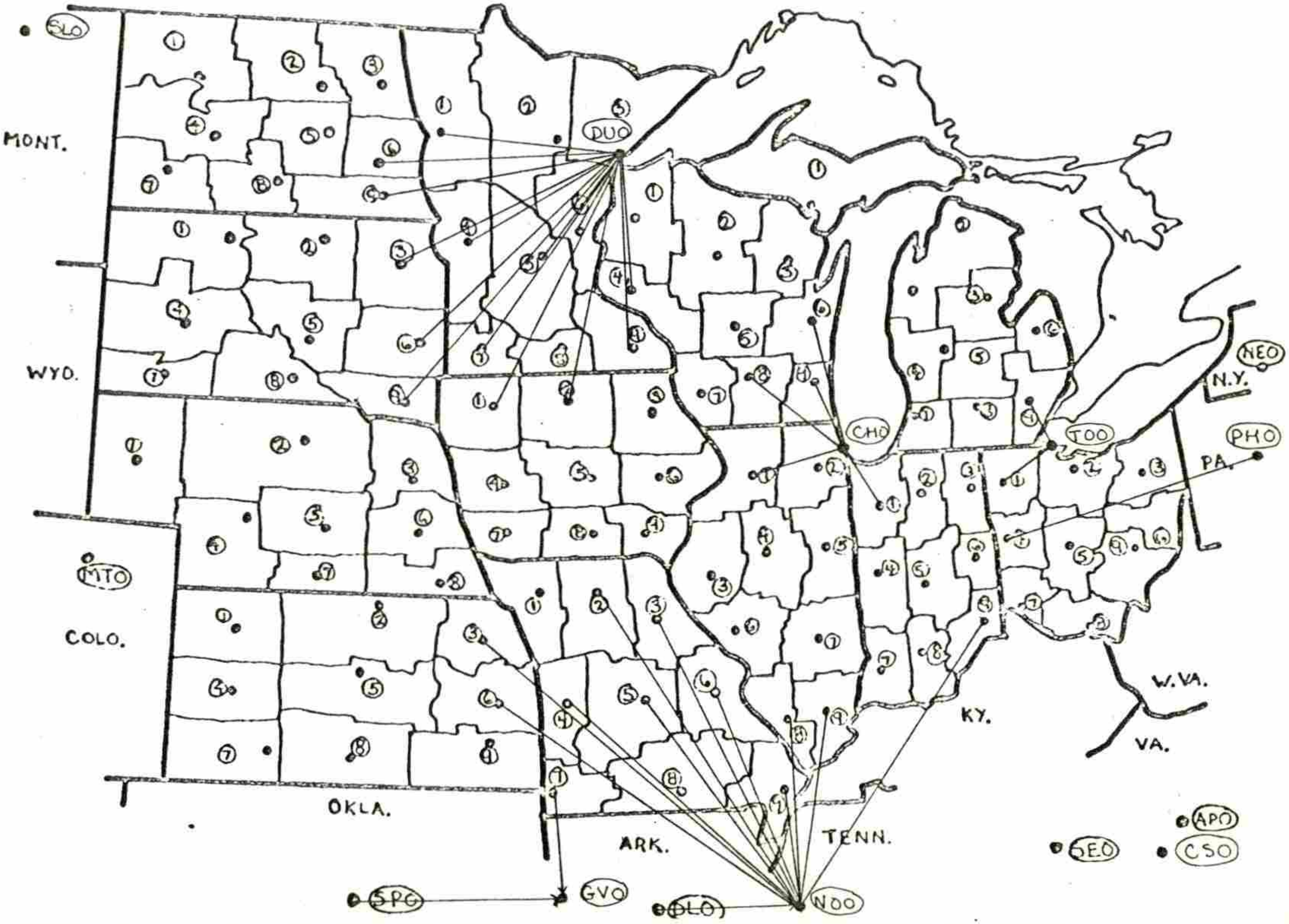

Figure 25. Solution 18, domestic flows from surplus regions to ports

Table 12. Per cent of total soybean exports that pass through a port region, solution 18

Port region	per cent
Duluth	30.2
Chicago	6.7
Toledo	4.8
New Orleans	55.5
Galveston	2.8

Sensitivity The comparison of solution 17 with solution 18, Figures 22 and 25, shows that in 18 Duluth and Chicago pull grain in from more regions, and New Orleans from fewer regions. This is reflected in the percentage of exports that go through the port regions. Duluth has increased almost 11 per cent while New Orleans has decreased a little over 9 per cent. Otherwise the two patterns of movement are similar.

The optimal quantities of soybeans that move over these domestic routes and the ocean routes are given in Table 26 of Appendix C. The opportunity costs are given in Table 32 of Appendix D.

Price surface The implied price surface for solution 17 as compared to solution 18, see Figures 23 and 26, shows that in 18 the prices are lower in Iowa, Nebraska, Kansas, Missouri, Michigan, Illinois, and Indiana. For one region in Iowa and four regions in Wisconsin the prices are the same as in solution 17. All of North Dakota and South Dakota have

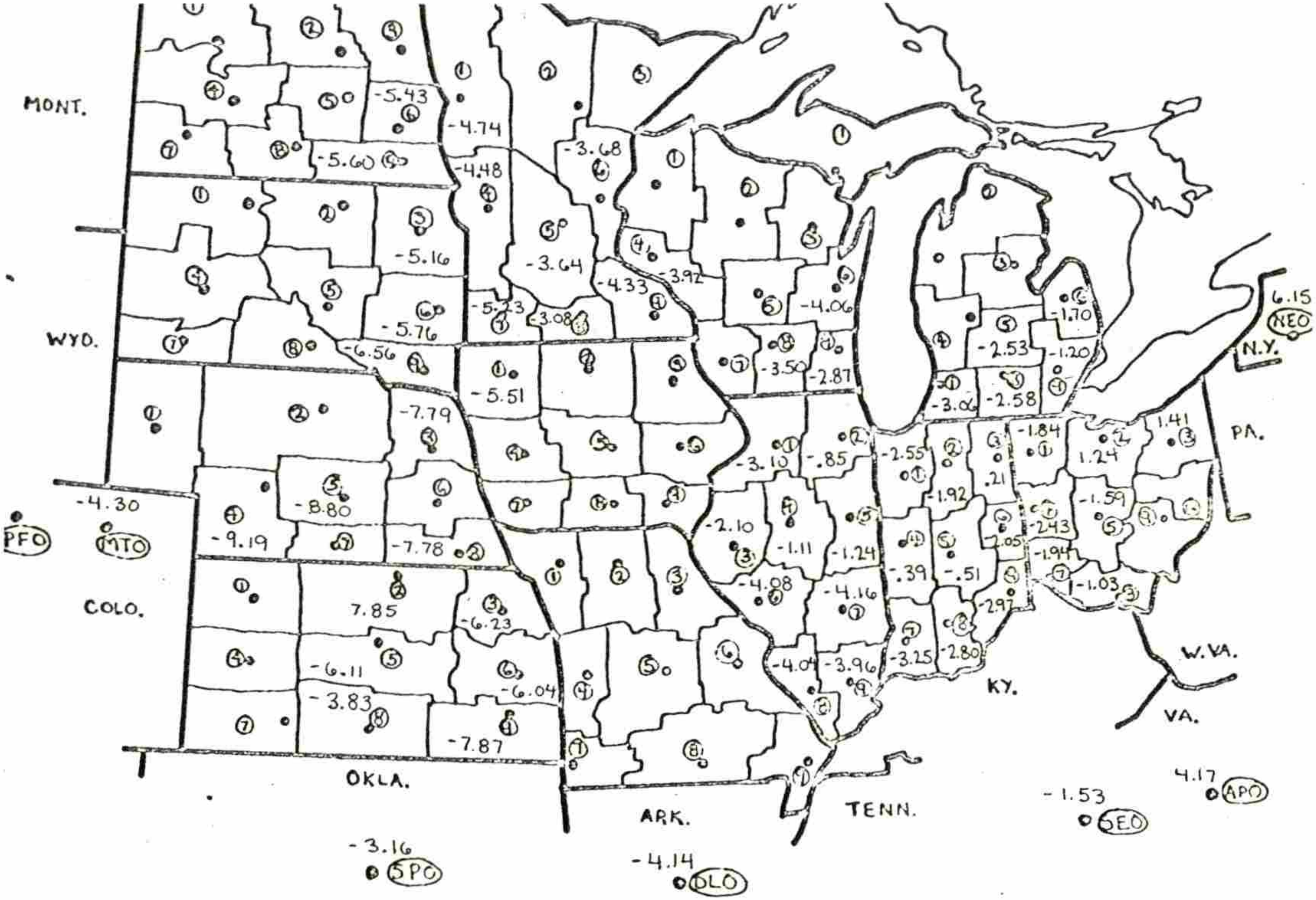

Figure 26. Solution 18, implied price surface relative to Chicago ($/ton)

higher prices along with the northern part of Minnesota, otherwise the rest of Minnesota has lower prices. All of Ohio except the southeastern regions have lower prices, and the southern one-third of Michigan has lower prices. Thus the effect of using rate functions over actual rates may not have much influence on the direction of movements, it definitely effects the price surface by making it generally lower.

Solution 19

Solution number 19, Model V has the same assumptions as solution 18 where rates are based on rate functions except the scheduled barge rate is cut in half.

Domestic shipments The map for domestic flows, see Figure 27, indicates that Iowa is supplied from within the state except for about 27 per cent coming from Nebraska to supply IA5. Kansas is supplied from within and from nearby Nebraska. Illinois deficit regions receive soybeans from within the state and from Kansas. KA9 supplies a little over 64 per cent of the grain required at IL4 and all the grain required at IL3. The other regions in Indiana and Ohio are supplied from within the state or at least from nearby the border. The deficit regions outside the NCMA receive grain from their nearest surplus region. These results are consistent since cost and thus distance are being minimized.

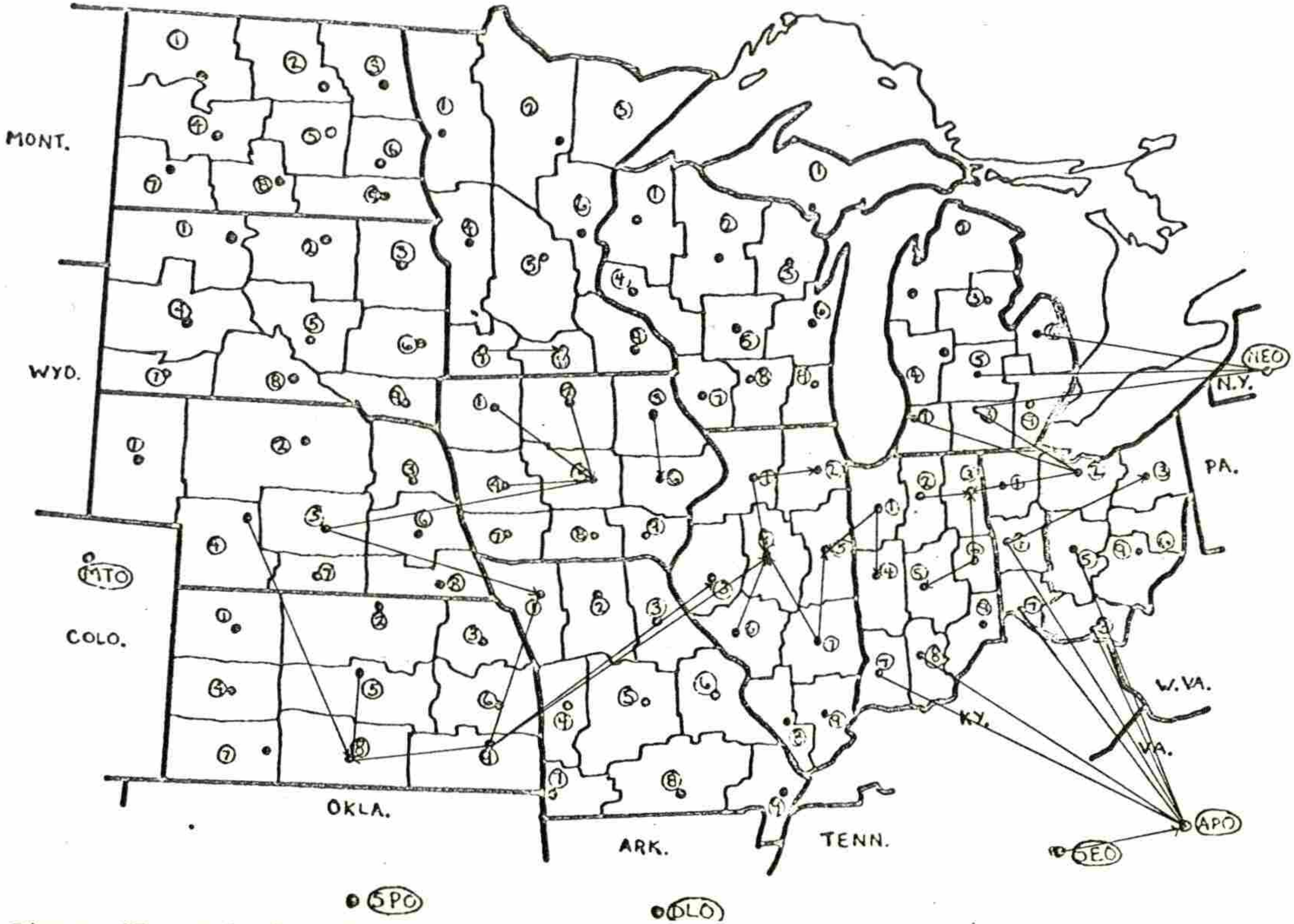

Figure 27. Solution 19, domestic flows from surplus to deficit regions

Sensitivity The comparison of solution 19 with solution 17, Figures 27 and 21, shows that the longer shipment to the Appalachia region has been eliminated. But the shipments from southeastern Kansas to Illinois still persists. The shipments from Iowa and Michigan to Illinois have been eliminated perhaps as a result of halving the barge rate to New Orleans. These regions are available for supplying ports of export. The comparison of solution 19 with solution 18, Figures 27 and 24, shows that in 19, Iowa is supplying itself more from within and that Nebraska is not supplying Minnesota at all. Otherwise the movements are almost similar.

Shipment to ports The flows to ports for export in solution 19, Figure 28 shows that New Orleans receives a large number of shipments. It also pulls grain in from long distances. New Orleans accounts for 78.2 per cent of the total exports which is 6 1/2 times that of Duluth with 12.6 per cent. See Table 13. Chicago handles a little over 5 per cent followed by Galveston and Toledo. The Gulf Coast region handles over 80 per cent of total exports while the Great Lakes handles only about 20 per cent. The odd occurrence is that MN6 which is very close to Duluth exports through New Orleans.

Sensitivity The comparison of solution 19 with solution 17 for the flows to ports, Figures 28 and 22, shows the effects of cutting the barge rate in half. New Orleans pulls

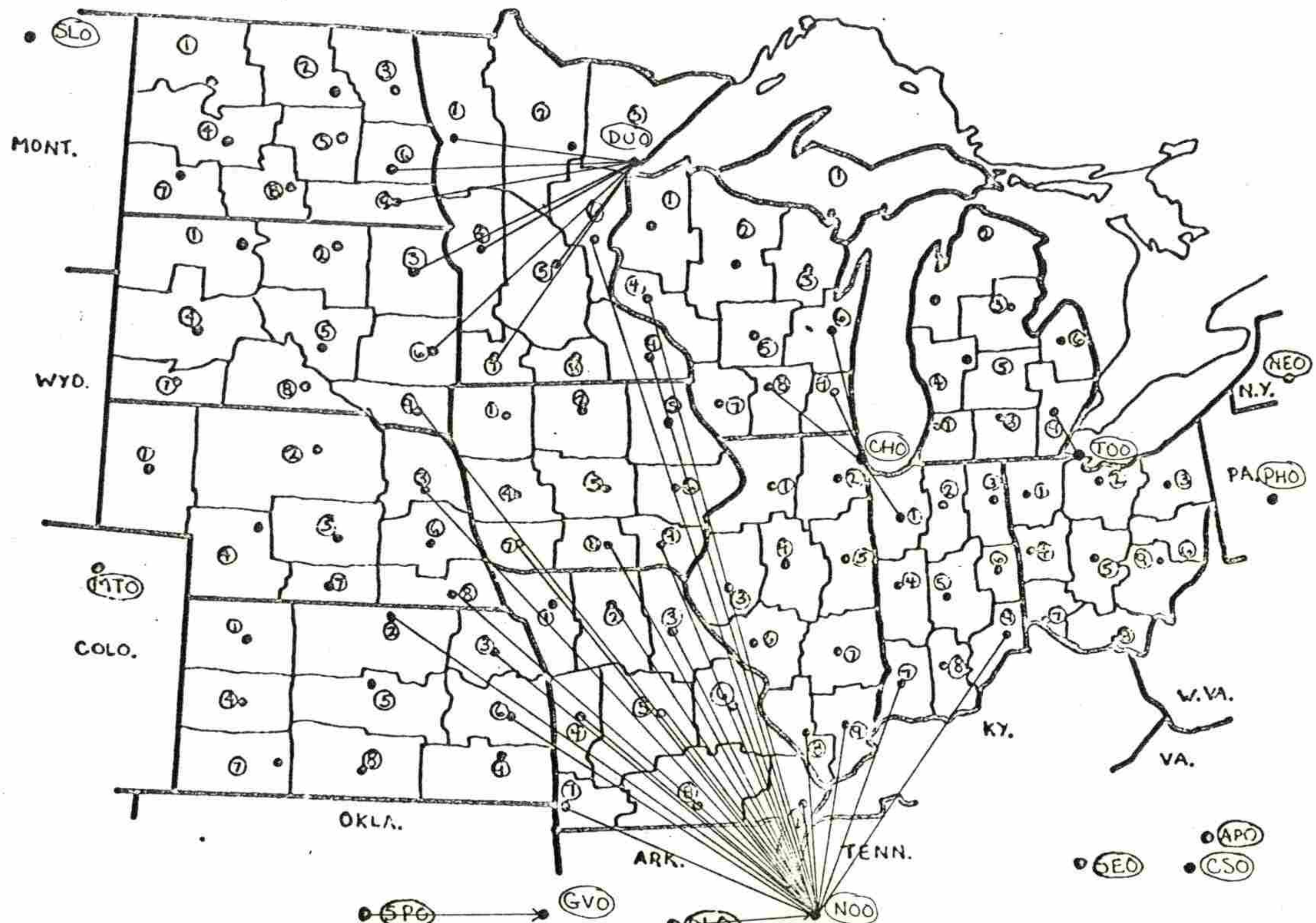

Figure 28. Solution 19, domestic flows from surplus regions to ports

Table 13. Per cent of total soybean exports that pass through a port region, solution 19

Port region	per cent
Duluth	12.6
Chicago	5.3
Toledo	1.9
New Orleans	78.2
Galveston	2.0

some of the grain for export away from Duluth, Chicago, and Toledo. New Orleans increases its exports by about 14 per cent while Duluth decreases by about 7 per cent, Chicago and Toledo by about 3 per cent each. Galveston remains unchanged indicating that the halved barge rate has no effect on the flow of grain from the Southern Plains to Galveston; a result opposite to that for feed grains. There is not as significant a shift in the direction or amount of grain that moves to the ports for soybeans as there is for feed grains. New Orleans is already exporting many times the amount of grain that Duluth exports and the halving of the barge rate magnifies this difference by about double.

The comparison of solution 19 with solution 18, Figures 28 and 25, is very similar to the previous comparison. New Orleans increases its percentage of total exports by about 23 percent while Duluth decreases by about 18 percent, Chicago by 1.5 percent and Toledo by about 3 percent. Again the halving of the barge rate magnifies the difference between the Great Lakes and the Gulf for percentage of exports. Since solution 19 is based on the same assumptions as solution 18, except for barge rates, the increase in the difference can be attributed to the halving of the barge rate.

Price surface The comparison of the price surfaces for solutions 17 and 19, Figures 23 and 29, indicates that the price surface in 19 is higher for North Dakota, South Dakota, Nebraska, Kansas, Iowa, and Ohio. Minnesota has higher prices except in the middle region and the southwestern region. Missouri has all higher prices except in two southeastern regions. Wisconsin has lower prices except for the three northern regions and the middle western region. Illinois has lower prices except for regions 3 and 4. Michigan has all higher prices except for region 9 and Indiana has higher prices in the eastern two-thirds of the state. The use of the rate functions instead of actual rates gives a price surface for solution 19 that is generally higher than the one for solution 17.

The comparison of solution 19 with solution 18, Figures 29 and 26, shows that in 19 all the prices for all of the twelve NCMA states are either higher or the same. Wisconsin, Michigan, and Indiana each have some regions with the same price surface. The rest of the states have higher prices completely. Since the only difference between solution 18 and 19 is the assumption that the barge rate to New Orleans

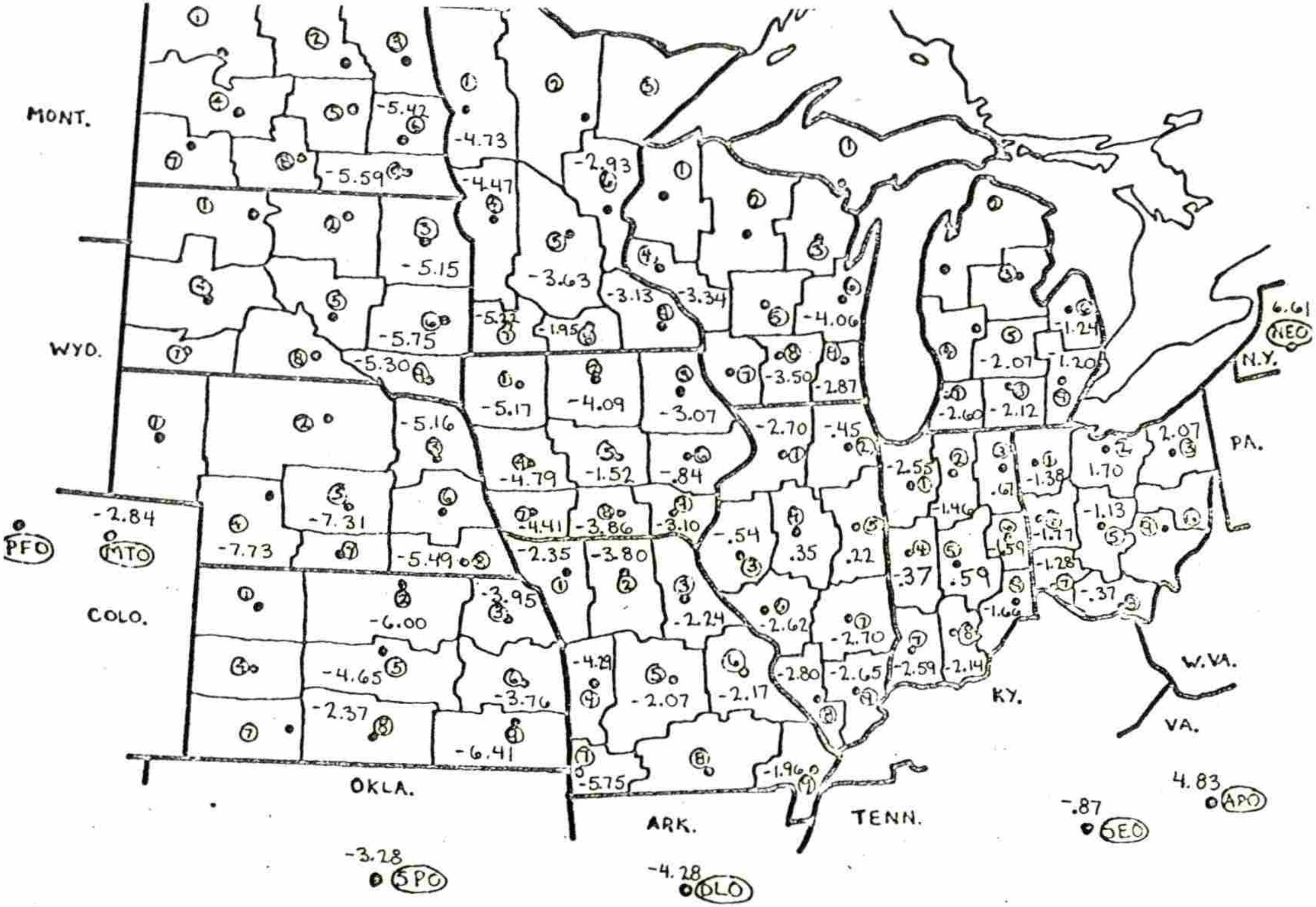

Figure 29. Solution 19, implied price surface relative to Chicago ($/ton)

is cut in half then the price increases can be attributed to that factor. A very significant fact for policy implications related to raising the income of all soybean producers.

International shipments Solution 19 also has maps for the movement of soybeans from the ports of export to the foreign deficit regions. See Figures 30, 31, 32, and 33. The movements of the ocean are consistent with the domestic movements. New Orleans supplies all of the South American regions and four out of eight African regions. Chicago supplies two African regions and Toledo supplies two plus Israel. Duluth supplies three regions of northern Europe. Chicago and Toledo both supply the same country, The Netherlands. Both Chicago and Duluth supply Canada, with Canada receiving a large amount from Duluth. New Orleans supplies eight regions of northern Europe with West Germany being the largest importer followed by The Netherlands. In the Mediterranean area New Orleans supplies five countries with Spain being the largest importer followed by Italy. Galveston also supplies part of Denmark's imports. Australia receives all of its grain from Galveston. New Orleans supplies the rest of eastern and western Asia with Japan receiving about 32 per cent of the grain available. There are a number of alternative optimum routes, one for Duluth, Toledo and Charleston, two for Chicago, and eight for New Orleans.

Figure 30. Solution 19, flows from U.S. ports to South America.

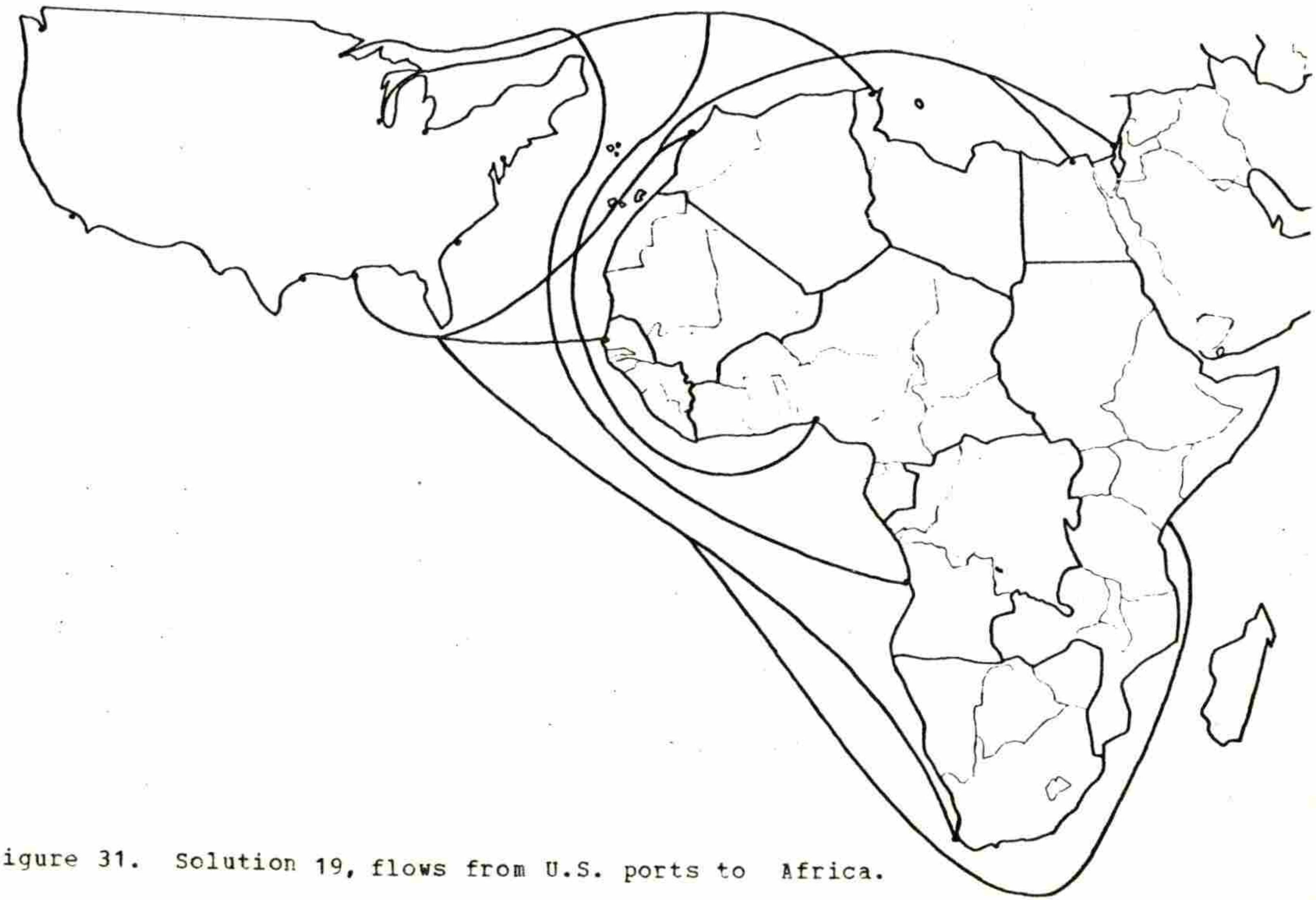

Figure 31. Solution 19, flows from U.S. ports to Africa.

Figure 32. Solution 19, flows from U.S. ports to Europe.

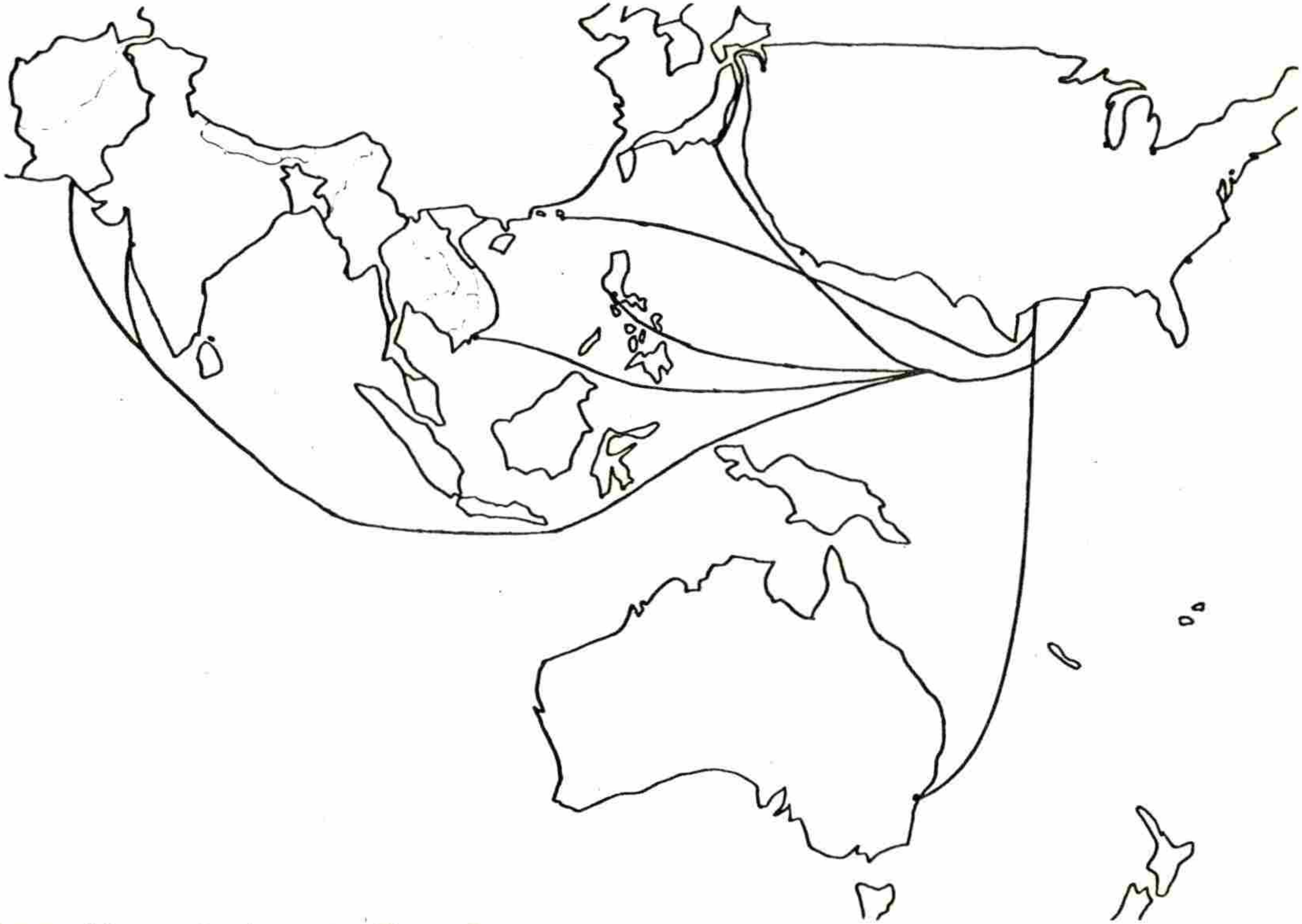

Figure 33. Solution 19, flows from U.S. ports to Asia.

The optimal quantities of soybeans that moves over these domestic and ocean routes are given in Table 27 of Appendix C. The opportunity costs appear in Table 33 of Appendix D.

Total cost of transportation   The total cost of transportation for each of the soybean models is given in Table 14. Solution 17 has the lowest value and is based on actual rates for domestic shipments outside the NCMA, and allows all sizes of ships for the ocean. Solution 18 is based on rate functions and increases the minimum total cost significantly. Solution 19, which has a halved barge rate to New Orleans brings the value down some. This difference in solution 18 and 19 can be attributed to the halved barge rate since all other assumptions are identical.

Table 14. Minimum total cost of transportation for soybeans

Solution number	Total cost
17	$136,841,485.30
18	149,845,807.40
19	144,158,305.80

Verification Results

The purpose of verifying the different solutions, or at least comparing them with reality, is to gain information as to the usefulness of the models. As the quote from Cohen and Cyert (5) previously given in chapter three suggests, the likelihood of a model incorrectly describing reality is high because it makes some strong assertions about the nature of the world. They also suggest that there are various degrees by which a model can fail to describe reality. Thus it is meaningful to be able to distinguish among models, those which give more adequate descriptions of reality than others. Statistical techniques are used in trying to verify the models and to establish some criteria by which they can be judged valid. The information gained in this process will hopefully lead to making revisions in models which will make them more adequate.

The transhipment models developed in chapter two have twenty-four different optimal solutions depending on the set of assumptions used. The activity levels of shipping from the ports to the foreign destinations are compared with their corresponding actual shipments over the ocean for the years 1966 and 1967. The purpose of doing this is twofold. First, it determines if a typically normative transhipment model can be used as a positive model. Secondly, it is used to verify the model and establish how well it abstracts reality.

The verification results for the subset of the twenty-four solutions, that is, solutions 1, 2, and 3, of Model I and solutions 17, 18, and 19, of Model V, are presented in Table 15. The r^2 is the coefficient of determination as described in equation 31. The intercept is the "a" term as described in the simple linear regression given in equation 29. And the coefficient is the "b" term as given in equation 29.

Table 15. Results of applying statistical techniques to the model solutions and actual data for the years 1966 and 1967

Solution number	r-square[1]	Coefficient[2]	Intercept[3]
1[4]	0.009[5]	0.001[5]	0.671[5]
	0.061[6]	0.197[6]	39.976[6]
2[4]	0.014	0.001	0.659
	0.063	0.197	39.983
3[4]	0.525	0.007	0.340
	0.296	0.400	29.346
17[7]	0.603	0.009	0.109
	0.493	0.553	6.102
18[7]	0.473	0.009	0.130
	0.405	0.512	7.049
19[7]	0.773	0.011	0.080
	0.706	0.662	3.587

[1] Coefficient of determination, r^2.

[2] Simple linear regression coefficient.

[3] Simple linear regression intercept.

[4] Model I, feed grains.

[5] Model solution compared to real world data for 1966, similarly for the first line in the rest of the table.

[6] Model solution compared to real world data for 1967, similarly for the second line in the rest of the table.

[7] Model V, soybeans.

The correlation coefficient R can be obtained by taking the square root of r^2 the coefficient of determination.

One result is that the real world data and optimal solutions for the year 1967 have regression coefficients that are much higher in value than for the year 1966. This may be quite possible since the deficit requirements for the foreign regions used in the transhipment model are based on a three year average for the years 1967, 1968, and 1969. The majority of actual shipments for 1966 are probably from grain produced in 1965 which is not represented in the model. The year 1966 is the one whose production is used as a base for making surplus and deficit estimates for the regions. Therefore, since 1965 data is not represented in the model, the comparison of model solutions to actual shipments gives poor results. However, the data for 1966 is represented in the model and it should reflect the ocean shipments made in 1967. The regression coefficients seem to indicate a relatively good relationship.

Another important result is that the regression coefficients and coefficients of determination for the 1967 in solution numbers 3 and 19 are higher than for their other corresponding solutions. Recall the assumption that in these two solutions calculated rates are used with the barge rate to New Orleans being cut in half. In previous sections of this chapter the results of this halved barge rate was discussed and found to cause a significant increase in the flow of grains to the port of New Orleans. The statistics indicate that this assumption also causes the appropriate models to describe the flows of grain on the ocean more realistically as opposed to other models. The magnitudes of the statistics for solution 3 and 19 also indicates that, although they are not close to one, they fare much better than the other models in approximating reality.

The three solutions for soybeans have higher values for their statistics than do the ones for feed grains. A possible interpretation of this is that the marketing and distribution channels are more efficient for soybeans than for feed grains. Or at least they approach perfect competion more closely, perhaps due to geographical production patterns, and are approximated better by an optimization type of model.

As touched on earlier the production data base is the year 1966, and a majority of this production goes for ocean shipments in 1967. Since the statistics for 1967 are relatively high, this indicates some forecasting ability of the model. That is, by putting into the model production values for a certain year, a forecast of ocean shipments for the subsequent year can be obtained. Any forecast of this kind is a conditional forecast based on the assumptions that go into the model. But with the proper set of assumptions, forecasts of future ocean shipments can be made, and as the statistics indicate they will be somewhat realistic.

It should be noted that the residuals of the regression equation divided by their standard error needs to be observed. This gives some indication as to the magnitude of the error in the regression equation. Consideration should also be given to possible measurement error in the real world data, the Y vector. Since the X vector, a model solution, is "tailor made" from the transhipment model and alternative optimal solutions exist there is a possibility for different values in the X vector. Consideration needs to be given to all of these factors during the verification procedure.

SUMMARY AND RECOMMENDATIONS

Summary

The North Central Marketing Area being a large producer of heavy grains has an important role in the distribution of these grains throughout the world. Similarly policy makers, at any level of the marketing channel, have to be responsive to the needs of these producers. Intelligent policy recommendations and action are required on the part of these policy makers. One key area of focus is on the transportation system and ways to improve all aspects of it. The purpose of this study is to analyze the domestic and foreign movements of heavy grain in the framework of a transhipment model. Various assumptions are made reflecting present and possible future conditions in the transportation network. There are two models each for feed grains, wheat, and soybeans each of which has four different assumptions associated with it. These models are then compared to actual data for shipments on the ocean for the years 1966 and 1967. The purpose of this is to arrive at some criteria by which one model may be judged more realistic than another. Through this process more information can be gained as how to make a model more adequate, and potentially a more applicable model.

There are quite a few objectives listed in chapter one which can be summarized as 1) construction of various transhipment models, 2) solution of these models, and 3) empirical verification of the models. A subset of the 24 solutions is chosen for presentation, three for feed grains and three for soybeans.

The first solution in each set has the assumption that transportation rates for domestic shipments are based on actual rates. The results indicate that most regions are supplied from nearby sources, but that in a few cases there are long distance movements which suggests special rates are in effect. The majority of the feed grains for export goes through the Great Lakes ports while soybeans go through the Gulf.

The second solution in each set has the assumption that transportation rates are based on rate functions. The effect of this assumption is that long distance movements are eliminated while the rest of the movements are similar to the ones for the previous solutions. Another facet associated with this assumption is that the movements of grain appear to be more realistic. The Great Lakes ports still handle the majority of feed grain exports while soybeans are shifting from the Gulf to the Great Lakes ports.

The third solution in each set assumes that barge rates to New Orleans are cut in half while the rest of the assumptions are the same as given for the second solution. This has a very significant effect on the movement of grain. The patterns of movement are again realistic and they minimize distance traveled. The movements to the ports for export are shifted heavily in the direction of New Orleans. The Great Lakes ports handle only a fraction of total exports compared to New Orleans. This significant shift can be attributed solely to the halving of the barge rate since all other assumptions remained the same as previously set.

The verification results indicate that solutions 1, 2, 17, and 18 do not approximate reality very well when compared to actual ocean shipments. However, solutions 3 and 18 when compared to actual data do relatively well. This indicates that they are better models for approximating reality than the others and can lead to more meaningful policy recommendations.

Recommendations

This study should be expanded to include all three commodities into one single model rather than three separate ones. The purpose being to have different grains compete with each other for marketing channel facilities. Since there were no restrictions placed on transportation vehicle or storage availability these factors should be included in the model.

Another area of expansion is to increase the number of regions considered as surplus deficit areas by disaggregating some of the present larger regions. This could be done in both the domestic and foreign sector.

One important improvement would be to consider using new data from current years, and possibly making the data base broader. Conceivably, five models could be built for each of five years with current updating through time. Or perhaps including a time dimension into one model.

Verification is a key in determining if a model has practical usefulness. By the use of the solution to the dual, the price surface implied in the domestic sector of the model can be compared with actual prices. This provides another method by which an indication of the usefulness of the model can be determined. As a result information can thus be gained as to the effect of various policies on the incomes of grain producers.

LITERATURE CITED

1. Bes, J. Despatch of tramp ships. San Francisco, California, George E. Butler and Co. 1967.

2. Blaug, M. Economic theory in retrospect. Homewood, Ill., Richard D. Irwin, Inc. 1962.

3. Cayemberg, Glen Dale Norbert. An analysis of freight rates and ocean shipping of United States grain exports. Unpublished M.S. thesis. Ames, Iowa, Library, Iowa State University of Science and Technology. 1969.

4. Clarkson, Goeffrey, P.E. Portfolio selection: a simulation of trust investment. Englewood Cliffs, N.J., Prentic-Hall. 1962.

5. Cohen, Kalman J. and Cyert, Richard M. Computer models in dynamic economics. The Quarterly Journal of Economics 75: 112-127. Feb. 1961.

6. Dantzig, George B. Application of the simplex method to a transportation problem. Activity Analysis of Production and Allocation. New York, N.Y., John Wiley and Sons, Inc. 1951.

7. Dantzig, George. Linear programming and extensions. Princeton, N.J., Princeton University Press. 1963.

8. Davis, M. LeRoy. Cost of shipping United States grain exports to principal world markets. Unpublished M.S. thesis. Ames, Iowa, Library, Iowa State University of Science and Technology. 1968.

9. Draper, N. R. and Smith, H. Applied regression analysis. New York, N.Y., John Wiley and Sons, Inc. 1968.

10. Durant, Will. The story of civilization: part I, our Oriental heritage. New York, N.Y., Simon and Schuster. 1954.

11. Ferber, Robert and Verdoorn, P.J. Research methods in economics and business. New York, N.Y., The Macmillan Company. 1962.

12. Futrell, Gene and Wisner, Robert M. Iowa farm outlook charts, 1971-72. Iowa State University of Science and Technology Cooperative Extension Service Economic Information Report 169. 1971.

13. Heady, Earl O. and Candler, Wilfred. Linear programming methods. Ames, Iowa., Iowa State University Press. 1958.

14. Henderson, James M. The efficiency of the coal industry, an application of linear programming. Cambridge, Mass., Harvard University Press. 1958.

15. Hitchcock, Frank. The distribution of a product from several sources to numerous localities. Journal of Mathematics and Physics 20: 224-230. 1941.

16. King, Richard A., ed. Interregional competition research methods. Raleigh, N.C., The Agricultural Policy Institute, North Carolina State Print Shop. 1963.

17. Koopmans, T. C. Optimum utilization of the transportation system. Econometrica 17, Supp.: 136-145. 1949.

18. Lefeber, L. Allocation in space: production, transport and industrial location. Amsterdam, Netherlands, North-Holland Publishing Company. 1958.

19. McDonald, Hugh J. and Sharp, John W. The impact of vessel size on an optimal system of U.S. grain export facilities. Unpublished paper presented at a North Central Regional Grain Marketing Research Project NCM-42 meeting, Toledo, Ohio. May 1969.

20. Naylor, Thomas H., Balintfy, Joseph L., Burdick, Donald S., and Chu, Kong. Computer simulation techniques. New York, N.Y., John Wiley and Sons, Inc. 1966.

21. Orden, Alex. The transshipment problem. Management Science 2, No. 3: 276-285. 1956.

22. Theil, H. Economic forecasts and policy. 2nd ed. Amsterdam, Netherlands, North-Holland Publishing Company. 1965.

23. Theil, H. Optimal decision rules for government and industry. Amsterdam, Netherlands, North-Holland Publishing Company. 1964.

24. Uhrig, John William. Economic effects of changes in transportation rates and processing capacity of soybean procurement by Iowa processors. Unpublished Ph.D. thesis. Ames, Iowa, Library, Iowa State University of Science and Technology. 1965.

25. U.S. Department of Commerce. Bureau of the Census. Schedule D, code classification of United States customs districts and ports. Washington, D.C., Bureau of the Census, U.S. Dept. of Commerce. 1967.

26. ________.________. Schedule B, commodity and country. FT 410/1967 Washington, D.C., Bureau of the Census, U.S. Dept. of Commerce. 1967.

27. ________.________. Schedule B, commodity and country. FT 410/1968 Washington, D.C., Bureau of the Census, U.S. Dept. of Commerce. 1968.

28. ________.________. Schedule B, commodity and country. FT 410/1969 Washington, D.C., Bureau of the Census, U.S. Dept. of Commerce. 1969.

29. U.S. Department of Commerce. Bureau of the Census. Unpublished foreign trade statistics: SA705/705IT, 1966. Washington, D.C., Bureau of the Census, U.S. Dept. of Commerce. 1967.

30. U.S. Department of Commerce. Bureau of the Census. Unpublished foreign trade statistics: SA705/705IT, 1967. Washington, D.C., Bureau of the Census, U.S. Dept. of Commerce. 1968.

31. Wonnacott, R. J. and Wonacott, T. H. Econometrics. New York, N.Y., John Wiley and Sons, Inc. 1970.

32. Wright, Bruce H. Impacts of alternate transportation policies on industrial location and regional agricultural development. Unpublished Ph.D. thesis. Ames, Iowa, Library, Iowa State University of Science and Technology. 1968.

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APPENDIX A. SURPLUS AND DEFICIT REGIONS FOR FEED GRAINS, WHEAT, AND SOYBEANS IN THE UNITED STATES

Table 16. Surplus and deficit regions for feed grains in the United States, 1966

Basing point	Crop reporting district, or states included	Computer code	Surplus	Deficit[1]
Powers, Mich.	1	MC1		47.29
Manton, Mich.	2	MC2		46.29
West Branch, Mich.	3	MC3		34.94
Mt. Pleasant, Mich.	4,5	MC4,5	100.77	
Caro, Mich.	6	MC6	148.56	
Allegan, Mich.	7	MC7	64.68	
Charlotte, Mich.	8	MC8	409.51	
Ann Arbor, Mich.	9	MC9	416.79	
Defiance, Ohio	1	OH1	1084.66	
Norwalk, Ohio	2	OH2	529.27	
Kent, Ohio	3	OH3		15.87
Sidney, Ohio	4	OH4	661.96	
Columbus, Ohio	5	OH5	835.33	
Cincinnati, Ohio	7	OH7	378.54	
Portsmouth, Ohio	8	OH8	83.67	
McConnelsville, Ohio	6,9	OH9		43.74
Rensselaer, Ind.	1	IN1	1364.66	
Rochester, Ind.	2	IN2	503.59	
Fort Wayne, Ind.	3	IN3	232.33	
Crawfordsville, Ind.	4	IN4	961.40	
Indianapolis, Ind.	5	IN5	1434.83	
Muncie, Ind.	6	IN6	362.26	
Washington, Ind.	7	IN7	795.35	
Bedford,Ind.	8	IN8		178.77
North Vernon, Ind.	9	IN9	59.64	
Spooner, Wis.	1	WI1		114.83
Wausau, Wis.	2	WI2		222.10
Shawano, Wis.	3	WI3		97.43
Osseo, Wis.	4	WI4		24.54
Wautoma, Wis.	5	WI5		39.77
Chilton, Wis.	6	WI6		186.43
Muscoda, Wis.	7	WI7		0.86
Madison, Wis.	8	WI8	387.57	
Waukesha, Wis.	9	WI9	140.87	

[1]All amounts are in 1000 short tons.

Table 16. (Continued)

Basing point	Crop reporting district, or states included	Computer code	Surplus	Deficit
Dixon, Ill.	1	IL1	2026.33	
Plano, Ill.	2	IL2	1909.68	
Macomb, Ill.	3	IL3	1172.27	
Bloomington, Ill.	4	IL4	2904.34	
Paxton, Ill.	5	IL5	2884.81	
Girard, Ill.	6	IL6	1272.46	
Effingham, Ill.	7	IL7	1503.21	
Pickneyville, Ill.	8	IL8	213.13	
McLeansboro, Ill.	9	IL9	407.27	
Crookston, Minn.	1	MN1		162.69
Bemidji, Minn.	2,3	MN2,3		60.59
Morris, Minn.	4	MN4	658.89	
St. Cloud, Minn.	5,6	MN5,6	613.07	
Slayton, Minn.	7	MN7	1131.96	
Mankato, Minn.	8	MN8	1628.74	
Rochester, Minn.	9	MN9	549.15	
Spencer, Iowa	1	IA1	1454.08	
Mason City, Iowa	2	IA2	1789.67	
West Union, Iowa	3	IA3	246.71	
Carroll, Iowa	4	IA4	1550.01	
Marshalltown, Iowa	5	IA5	1986.01	
Cedar Rapids, Iowa	6	IA6	855.41	
Red Oak, Iowa	7	IA7	896.59	
Chariton, Iowa	8	IA8	308.04	
Fairfield, Iowa	9	IA9	562.19	
King City, Mo.	1	MO1	238.08	
Bucklin, Mo.	2	MO2	46.54	
Monroe, Mo.	3	MO3	84.41	
Clinton, Mo.	4	MO4	142.36	
Jefferson City, Mo.	5	MO5		271.70
Pacific, Mo.	6	MO6		119.43
Carthage, Mo.	7	MO7		380.55
West Plains, Mo.	8	MO8		315.39
Sikeston, Mo.	9	MO9	139.28	
LaMoure, N. Dakota	6,9	ND6,9	28.71	
Isabel, S. Dakota	1	SD1		44.41
Ipswich, S. Dakota	2	SD2	132.96	

Table 16. (Continued)

Basing point	Crop reporting district, or states included	Computer code	Surplus	Deficit
Summit, S. Dakota	3	SD3	129.74	
Phillip, S. Dakota	4	SD4		42.74
Madison, S. Dakota	6	SD6	238.06	
Winner, S. Dakota	5,7,8	SD5,7,8	14.31	
Scotland, S. Dakota	9	SD9	520.21	
Alliance, Neb.	1	NB1		103.63
Ainsworth, Neb.	2	NB2		11.57
Norfolk, Neb.	3	NB3	806.33	
N. Platte, Neb.	4	NB4	998.01	
Loup City, Neb.	5	NB5	2930.35	
David City, Neb.	6	NB6	411.32	
Holdrege, Neb.	7	NB7	1038.21	
Beatrice, Neb.	8	NB8	1454.36	
Colby, Kans.	1	KA1	176.63	
Belleville, Kans.	2	KA2	216.86	
Holton, Kans.	3	KA3	872.01	
Scott City, Kans.	4	KA4	360.38	
Ellsworth, Kans.	5	KA5	123.10	
Ottawa, Kans.	6	KA6	102.58	
Dodge City, Kans.	7	KA7	868.58	
Kingman, Kans.	8	KA8	396.48	
Chanute, Kans.	9	KA9	38.78	
Albany, N.Y. Northeast Region	Pa., Md., and all states N.E. thereof	NE0		8112.70
Greensboro, N.C. Appalachia Region	Ky., Tenn., Va. W. Va., and N.C.	AP0		4956.68
Atlanta, Ga. Southeast Region	S.C., Ga., Fla. and Ala.	SE0		7786.55
Little Rock, Ark. Delta Region	Miss., Ark., and La.	DL0		6194.52

Table 16. (Continued)

Basing point	Crop reporting district, or states included	Computer code	Surplus	Deficit
Sacramento, Calif. Pacific Region	Wash., Ore., and Calif.	PF0		4955.99
Denver, Colo. Mountain Region	Mont., Colo., Id., Wyo., N.M. Ariz., Utah, and Nev.	MT0		2181.24
Fort Worth, Tex. Southern Plains Region	Tex. and Okla.	SP0	4603.48	

Table 17. Surplus and deficit regions for wheat in the United States, 1966

Basing point	Crop reporting district, or states included	Computer code	Surplus	Deficit[1]
Mt. Pleasant, Mich.	1,2,3,4,5	MC1,2,3,4,5	57.72	
Caro, Mich.	6	MC6	132.87	
Charlotte, Mich	7,8,9	MC7,8,9		51.80
Defiance, Ohio	1	OH1		143.78
Kent, Ohio	2,3	OH2,3		104.79
Sidney, Ohio	4	OH4	166.28	
Columbus, Ohio	5,6	OH5,6	135.77	
Cincinnati, Ohio	7	OH7	44.78	
Portsmouth, Ohio	8,9	OH8,9	5.36	
Rensselaer, Ind.	1	IN1	98.53	
Rochester, Ind.	2	IN2	127.18	
Fort Wayne, Ind.	3	IN3	49.77	
Crawfordsville, Ind.	4	IN4	130.03	
Indianapolis, Ind.	5	IN5	108.37	
Muncie, Ind.	6	IN6	77.89	
Washington, Ind.	7	IN7		75.84
North Vernon, Ind.	8,9	IN8,9	56.93	
Spooner, Wis.	1,2,3	WI1,2,3		115.63
Wautoma, Wis.	4,5,6	WI4,5,6		24.86
Madison, Wis.	7,8	WI7,8	0.15	
Waukesha, Wis.	9	WI9	0.43	
Plano, Ill.	1,2	IL1,2		252.97
Macomb, Ill.	3	IL3	95.22	
Bloomington, Ill.	4	IL4	109.05	
Paxton, Ill.	5	IL5	108.60	
Girard, Ill.	6	IL6		60.67
Effingham, Ill.	7	IL7	445.04	
Pickneyville, Ill.	8	IL8	151.38	
McLeansboro, Ill.	9	IL9	185.59	
Crookston, Minn.	1,2,3	MN1,2,3	338.08	
Morris, Minn.	4,7	MN4,7	52.33	
St. Cloud, Minn.	5	MN5		102.16

[1]All amounts are in 1000 short tons.

Table 17. (Continued)

Basing point	Crop reporting district, or states included	Computer code	Surplus	Deficit
Cambridge, Minn.	6	MN6		656.48
Rochester, Minn.	8,9	MN8,9		729.03
Mason City, Iowa	1,2,3	IA1,2,3	0.26	
Carroll, Iowa	4	IA4	6.01	
Marshalltown, Iowa	5	IA5		136.90
Cedar Rapids, Iowa	6	IA6		162.50
Red Oak, Iowa	7	IA7	7.09	
Chariton, Iowa	8	IA8		73.39
Fairfield, Iowa	9	IA9	6.57	
King City, Mo.	1	MO1		946.72
Bucklin, Mo.	2	MO2	90.69	
Monroe City, Mo.	3	MO3	112.73	
Clinton, Mo.	4	MO4	103.75	
Jefferson City, Mo.	5	MO5	142.92	
Pacific, Mo.	6	MO6		86.00
Sikeston, Mo.	7,8,9	MO7,8,9	283.77	
Stanley, N. Dak.	1	ND1	807.97	
Rugby, N. Dak.	2	ND2	549.88	
Park River, N. Dak.	3	ND3	766.38	
Beulah, N. Dak.	4	ND4	398.01	
Carrington, N. Dak.	5	ND5	374.80	
Valley City, N. Dak.	6	ND6	410.26	
Dickinson, N. Dak.	7	ND7	455.30	
Bismarck, N. Dak.	8	ND8	280.32	
LaMoure, N. Dak.	9	ND9	314.32	
Isabel, S. Dak.	1	SD1	124.34	
Ipswich, S. Dak.	2	SD2	336.16	
Summit, S. Dak.	3	SD3	126.80	
Phillip, S. Dak.	4	SD4	61.73	
Miller, S. Dak.	5,6,9	SD5,6,9	138.59	
Hot Springs, S. Dak.	7	SD7	77.81	
Winner, S. Dak.	8	SD8	172.26	
Alliance, Neb.	1	NB1	797.36	
N. Platte, Neb.	2,3,4	NB2,3,4	179.17	
Loup City, Neb.	5	NB5	67.26	
David City, Neb.	6	NB6	631.98	
Holdrege, Neb.	7	NB7	384.61	
Beatrice, Neb.	8	NB8	509.27	

Table 17. (Continued)

Basing point	Crop reporting district, or states included	Computer code	Surplus	Deficit
Colby, Kans.	1	KA1	691.76	
Belleville, Kans.	2	KA2	713.86	
Scott City, Kans.	4	KA4	388.78	
Ellsworth, Kans.	5	KA5	125.76	
Ottawa, Kans.	6,3	KA6,3		58.69
Dodge City, Kans.	7	KA7	726.73	
Kingman, Kans.	8	KA8	710.72	
Chanute, Kans.	9	KA9		76.35
Albany, N.Y. Northeast Region	Pa., Md., and all states N.E. thereof	NE0		1025.13
Greensboro, N.C. Appalachia Region	Ky., Tenn., Va. W. Va., and N.C.	AP0		175.45
Atlanta, Ga. Southeast Region	S.C., Ga., Fla. and Ala.	SE0	3557.98	
Little Rock, Ark. Delta Region	Miss., Ark., and La.	DL0	500.48	
Sacramento, Calif. Pacific Region	Wash., Ore., and Calif.	PF0	2098.85	
Denver, Colo. Mountain Region	Mont., Colo., Id., Wyo., N.M. Ariz., Utah, and Nev.	MT0	4588.91	
Fort Worth, Tex. Southern Plains Region	Tex. and Okla.	SP0		2282.61

Table 18. Surplus and deficit regions for soybeans in the United States, 1966

Basing point	Crop reporting district, or states included	Computer code	Surplus	Deficit[1]
Mt. Pleasant, Mich.	3,4,5	MC3,4,5	22.48	
Caro, Mich.	6	MC6	35.35	
Allegan, Mich.	7	MC7	23.23	
Charlotte, Mich.	8	MC8	102.54	
Ann Arbor, Mich.	9	MC9	166.30	
Defiance, Ohio	1	OH1	324.41	
Norwalk, Ohio	2	OH2		172.43
Kent, Ohio	3,6	OH3,6		246.30
Sidney, Ohio	4	OH4	375.51	
Columbus, Ohio	5	OH5	74.43	
Cincinnati, Ohio	7	OH7	93.76	
Portsmouth, Ohio	8,9	OH8,9	40.52	
Rensselaer, Ind.	1	IN1	417.84	
Rochester, Ind.	2	IN2	263.15	
Fort Wayne, Ind.	3	IN3		501.12
Crawfordsville, Ind.	4	IN4		13.33
Indianopolis, Ind.	5	IN5		198.78
Muncie, Ind.	6	IN6	212.36	
Washington, Ind.	7	IM7	234.09	
Bedford, Ind.	8	IN8	64.62	
N. Vernon, Ind.	9	IN9	85.27	
Osseo, Wis.	1,2,3,4,5	WI1,2,3,4,5	48.49	
Chilton, Wis.	5,6	WI5,6	13.64	
Madison, Wis.	7,8	WI7,8	25.57	
Waukesha, Wis.	9	WI9	26.20	
Dixon, Ill.	1	IL1	317.43	
Plano, Ill.	2	IL2		218.70
Macomb, Ill.	3	IL3		367.66
Bloomington, Ill.	4	IL4		2231.72
Paxton, Ill.	5	IL5		540.10
Girard, Ill.	6	IL6	486.43	
Effingham, Ill.	7	IL7	747.83	

[1]All amounts are in 1000 short tons.

Table 18. (Continued)

Basing point	Crop reporting district, or states included	Computer code	Surplus	Deficit
Pickneyville, Ill.	8	IL8	318.94	
McLeansboro, Ill.	9	IL9	290.25	
Crookston, Minn.	1,2,3	MN1,2,3	69.70	
Morris, Minn.	4	MN4	179.61	
St. Cloud, Minn.	5	MN5	187.19	
Cambridge, Minn.	6	MN6	37.28	
Slayton, Minn.	7	MN7	536.59	
Mankato, Minn.	8	MN8		126.68
Rochester, Minn.	9	MN9	250.06	
Spencer, Iowa	1	IA1	563.32	
Mason City, Iowa	2	IA2	156.64	
West Union, Iowa	3	IA3	234.16	
Carroll, Iowa	4	IA4	249.42	
Marshalltown, Iowa	5	IA5		917.96
Cedar Rapids, Iowa	6	IA6		531.85
Red Oak, Iowa	7	IA7	380.82	
Chariton, Iowa	8	IA8	297.53	
Fairfield, Iowa	9	IA9	241.07	
King City, Mo.	1	MO1		210.13
Bucklin, Mo.	2	MO2	371.76	
Monroe City, Mo.	3	MO3	94.61	
Clinton, Mo.	4	MO4	233.79	
Jefferson City, Mo.	5	MO5	152.29	
Pacific, Mo.	6	MO6	100.86	
Carthage, Mo.	7	MO7	73.41	
Sikeston, Mo.	8,9	MO8,9	37.52	
Valley City, N. Dak.	3,6	ND3,6	84.55	
LaMoure, N. Dak.	9	ND9	85.48	
Summit, S. Dak.	1,2,3	SD1,2,3	26.42	
Madison, S. Dak.	4,5,6	SD4,5,6	55.67	
Scotland, S. Dak.	7,8,9	SD7,8,9	139.56	
Norfolk, Neb.	2,3	NB2,3	233.21	
N. Platte, Neb.	4	NB4	17.37	
Loup City, Neb.	5	NB5	255.66	
Beatrice, Neb.	6,7,8	NB6,7,8	103.98	
Belleville, Kans.	1,2	KA1,2	0.61	

Table 18. (Continued)

Basing point	Crop reporting district, or states included	Computer code	Surplus	Deficit
Holton, Kans.	3	KA3	140.69	
Ellsworth, Kans.	4,5	KA4,5	18.22	
Ottawa, Kans.	6	KA6	105.34	
Kingman, Kans.	7,8	KA7,8		330.13
Chanute, Kans.	9	KA9	2294.83	
Albany, N.Y. Northeast Region	Pa., Md., and all states N.E. thereof	NE0		135.60
Greensboro, N.C. Appalachia Region	Ky., Tenn., Va. W. Va., and N.C.	AP0		1058.35
Atlanta, Ga. Southeast Region	S.C., Ga., Fla. and Ala.	SE0	479.12	
Little Rock, Ark. Delta Region	Miss., Ark., and La.	DL0	3028.39	
Sacramento, Calif. Pacific Region	Wash., Ore., and Calif.	PF0	--	
Denver, Colo. Mountain Region	Mont., Colo., Id., Wyo., N.M. Ariz., Utah, and Nev.	MT0	--	
Fort Worth, Tex. Southern Plains Region	Tex. and Okla.	SP0	172.42	

APPENDIX B. 1967-1969 AVERAGE OF UNITED STATES EXPORTS OF FEED GRAINS, WHEAT, AND SOYBEANS

Table 19. United States exports of feed grains to foreign regions, 1967-69 average

Basing point	Countries includes in region	Computer code	Quantity[1] [2] exported (foreign deficits)
Veracruz, Mexico	Mexico Guatemala British Honduras Honduras	MXO	89.01
Cristobal, Panama	Panama El Salvador Nicaragua Costa Rica Columbia	PAO	12.05
Kingston,	Jamaica Bahamas Haiti Dominican Republic Leeward and Windward Islands	JMO	59.50
Port of Spain, Trinidad	Trinidad Bermudas Barbados Northern Antilles French West Indies Guyana Surinam	TRO	59.01
La Guaira, Venezuela	Venezuela	VZO	9.09
Rio De Janeiro, Brazil	Brazil Paraguay	BZO	9.10
Montevideo, Uruguay	Uruguay	URO	38.83

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[1]All amounts are in 1000 short tons.

[2]See references (26,27,28).

Table 19. (Continued)

Basing point	Countries includes in region	Computer code	Quantity exported (foreign deficits)
Callao, Peru	Peru Equador Bolivia	PU0	8.99
Valparaiso, Chile	Chile Argentina	CL0	116.93
Gothenburg, Sweden	Sweden	SE0	7.83
Oslo, Norway	Norway	NW0	110.53
Helsinki, Finland	Finland	FN0	5.30
Copenhagen, Denmark	Denmark	DN0	9.97
Liverpool, United Kingdom	United Kingdom	UK0	1764.12
Dublin, Ireland	Ireland Iceland	IR0	55.45
Rotterdam, Netherland	Netherland	NH0	2809.28
Antwerp, Belgium	Belgium	BL0	813.28
Marseille, France	France Switzerland	FR0	195.80
Hamburg, West Germany	West Germany	WG0	1143.14
Rostock, East Germany	East Germany	EG0	409.37
Gdansk, Poland	Poland Czechoslovakia Hungary	PO0	374.22
Barcelona, Spain	Spain	SI0	805.03
Lisbon, Portugal	Portugal Azores	PG0	86.64

Table 19. (Continued)

Basing point	Countries includes in region	Computer code	Quantity exported (foreign deficits)
Genoa, Italy	Italy Austria	ITO	1597.54
Istanbul, Turkey	Turkey Yugoslavia Greece Bulgaria Cyprus	TKO	286.36
Casablanca, Morocco	Morocco Algeria Canary Island Madeira Island	MRO	99.36
Tunis, Tunisia	Tunisia Malta Libya	TUO	27.41
Alexandria, U.A.R.	United Arab Republic Lebanon Iraq Iran Jordan Kuwait Suadi Arabia Arabia Aden Bahrain	UAO	62.59
Tel Aviv, Israel	Israel	ISO	566.39
Dakar, Senegal	Senegal Guinea Sierra Leone Gambia Liberia	SNO	22.18
Lagos, Nigeria	Nigeria Cameroon Ivory Coast Ghana Togo Gahon	NGO	29.14

Table 19. (Continued)

Basing point	Countries includes in region	Computer code	Quantity exported (foreign deficits)
	Other West Africa		
Capetown, South Africa	South Africa Other South Africa	SA0	7.48
Mombasa, Kenya	Kenya Sudan Somali Republic Ethiopia Uganda Tanzania Mauritius Mozambique Malawi	KN0	23.31
Bombay, India	India Nepal Ceylon Burma	ID0	952.17
Karachi, Pakistan	Pakistan Afghanistan	PK0	114.83
Saigon, Vietnam	South Vietnam Laos Thailand South Korea Taiwan	VN0	182.92
Manila, Philippines	Philippines Malaysia Singapore Indonesia Other Southern Asia	PP0	25.00
Hong Kong, British Crown Colony	British Crown Colony Macao	HK0	3.76
Yokohama, Japan	Japan	JP0	5209.58
Montreal, Canada	Canada	CN0	1632.68

Table 19. (Continued)

Basing point	Countries includes in region	Computer code	Quantity exported (foreign deficits)
Luanda, Angola	Angola Other Western Portuguese Africa Congo Burundi Rwanda	AG0	1.17
Sydney, Australia	Australia Nansei Island New Zealand British Western Pacific Island Trust Territory of Pacific Island	AU0	1.05

Table 20. United States exports of wheat to foreign regions, 1967-69 average

Basing point	Countries includes in region	Computer code	Quantity[1] [2] exported (foreign deficits)
Veracruz, Mexico	Mexico Guatemala British Honduras Honduras	MX0	106.12
Cristobal, Panama	Panama El Salvador Nicaragua Costa Rica Columbia	PA0	392.75
Kingston,	Jamaica Bahamas Haiti Dominican Republic Leeward and Windward Islands	JM0	159.09
Port of Spain, Trinidad	Trinidad Bermudas Barbados Northern Antilles French West Indies Guyana Surinam	TR0	125.83
La Guaira, Venezuela	Venezuela	VZ0	678.64
Rio De Janeiro, Brazil	Brazil Paraguay	BZ0	1118.73
Montevideo, Uruguay	Uruguay	UR0	123.46

[1]All amounts are in 1000 short tons.

[2]See references (26,27,28).

Table 20. (Continued)

Basing point	Countries includes in region	Computer code	Quantity exported (foreign deficits)
Callao, Peru	Peru Equador Bolivia	PU0	355.73
Valparaiso, Chile	Chile Argentina	CL0	150.28
Gothenburg, Sweden	Sweden	SE0	0.12
Oslo, Norway	Norway	NW0	49.28
Helsinki, Finland	Finland	FN0	50.16
Copenhagen, Denmark	Denmark	DN0	0.03
Liverpool, United Kingdom	United Kingdom	UK0	246.68
Dublin, Ireland	Ireland Iceland	IR0	14.34
Rotterdam, Netherland	Netherland	NH0	408.59
Antwerp, Belgium	Belgium	BL0	145.01
Marseille, France	France Switzerland	FR0	381.85
Hamburg, West Germany	West Germany	WG0	300.16
Rostock, East Germany	East Germany	EG0	--
Gdansk, Poland	Poland Czechoslovakia Hungary	PO0	20.41
Barcelona, Spain	Spain	SI0	0.82
Lisbon, Portugal	Portugal Azores	PG0	42.53

Table 20. (Continued)

Basing point	Countries includes in region	Computer code	Quantity exported (foreign deficits)
Genoa, Italy	Italy Austria	ITO	258.93
Istanbul, Turkey	Turkey Yugoslavia Greece Bulgaria Cyprus	TKO	327.31
Casablanca, Morocco	Morocco Algeria Canary Island Madeira Island	MRO	655.25
Tunis, Tunisia	Tunisia Malta Libya	TUO	247.02
Alexandria, U.A.R.	United Arab Republic Lebanon Iraq Iran Jordan Kuwait Suadi Arabia Arabia Aden Bahrain	UAO	378.23
Tel Aviv, Israel	Israel	ISO	332.99
Dakar, Senegal	Senegal Guinea Sierra Leone Gambia Liberia	SNO	24.46
Lagos, Nigeria	Nigeria Cameroon Ivory Coast Ghana Togo Gahon	NGO	175.97

Table 20. (Continued)

Basing point	Countries includes in region	Computer code	Quantity exported (foreign deficits)
	Other West Africa		
Capetown, South Africa	South Africa Other South Africa	SA0	38.92
Mombasa, Kenya	Kenya Sudan Somali Republic Ethiopia Uganda Tanzania Mauritius Mozambique Malawi	KN0	30.68
Bombay, India	India Nepal Ceylon Burma	ID0	4055.64
Karachi, Pakistan	Pakistan Afghanistan	PK0	1200.28
Saigon, Vietnam	South Vietnam Laos Thailand South Korea Taiwan	VN0	1814.87
Manila, Philippines	Philippines Malaysia Singapore Indonesia Other Southern Asia	PP0	705.15
Hong Kong, British Crown Colony	British Crown Colony Macao	HK0	28.45
Montreal, Canada	Canada	CN0	616.97

Table 20. (Continued)

Basing point	Countries includes in region	Computer code	Quantity exported (foreign deficits)
Luanda, Angola	Angola Other Western Portuguese Africa Congo Burundi Rwanda	AG0	60.71
Sydney, Australia	Australia	AU0	54.23
Yokohama, Japan	Japan Nansei Island New Zealand British Western Pacific Island Trust Territory of Pacific Island	JP0	2280.99

Table 21. United States exports of soybeans to foreign regions, 1967-69 average

Basing point	Countries includes in region	Computer code	Quantity[1] [2] exported (foreign deficits)
Veracruz, Mexico	Mexico Guatemala British Honduras Honduras	MX0	14.80
Cristobal, Panama	Panama El Salvador Nicaragua Costa Rica Columbia	PA0	1.83
Kingston,	Jamaica Bahamas Haiti Dominican Republic Leeward and Windward Islands	JM0	0.41
Port of Spain, Trinidad	Trinidad Bermudas Barbados Northern Antilles French West Indies Guyana Surinam	TR0	0.05
La Guaira, Venezuela	Venezuela	VZ0	42.65
Rio De Janeiro, Brazil	Brazil Paraguay	BZ0	0.04
Montevideo, Uruguay	Uruguay	UR0	--

[1]All amounts are in 1000 short tons.

[2]See references (26,27,28).

Table 21. (Continued)

Basing point	Countries includes in region	Computer code	Quantity exported (foreign deficits)
Callao, Peru	Peru Equador Bolivia	PU0	--
Valparaiso, Chile	Chile Argentina	CL0	--
Gothenburg, Sweden	Sweden	SE0	0.17
Oslo, Norway	Norway	NW0	145.09
Helsinki, Finland	Finland	FN0	--
Copenhagen, Denmark	Denmark	DN0	430.65
Liverpool, United Kingdom	United Kingdom	UK0	154.34
Dublin, Ireland	Ireland Iceland	IR0	--
Rotterdam, Netherland	Netherland	NH0	1202.17
Antwerp, Belgium	Belgium	BL0	329.66
Marseille, France	France Switzerland	FR0	39.85
Hamburg, West Germany	West Germany	WG0	950.39
Rostock, East Germany	East Germany	EG0	3.65
Gdansk, Poland	Poland Czechoslovakia Hungary	PO0	79.68
Barcelona, Spain	Spain	SI0	902.45
Lisbon, Portugal	Portugal Azores	PG0	8.11

Table 21. (Continued)

Basing point	Countries includes in region	Computer code	Quantity exported (foreign deficits)
Genoa, Italy	Italy Austria	IT0	540.42
Istanbul, Turkey	Turkey Yugoslavia Greece Bulgaria Cyprus	TK0	3.62
Casablanca, Morocco	Morocco Algeria Canary Island Madeira Island	MR0	--
Tunis, Tunisia	Tunisia Malta Libya	TU0	--
Alexandria, U.A.R.	United Arab Republic Lebanon Iraq Iran Jordan Kuwait Suadi Arabia Arabia Aden Bahrain	UA0	0.11
Tel Aviv, Israel	Israel	IS0	259.11
Dakar, Senegal	Senegal Guinea Sierra Leone Gambia Liberia	SN0	--
Lagos, Nigeria	Nigeria Cameroon Ivory Coast Ghana Togo Gahon	NG0	--

Table 21. (Continued)

Basing point	Countries includes in region	Computer code	Quantity exported (foreign deficits)
	Other West Africa		
Capetown, South Africa	South Africa Other South Africa	SA0	0.09
Mombasa, Kenya	Kenya Sudan Somali Republic Ethiopia Uganda Tanzania Mauritius Mozambique Malawi	KN0	--
Bombay, India	India Nepal Ceylon Burma	ID0	0.23
Karachi, Pakistan	Pakistan Afghanistan	PK0	--
Saigon, Vietnam	South Vietnam Laos Thailand South Korea Taiwan	VN0	455.48
Manila, Philippines	Philippines Malaysia Singapore Indonesia Other Southern Asia	PP0	3.54
Hong Kong, British Crown Colony	British Crown Colony Macao	HK0	1.92
Yokohama, Japan	Japan	JP0	2144.63
Montreal, Canada	Canada	CN0	982.42

Table 21. (Continued)

Basing point	Countries includes in region	Computer code	Quantity exported (foreign deficits)
Luanda, Angola	Angola Other Western Portuguese Africa Congo Burundi Rwanda	AGO	--
Sydney, Australia	Australia Nansei Island New Zealand British Western Pacific Island Trust Territory of Pacific Island	AUO	1.69

APPENDIX C. OPTIMAL SOLUTIONS FOR FEED GRAIN AND SOYBEANS MODELS

Table 22. Optimal solution: model I, objective function 1

Coded route	Flow over the route	Coded route	Flow over the route	Coded route	Flow over the route
SP0GV0	4603.48	MN4MN2	30.95	KA3DL0	872.01
MC5NE0	19.54	MN5DU0	160.32	KA4PF0	360.38
MC5MC2	46.29	MN5SE0	452.75	KA5DL0	123.10
MC5MC3	34.94	MN7SE0	1131.96	KA6DL0	102.58
MC6NE0	148.56	MN8DU0	1628.74	KA7LA0	0.0
MC7NE0	64.68	MN9NO0	302.51	KA7SL0	363.26
MC8NE0	409.51	MN9WI2	222.10	KA7PF0	505.32
MC9NE0	416.79	MN9WI4	24.54	KA8DL0	254.01
OH1NE0	1084.66	IA1DU0	1454.08	KA8MO7	142.47
OH2NE0	513.40	IA2NE0	1789.67	KA9DL0	38.78
OH2OH3	15.87	IA3WI3	97.43	DU0UK02	1633.62
OH4NE0	661.96	IA3WI6	148.42	DU0IR02	55.45
OH5NE0	791.59	IA3WI7	0.86	DU0EG02	409.37
OH5OH9	43.74	IA4DL0	1550.01	DU0SI02	25.13
OH7SE0	378.54	IA5CH0	1439.07	DU0CN02	1632.68
OH8AP0	83.67	IA5DL0	546.94	CH0SW02	7.83
IN1CH0	803.86	IA6NE0	855.41	CH0NW02	110.53
IN1NE0	560.80	IA7DL0	896.59	CH0FN02	5.30
IN2NE0	503.59	IA8MO5	271.70	CH0DN02	9.97
IN3NE0	232.33	IA8MO6	36.34	CH0UK02	130.50
IN4PH0	782.63	IA9AP0	562.19	CH0NH02	2809.28
IN4IN8	178.77	MO1MO7	238.08	CH0BL02	813.28
IN5AP0	1434.83	MO2MO8	46.54	CH0FR02	195.80
IN6NE0	60.21	MO3AP0	84.41	CH0WG02	1143.14
IN6AP0	302.05	MO4MO8	142.36	CH0PO02	374.22
IN7SE0	795.35	MO9DL0	139.28	CH0PG02	86.64
IN9AP0	59.64	ND9MN1	28.71	CH0MR02	99.36
WI8CH0	300.51	SD2MN1	34.24	CH0TU02	27.41
WI8MC1	47.29	SD2SD1	44.41	CH0NG02	29.14
WI8WI5	39.77	SD2SD4	42.74	CH0AG02	1.17
WI9CH0	102.86	SD2NB2	11.57	TO0BL02	0.0
WI9WI6	38.01	SD3MN1	99.74	PH0SI04	779.90
IL1CH0	2026.33	SD3MN2	30.00	PH0IT04	1597.54
IL2AP0	1909.68	SD6NO0	238.06	PH0TK04	286.36
IL3CH0	1172.27	SD8NB1	14.31	PH0UA04	62.59
IL4SE0	2904.34	SD9AP0	520.21	PH0IS04	566.39
IL5PH0	2884.81	NB3PF0	806.33	PH0SN04	22.18
IL6CS0	0.0	NB4MT0	966.40	PH0SA04	7.48
IL6NO0	1062.88	NB4NB1	31.61	PH0KN04	23.31
IL6MO6	83.09	NB5PF0	2872.64	PH0ID04	206.86
IL6MO8	126.49	NB5NB1	57.71	PH0PK04	114.83
IL7SE0	1503.21	NB6PF0	411.32	NO0JM04	59.50
IL8SE0	213.13	NB7MT0	1038.21	NO0TR04	59.01
IL9SE0	407.27	NB8DL0	1454.36	NO0BZ04	9.10
MN4DU0	513.11	KA1MT0	176.63	NO0UR04	38.83
MN4WI1	114.83	KA2DL0	216.86	NO0ID04	745.31

Table 22. (Continued)

Coded route	Flow over the route
NO0JP04	691.70
GV0MX04	89.07
GV0PA04	12.05
GV0VZ04	9.09
GV0PU04	8.99
GV0CL04	116.93
GV0VN04	182.92
GV0PP04	25.00
GV0HK04	3.76
GV0JP04	4154.62
GV0AU04	1.05
SL0JP06	363.26

Table 23. Optimal solution: model I, objective function 2

Coded route	Flow over the route	Coded route	Flow over the route	Coded route	Flow over the route
SP0GV0	4603.48	MN5DU0	613.07	KA1MT0	176.63
MC5NE0	65.83	MN7DU0	1131.96	KA2DL0	216.86
MC5MC3	34.94	MN8DU0	1628.74	KA3DL0	491.46
MC6NE0	148.56	MN9NO0	549.15	KA3MO7	380.55
MC7NE0	64.68	IA1DU0	1454.08	KA4MT0	360.38
MC8NE0	409.51	IA2DU0	1388.43	KA5DL0	123.10
MC9NE0	416.79	IA2WI1	114.83	KA6DL0	60.50
OH1NE0	1084.66	IA2WI2	222.10	KA6MO8	42.08
OH2NE0	513.40	IA2WI4	24.54	KA7LA0	0.0
OH2OH3	15.87	IA2WI5	39.77	KA7PF0	868.58
OH4NE0	661.96	IA3WI3	97.43	KA8DL0	396.48
OH5PH0	0.0	IA3WI6	148.42	KA9DL0	38.78
OH5NE0	791.59	IA3WI7	0.86	DU0SW02	7.83
OH5OH9	43.74	IA4DL0	1550.01	DU0UK02	1764.12
OH7AP0	378.54	IA5CH0	1645.74	DU0IR02	55.45
OH8AP0	83.67	IA5DL0	340.27	DU0NH02	19.20
IN1NE0	1364.66	IA6NO0	855.41	DU0BL02	813.28
IN2NE0	503.59	IA7DL0	896.59	DU0WG02	1143.14
IN3NE0	232.33	IA8DL0	36.34	DU0EG02	409.37
IN4AP0	961.40	IA8MO5	271.70	DU0PO02	374.22
IN5AP0	1434.83	IA9NO0	562.19	DU0SI02	805.03
IN6NE0	362.26	MO1DL0	238.08	DU0IS02	566.39
IN7SE0	616.58	MO2MO8	46.54	DU0SN02	22.18
IN7IN8	178.77	MO3MO8	84.41	DU0CN02	1632.68
IN9SE0	59.64	MO4MO8	142.36	DU0AG02	1.17
WI8NE0	293.99	MO9SE0	139.28	CH0NW02	110.53
WI8MC1	47.29	ND9MN1	28.71	CH0FN02	5.30
WI8MC2	46.29	SD2MN1	88.55	CH0DN02	9.97
WI9NE0	102.86	SD2SD1	44.41	CH0NH02	2790.08
WI9WI6	38.01	SD3DU0	23.36	CH0FR02	195.80
IL1CH0	1746.63	SD3MN1	45.43	CH0PG02	86.64
IL1NE0	279.70	SD3MN2	60.95	CH0IT02	1597.54
IL2CH0	1909.68	SD6DU0	238.06	CH0TK02	286.36
IL3NO0	352.44	SD8NB1	2.74	CH0MR02	99.36
IL3SE0	700.40	SD8NB2	11.57	CH0TU02	27.41
IL3MO6	119.43	SD9DU0	477.47	CH0UA02	62.59
IL4AP0	29.76	SD9SD4	42.74	CH0NG02	29.14
IL4SE0	2874.58	NB3DL0	351.69	TO0IT02	0.0
IL5NE0	816.33	NB3PF0	454.64	NO0JM04	59.50
IL5AP0	2068.48	NB4PF0	998.01	NO0TR04	59.01
IL6SE0	1272.46	NB5PF0	2634.76	NO0BZ04	9.10
IL7CS0	0.0	NB5MT0	194.70	NO0UR04	38.83
IL7SE0	1503.21	NB5NB1	100.89	NO0SA04	7.48
IL8SE0	213.13	NB6MT0	411.32	NO0KN04	23.31
IL9SE0	407.27	NB7MT0	1038.21	NO0ID04	952.17
MN4DU0	658.89	NB8DL0	1454.36	NO0PK04	114.83

Table 23. (Continued)

Coded route	Flow over the route
NO0JP04	1054.96
GV0MX04	89.07
GV0PA04	12.05
GV0VZ04	9.09
GV0PU04	8.99
GV0CL04	116.93
GV0VN04	182.92
GV0PP04	25.00
GV0HK04	3.76
GV0JP04	4154.62
GV0AU04	1.05
SL0JP06	0.0

Table 24. Optimal solution: model I, objective function 3

Coded route	Flow over the route	Coded route	Flow over the route	Coded route	Flow over the route
SP0GV0	219.68	MN4MN2	19.38	KA1MT0	176.63
SP0DL0	4383.80	MN5DU0	613.07	KA2MT0	216.86
MC5NE0	65.83	MN7DU0	1017.13	KA3NO0	531.58
MC5MC3	34.94	MN7WI1	114.83	KA3MO7	340.43
MC6NE0	148.56	MN8NO0	1628.74	KA4MT0	360.38
MC7NE0	64.68	MN9NO0	549.15	KA5MT0	123.10
MC8NE0	409.51	IA1DU0	1429.54	KA6MO8	102.58
MC9NE0	416.79	IA1WI4	24.54	KA7LA0	0.0
OH1NE0	1084.66	IA2NO0	1567.57	KA7PF0	868.58
OH2NE0	513.40	IA2WI2	222.10	KA8DL0	356.36
OH2OH3	15.87	IA3NO0	103.72	KA8MO7	40.12
OH4NE0	661.96	IA3WI3	97.43	KA9MO8	38.78
OH5PH0	0.0	IA3WI6	45.56	DU0UK02	1764.12
OH5NE0	791.59	IA4NO0	1550.01	DU0IR02	55.45
OH5OH9	43.74	IA5NO0	1985.15	DU0NH02	74.52
OH7AP0	378.54	IA5WI7	0.86	DU0EG02	409.37
OH8AP0	83.67	IA6NO0	855.41	DU0CN02	1632.68
IN1NE0	1364.66	IA7NO0	896.59	DU0AG02	1.17
IN2NE0	503.59	IA8NO0	51.21	CH0NH02	1851.80
IN3NE0	232.33	IA8MO5	256.83	CH0TU02	27.41
IN4AP0	961.40	IA9NO0	562.19	CH0NG02	29.14
IN5AP0	1434.83	MO1NO0	238.08	TO0NH02	0.0
IN6AP0	362.26	MO2MO5	14.87	NO0PA04	12.05
IN7SE0	616.58	MO2MO8	31.67	NO0JM04	59.50
IN7IN8	178.77	MO3NO0	84.41	NO0TR04	59.01
IN9SE0	59.64	MO4MO8	142.36	NO0VZ04	9.09
WI8NE0	254.22	MO9SE0	139.28	NO0BZ04	9.10
WI8MC1	47.29	ND9MN1	28.71	NO0UR04	38.83
WI8MC2	46.29	SD2MN1	45.81	NO0PU04	8.99
WI8WI5	39.77	SD2SD1	44.41	NO0CL04	116.93
WI9WI6	140.87	SD2SD4	42.74	NO0SW04	7.83
IL1NO0	425.41	SD3MN1	88.17	NO0NH04	882.96
IL1NE0	1600.92	SD3MN2	41.57	NO0BL04	813.28
IL2CH0	1909.68	SD6DU0	238.06	NO0FR04	195.80
IL3NO0	1052.84	SD8NB1	2.74	NO0WG04	1143.14
IL3MO6	119.43	SD8NB2	11.57	NO0PO04	374.22
IL4NO0	478.19	SD9NO0	520.21	NO0SI04	805.03
IL4SE0	2426.15	NB3NO0	691.65	NO0PG04	86.64
IL5AP0	1735.98	NB3PF0	114.68	NO0IT04	1597.54
IL5SE0	1148.83	NB4PF0	998.01	NO0TK04	286.36
IL6SE0	1272.46	NB5PF0	2829.46	NO0MR04	99.36
IL7CS0	0.0	NB5NB1	100.89	NO0UA04	62.59
IL7SE0	1503.21	NB6PF0	145.26	NO0IS04	566.39
IL8SE0	213.13	NB6MT0	266.06	NO0SN04	22.18
IL9SE0	407.27	NB7MT0	1038.21	NO0SA04	7.48
MN4DU0	639.51	NB8DL0	1454.36	NO0KN04	23.31

Table 24. (Continued)

Coded route	Flow over the route
NO0ID04	952.17
NO0PK04	114.83
NO0VN04	182.92
NO0PP04	25.00
NO0JP04	5209.58
GV0MX04	89.07
GV0NW04	110.53
GV0FN04	5.30
GV0DN04	9.97
GV0HK04	3.76
GV0AU04	1.05
SL0JP06	0.0

Table 25. Optimal solution: model V, objective function 1

Coded route	Flow over the route	Coded route	Flow over the route	Coded route	Flow over the route
SE0AP0	479.12	IA3IA6	234.16	CH0NH02	532.51
DL0NO0	3028.39	IA4IA5	249.42	TO0NH02	450.63
SP0GV0	172.42	IA7AP0	259.87	CS0DN04	0.0
MC5OH2	22.48	IA7IA5	9.57	NO0MX04	14.80
MC6NE0	35.35	IA7MO1	111.38	NO0PA04	1.83
MC7OH2	23.23	IA8IL2	178.86	NO0JM04	0.41
MC8NE0	100.25	IA8IA5	118.67	NO0TR04	0.05
MC8OH2	2.29	IA9NO0	241.07	NO0VZ04	42.65
MC9TO0	166.30	MO2NO0	4.10	NO0BZ04	0.04
OH1TO0	114.60	MO2IL3	367.66	NO0UR04	0.0
OH1OH2	50.04	MO3NO0	94.61	NO0PU04	0.0
OH1IN3	159.77	MO4NO0	233.79	NO0CL04	0.0
OH4TO0	169.73	MO5NO0	152.29	NO0SW04	0.17
OH4OH3	205.78	MO6NO0	100.86	NO0NW04	145.09
OH5OH2	74.39	MO7IL4	73.91	NO0FN04	0.0
OH7NO0	93.76	MO9NO0	37.52	NO0DN04	45.08
OH8OH3	40.52	ND6DU0	84.55	NO0FR04	39.85
IN1CH0	404.51	ND9DU0	85.48	NO0WG04	950.39
IN1IN4	13.33	SD3DU0	26.42	NO0PO04	79.68
IN2IN3	263.15	SD6DU0	55.67	NO0SI04	902.45
IN6IN3	78.20	SD9MN8	126.68	NO0PG04	8.11
IN6IN5	134.16	SD9IA5	12.88	NO0IT04	540.42
IN7AP0	234.09	NB3IA5	233.21	NO0TK04	3.62
IN8IN5	64.62	NB4LA0	0.0	NO0MR04	0.0
IN9PH0	0.0	NB4SL0	0.0	NO0UA04	0.11
IN9AP0	85.27	NB4MT0	0.0	NO0IS04	259.11
WI4DU0	48.49	NB4KA8	17.37	NO0SN04	0.0
WI6IL2	13.64	NB5MO1	98.75	NO0SA04	0.09
WI8CH0	25.57	NB5KA8	156.91	NO0KN04	0.0
WI9IL2	26.20	NB8NO0	103.98	NO0ID04	0.23
IL1CH0	317.43	KA2KA8	0.61	NO0PK04	0.0
IL6NO0	486.43	KA3NO0	140.69	NO0VN04	455.48
IL7NO0	207.73	KA5KA8	18.22	NO0PP04	3.54
IL7IL5	540.10	KA6NO0	105.34	NO0HK04	1.92
IL8NO0	318.94	KA9IL4	2157.81	NO0JP04	2144.63
IL9NO0	290.25	KA9KA8	137.02	GV0DN04	170.73
MN1DU0	69.70	DU0UK02	154.34	GV0AU04	1.69
MN4DU0	179.61	DU0IR02	0.0		
MN5DU0	187.19	DU0NH02	219.03		
MN6DU0	37.28	DU0BL02	329.66		
MN7DU0	536.59	DU0EG02	3.65		
MN9DU0	250.06	DU0TU02	0.0		
IA1DU0	128.06	DU0NG02	0.0		
IA1IA5	137.57	DU0CN02	982.42		
IA1IA6	297.69	DU0AG02	0.0		
IA2IA5	156.64	CH0DN02	214.84		

Table 26. Optimal solution: model V, objective function 2

Coded route	Flow over the route	Coded route	Flow over the route	Coded route	Flow over the route
SE0AP0	479.12	IA2DU0	156.64	CH0DN02	200.81
DL0NO0	3028.39	IA3IA6	234.16	CH0NH02	381.01
SP0GV0	172.42	IA4DU0	209.84	TO0NH02	415.06
MC5NE0	22.48	IA4IA5	39.58	CS0DN04	0.0
MC6NE0	35.35	IA7IA5	324.20	NO0PA04	1.83
MC7OH2	23.23	IA7IA6	56.62	NO0JM04	0.41
MC8NE0	77.77	IA8IA5	297.53	NO0TR04	0.05
MC8OH2	24.77	IA9IA6	241.07	NO0VZ04	42.65
MC9TO0	166.30	MO2NO0	4.10	NO0BZ04	0.04
OH1TO0	248.76	MO2IL3	367.66	NO0UR04	0.0
OH1OH2	50.04	MO3NO0	94.61	NO0PU04	0.0
OH1IN3	25.61	MO4NO0	233.79	NO0CL04	0.0
OH4PH0	0.0	MO5NO0	152.29	NO0SW04	0.17
OH4AP0	129.21	MO6NO0	100.86	NO0NW04	145.09
OH4OH3	246.30	MO7GV0	73.91	NO0FR04	39.85
OH5OH2	74.39	MO9NO0	37.52	NO0WG04	196.16
OH7AP0	93.76	ND6DU0	84.55	NO0PO04	79.68
OH8AP0	40.52	ND9DU0	85.48	NO0SI04	902.45
IN1CH0	417.84	SD3DU0	26.42	NO0PG04	8.11
IN2IN3	263.15	SD6DU0	55.67	NO0IT04	540.42
IN6IN3	212.36	SD9DU0	139.56	NO0TK04	3.62
IN7AP0	220.76	NB3MN8	126.68	NO0MR04	0.0
IN7IN4	13.33	NB3IA5	106.53	NO0UA04	0.11
IN8AP0	64.62	NB4LA0	0.0	NO0IS04	259.11
IN9NO0	85.27	NB4SL0	0.0	NO0SN04	0.0
WI4DU0	48.49	NB4MT0	0.0	NO0SA04	0.09
WI6CH0	13.64	NB4KA8	17.37	NO0KN04	0.0
WI8CH0	25.57	NB5IA5	150.12	NO0ID04	0.23
WI9CH0	26.20	NB5MO1	105.54	NO0PK04	0.0
IL1CH0	98.73	NB8MO1	103.98	NO0VN04	455.48
IL1IL2	218.70	KA2MO1	0.61	NO0PP04	3.54
IL6NO0	263.95	KA3NO0	140.69	NO0HK04	1.92
IL6IL4	222.48	KA5KA8	18.22	NO0JP04	2144.63
IL7IN5	198.78	KA6NO0	105.34	GV0MX04	14.80
IL7IL4	8.95	KA9IL4	2000.29	GV0FN04	0.0
IL7IL5	540.10	KA9KA8	294.54	GV0DN04	229.84
IL8NO0	318.94	DU0UK02	154.34	GV0AU04	1.69
IL9NO0	259.89	DU0IR02	0.0		
IL9AP0	30.36	DU0NH02	406.10		
MN1DU0	69.70	DU0BL02	329.66		
MN4DU0	179.61	DU0WG02	754.23		
MN5DU0	187.19	DU0EG02	3.65		
MN6DU0	37.28	DU0TU02	0.0		
MN7DU0	536.59	DU0NG02	0.0		
MN9DU0	250.06	DU0CN02	982.42		
IA1DU0	563.32	DU0AG02	0.0		

Table 27. Optimal solution: model V, objective function 3

Coded route	Flow over the route	Coded route	Flow over the route	Coded route	Flow over the route
SE0AP0	479.12	IA1IA5	265.63	CS0DN04	0.0
DL0NO0	3028.39	IA1IA6	297.69	NO0MX04	14.80
SP0GV0	172.42	IA2IA5	156.64	NO0PA04	1.83
MC5NE0	22.48	IA3IA6	234.16	NO0JM04	0.41
MC6NE0	35.35	IA4IA5	249.42	NO0TR04	0.05
MC7OH2	23.23	IA7NO0	380.82	NO0VZ04	42.65
MC8NE0	77.77	IA8NO0	297.53	NO0BZ04	0.04
MC8OH2	24.77	IA9NO0	241.07	NO0UR04	0.0
MC9TO0	166.30	MO2NO0	371.76	NO0PU04	0.0
OH1OH2	100.02	MO3NO0	94.61	NO0CL04	0.0
OH1IN3	224.39	MO4NO0	233.79	NO0SW04	0.17
OH4AP0	129.21	MO5NO0	152.29	NO0NW04	145.09
OH4OH3	246.30	MO6NO0	100.86	NO0FN04	0.0
OH5PH0	0.0	MO7NO0	73.91	NO0DN04	259.92
OH5AP0	49.98	MO9NO0	37.52	NO0NH04	614.93
OH5OH2	24.41	ND6DU0	84.55	NO0BL04	329.66
OH7AP0	93.76	ND9DU0	85.48	NO0FR04	39.85
OH8AP0	40.52	SD3DU0	26.42	NO0WG04	950.39
IN1CH0	397.57	SD6DU0	55.67	NO0PO04	79.68
IN1IN4	13.33	SD9NO0	139.56	NO0SI04	902.45
IN1IL5	6.94	NB3NO0	233.21	NO0PG04	8.11
IN2IN3	263.15	NB4LA0	0.0	NO0IT04	540.42
IN6IN3	13.58	NB4SL0	0.0	NO0TK04	3.62
IN6IN5	198.78	NB4MT0	0.0	NO0MR04	0.0
IN7NO0	32.95	NB4KA8	17.37	NO0UA04	0.11
IN7AP0	201.14	NB5IA5	246.27	NO0IS04	259.11
IN8AP0	64.62	NB5MO1	9.39	NO0SN04	0.0
IN9NO0	85.27	NB8NO0	103.98	NO0SA04	0.09
WI4NO0	48.49	KA2NO0	0.61	NO0KN04	0.0
WI6CH0	13.64	KA3NO0	140.69	NO0ID04	0.23
WI8CH0	25.57	KA5KA8	18.22	NO0PK04	0.0
WI9CH0	26.20	KA6NO0	105.34	NO0VN04	455.48
IL1IL2	218.70	KA9IL3	367.66	NO0PP04	3.54
IL1IL4	98.73	KA9IL4	1431.89	NO0HK04	1.92
IL6IL4	486.43	KA9MO1	200.74	NO0JP04	2144.63
IL7IL4	214.67	KA9KA8	294.54	GV0DN04	170.73
IL7IL5	533.16	DU0UK02	154.34	GV0AU04	1.69
IL8NO0	318.94	DU0IR02	0.0		
IL9NO0	290.25	DU0EG02	3.65		
MN1DU0	69.70	DU0CN02	940.54		
MN4DU0	179.61	CH0NH02	420.94		
MN5DU0	187.19	CH0NG02	0.0		
MN6NO0	37.28	CH0CN02	41.88		
MN7DU0	409.91	CH0AG02	0.0		
MN7MN8	126.68	TO0NH02	166.30		
MN9NO0	250.06	TO0TU02	0.0		

APPENDIX D. OPPORTUNITY COSTS FOR FEED GRAIN AND SOYBEAN MODELS

Table 28. Opportunity Cost: model I, objective function 1

Coded route	Oppor. Cost	Coded route	Oppor. Cost	Coded route	Oppor. Cost
SP0LA0	2.25	OH1MC2	1.94	IN1WI6	1.77
SP0SL0	2.25	OH1MC3	1.92	IN1WI7	3.52
SP0SE0	6.26	OH1OH3	0.53	IN2PH0	0.33
SP0DL0	1.45	OH1OH9	1.23	IN2NO0	2.40
SP0PF0	2.25	OH1IN8	2.56	IN2CH0	1.32
SP0MT0	12.13	OH2PH0	1.33	IN2TO0	2.06
MC5PH0	2.73	OH2TO0	2.36	IN2MC2	1.28
MC5CH0	3.88	OH2AP0	3.18	IN2IN8	1.45
MC5TO0	2.87	OH2SE0	3.19	IN2WI6	2.08
MC5MC1	1.83	OH2MC3	3.17	IN3PH0	0.93
MC5WI3	2.75	OH2OH9	1.82	IN3CH0	2.90
MC5WI5	3.86	OH4PH0	0.13	IN3TO0	1.40
MC5WI6	2.39	OH4CH0	3.76	IN3MC2	1.84
MC6PH0	3.53	OH4TO0	2.07	IN3MC3	1.96
MC6TO0	3.06	OH4AP0	0.50	IN3OH3	0.82
MC6MC2	2.59	OH4SE0	0.51	IN3OH9	1.35
MC6MC3	1.15	OH4DL0	2.54	IN3IN8	1.98
MC6OH3	2.04	OH4OH3	0.37	IN4NO0	0.80
MC7PH0	2.33	OH4OH9	0.51	IN4CH0	2.20
MC7CH0	3.06	OH4IN8	1.78	IN4TO0	2.30
MC7TO0	2.31	OH5PH0	0.53	IN4NE0	0.07
MC7MC2	0.82	OH5TO0	2.59	IN4AP0	1.73
MC7MC3	1.02	OH5AP0	0.90	IN4SE0	1.09
MC7WI3	2.37	OH5SE0	0.91	IN4DL0	2.27
MC7WI5	3.19	OH5DL0	2.66	IN4MO6	1.43
MC7WI6	1.81	OH5OH3	1.06	IN5PH0	0.42
MC8PH0	2.73	OH5IN8	2.65	IN5NO0	0.67
MC8CH0	3.42	OH7TO0	5.29	IN5CH0	2.63
MC8TO0	2.75	OH7NE0	2.85	IN5TO0	2.45
MC8MC2	1.16	OH7AP0	0.0	IN5NE0	0.29
MC8MC3	1.37	OH7DL0	1.75	IN5SE0	0.0
MC8OH3	1.35	OH7OH3	3.49	IN5DL0	1.87
MC8WI5	4.08	OH7OH9	3.15	IN5OH9	1.21
MC8WI6	2.66	OH7IN8	4.30	IN5IN8	0.03
MC9PH0	1.93	OH8PH0	0.73	IN6PH0	0.73
MC9CH0	4.64	OH8TO0	2.88	IN6NO0	3.78
MC9TO0	1.40	OH8NE0	0.40	IN6CH0	2.99
MC9MC2	2.19	OH8SE0	0.01	IN6TO0	2.54
MC9MC3	2.28	OH8DL0	1.76	IN6SE0	0.01
MC9OH3	1.16	OH8OH3	0.51	IN6DL0	1.76
MC9OH9	2.33	OH8OH9	0.14	IN6OH3	0.93
OH1PH0	1.13	OH8IN8	1.76	IN6OH9	1.06
OH1CH0	3.51	IN1PH0	0.13	IN6IN8	1.72
OH1TO0	1.24	IN1NO0	1.08	IN7PH0	1.67
OH1AP0	1.84	IN1TO0	2.70	IN7NO0	1.34
OH1SE0	1.85	IN1IN8	0.95	IN7CH0	4.60

Table 28. (Continued)

Coded route	Oppor. Cost	Coded route	Oppor. Cost	Coded route	Oppor. Cost
IN7NE0	2.54	IL2NE0	1.00	IL7NE0	2.18
IN7AP0	1.00	IL2SE0	0.60	IL7AP0	1.00
IN7DL0	1.18	IL2DL0	0.86	IL7DL0	1.29
IN7IN8	0.24	IL2WI3	2.40	IL7IN8	2.45
IN7MO6	2.65	IL2WI5	2.83	IL7MO5	3.18
IN9PH0	1.23	IL2WI6	2.10	IL7MO6	2.56
IN9NO0	1.44	IL2WI7	3.24	IL8NO0	2.48
IN9NE0	2.50	IL3PH0	3.03	IL8CH0	6.90
IN9SE0	0.01	IL3NO0	1.02	IL8NE0	3.90
IN9DL0	1.94	IL3NE0	0.90	IL8AP0	2.71
IN9IN8	1.16	IL3AP0	0.57	IL8DL0	2.74
IN9MO6	1.81	IL3SE0	0.57	IL8IN8	3.29
WI8NO0	1.59	IL3DL0	0.90	IL8MO5	3.66
WI8NE0	4.77	IL3WI7	3.65	IL8MO6	2.27
WI8MC2	0.27	IL3MO5	1.72	IL8MO8	1.85
WI8WI1	3.29	IL3MO6	0.73	IL9NO0	2.66
WI8WI2	0.57	IL4PH0	3.96	IL9CH0	9.42
WI8WI3	0.49	IL4NO0	0.81	IL9NE0	4.02
WI8WI4	1.23	IL4CH0	1.73	IL9AP0	2.21
WI8WI6	0.19	IL4NE0	1.33	IL9DL0	2.50
WI8WI7	0.20	IL4AP0	0.0	IL9IN8	3.72
WI9NO0	2.74	IL4DL0	0.68	IL9MO5	4.73
WI9NE0	5.26	IL4IN8	1.48	IL9MO6	3.85
WI9MC1	1.14	IL4WI7	3.54	IL9MO8	2.85
WI9MC2	0.95	IL4MO5	2.18	MN4PH0	4.26
WI9MC3	1.68	IL4MO6	1.06	MN4NO0	0.17
WI9WI2	2.13	IL5NO0	0.25	MN4GV0	1.50
WI9WI3	1.17	IL5CH0	0.93	MN4LA0	2.03
WI9WI4	3.17	IL5NE0	0.17	MN4SL0	2.03
WI9WI5	1.88	IL5AP0	0.93	MN4NE0	7.23
WI9WI7	3.23	IL5SE0	0.93	MN4MN1	0.75
IL1PH0	2.63	IL5DL0	1.19	MN5PH0	4.96
IL1NO0	0.81	IL5IN8	0.64	MN5NO0	0.28
IL1NE0	0.90	IL5WI7	3.35	MN5GV0	1.61
IL1AP0	0.42	IL5MO6	0.95	MN5LA0	4.03
IL1SE0	0.42	IL6PH0	3.05	MN5SL0	4.03
IL1DL0	0.78	IL6CH0	1.72	MN5NE0	7.93
IL1WI2	2.40	IL6NE0	1.02	MN5AP0	0.0
IL1WI3	1.82	IL6AP0	0.32	MN5WI1	1.64
IL1WI4	3.04	IL6SE0	0.32	MN5WI2	0.44
IL1WI5	2.43	IL6DL0	0.33	MN5WI4	0.47
IL1WI6	1.38	IL6IN8	1.16	MN5MN1	2.76
IL1WI7	2.69	IL6MO5	1.03	MN5MN2	2.45
IL2PH0	0.83	IL7CS0	1.49	MN7PH0	5.78
IL2NO0	0.79	IL7NO0	1.26	MN7NO0	2.49
IL2CH0	1.50	IL7CH0	4.68	MN7GV0	3.82

Table 28. (Continued)

Coded route	Oppor. Cost	Coded route	Oppor. Cost	Coded route	Oppor. Cost
MN7LA0	3.15	IA2DU0	0.67	IA7NO0	2.64
MN7SL0	3.15	IA2CH0	1.20	IA7GV0	3.97
MN7DU0	0.42	IA2AP0	2.50	IA7CH0	4.90
MN7NE0	8.55	IA2SE0	2.50	IA7AP0	1.34
MN7AP0	1.00	IA2DL0	2.10	IA7SE0	1.85
MN7WI1	1.54	IA2WI1	2.26	IA7MO5	1.65
MN7WI4	0.50	IA2WI2	0.65	IA8CS0	0.85
MN7NB2	2.19	IA2WI4	0.55	IA8NO0	0.95
MN8PH0	4.96	IA2WI5	1.31	IA8GV0	2.28
MN8NO0	0.45	IA2WI7	1.67	IA8CH0	1.37
MN8GV0	1.78	IA3NO0	0.75	IA8AP0	0.74
MN8LA0	4.03	IA3GV0	2.08	IA8SE0	0.74
MN8SL0	4.03	IA3CH0	0.83	IA8DL0	1.57
MN8NE0	7.73	IA3AP0	0.13	IA8WI7	1.85
MN8AP0	1.30	IA3SE0	0.13	IA9NO0	0.50
MN8SE0	1.30	IA3DL0	2.93	IA9GV0	1.83
MN8WI1	1.51	IA3WI1	2.11	IA9CH0	1.90
MN8WI2	0.43	IA3WI2	0.01	IA9SE0	0.0
MN8WI4	0.28	IA3WI4	0.21	IA9DL0	1.10
MN8WI7	1.39	IA3WI5	0.43	IA9WI7	2.51
MN9PH0	5.64	IA4PH0	4.53	IA9MO5	1.12
MN9CS0	0.15	IA4NO0	1.38	IA9MO6	0.68
MN9GV0	1.33	IA4DU0	2.27	MO1NO0	1.08
MN9LA0	6.61	IA4CH0	1.40	MO1GV0	2.41
MN9SL0	6.61	IA4NE0	1.00	MO1CH0	5.61
MN9DU0	0.38	IA4AP0	1.97	MO1NE0	9.71
MN9NE0	8.41	IA4SE0	2.08	MO1AP0	0.50
MN9AP0	0.04	IA5NO0	0.38	MO1SE0	0.50
MN9SE0	0.04	IA5GV0	0.45	MO1DL0	0.07
MN9WI1	1.79	IA5AP0	0.77	MO1MO5	0.0
MN9WI3	0.24	IA5SE0	0.77	MO1MO6	0.31
MN9WI5	0.86	IA5WI4	0.43	MO2NO0	1.93
MN9WI6	0.50	IA5WI7	0.36	MO2GV0	3.26
MN9WI7	0.91	IA6PH0	2.53	MO2CH0	5.85
IA1NO0	2.57	IA6NO0	0.80	MO2NE0	9.15
IA1GV0	3.90	IA6GV0	2.13	MO2AP0	1.69
IA1CH0	0.83	IA6DU0	3.27	MO2SE0	1.36
IA1NE0	0.03	IA6CH0	0.60	MO2DL0	1.47
IA1AP0	1.42	IA6AP0	0.24	MO2MO5	0.47
IA1SE0	1.53	IA6SE0	0.24	MO2MO6	0.56
IA1DL0	1.83	IA6DL0	3.10	MO2MO7	1.18
IA1WI4	0.39	IA6WI2	1.26	MO3CS0	0.70
IA2PH0	3.93	IA6WI4	1.45	MO3NO0	0.80
IA2CS0	2.24	IA6WI5	1.43	MO3GV0	2.13
IA2NO0	1.18	IA6WI6	0.91	MO3CH0	5.72
IA2GV0	1.25	IA6WI7	1.58	MO3NE0	8.02

Table 28. (Continued)

Coded route	Oppor. Cost	Coded route	Oppor. Cost	Coded route	Oppor. Cost
MO3SE0	0.01	SD3SE0	1.28	NB4SE0	5.63
MO3DL0	0.81	SD3SD1	1.06	NB4PF0	1.02
MO3MO5	0.41	SD6PH0	6.71	NB4SD4	4.09
MO3MO6	0.49	SD6GV0	1.33	NB4NB2	2.87
MO3MO8	0.10	SD6LA0	1.68	NB5PH0	9.83
MO4NO0	3.04	SD6SL0	1.68	NB5NO0	4.78
MO4GV0	4.37	SD6DU0	0.65	NB5GV0	4.85
MO4NE0	8.92	SD6NE0	9.38	NB5LA0	3.80
MO4AP0	2.35	SD6AP0	0.83	NB5SL0	3.80
MO4SE0	2.47	SD6SE0	0.83	NB5CH0	7.90
MO4DL0	0.35	SD6SD1	1.47	NB5NE0	11.50
MO4MO5	1.12	SD6SD4	1.24	NB5AP0	3.41
MO4MO6	1.57	SD6NB2	0.08	NB5SE0	3.41
MO4MO7	0.80	SD8SD1	3.09	NB5MT0	0.18
MO9CS0	1.95	SD8SD4	2.87	NB5NB2	1.70
MO9NO0	2.05	SD8NB2	0.41	NB6PH0	7.63
MO9GV0	3.38	SD9PH0	7.35	NB6NO0	1.48
MO9AP0	1.92	SD9NO0	1.06	NB6GV0	2.81
MO9SE0	2.71	SD9GV0	2.39	NB6LA0	3.80
MO9IN8	4.05	SD9LA0	1.72	NB6SL0	3.80
MO9MO5	4.20	SD9SL0	1.72	NB6CH0	5.70
MO9MO6	3.74	SD9DU0	1.39	NB6NE0	9.30
MO9MO8	1.82	SD9NE0	10.02	NB6AP0	0.45
ND9NE0	11.28	SD9SE0	0.0	NB6SE0	0.45
ND9AP0	4.83	SD9SD4	1.07	NB6MT0	0.18
ND9SE0	4.83	SD9NB2	0.18	NB6NB2	2.10
ND9MN2	0.49	NB3PH0	8.63	NB7PH0	11.25
ND9SD1	1.05	NB3NO0	2.72	NB7NO0	4.95
ND9SD4	1.67	NB3GV0	4.05	NB7GV0	6.28
SD2PH0	6.65	NB3LA0	3.80	NB7LA0	4.82
SD2NO0	6.90	NB3SL0	3.80	NB7SL0	4.82
SD2GV0	6.97	NB3CH0	6.70	NB7CH0	9.32
SD2LA0	1.22	NB3NE0	10.30	NB7NE0	12.92
SD2SL0	1.22	NB3AP0	1.85	NB7AP0	4.83
SD2DU0	2.39	NB3SE0	1.85	NB7SE0	4.83
SD2NE0	11.22	NB3DL0	0.10	NB7DL0	0.62
SD2AP0	2.77	NB3MT0	0.18	NB7PF0	1.02
SD2SE0	2.77	NB3NB2	1.70	NB7NB1	1.07
SD3PH0	5.16	NB4PH0	12.05	NB7NB2	3.21
SD3NO0	5.41	NB4NO0	6.90	NB8PH0	10.03
SD3GV0	5.48	NB4GV0	6.97	NB8NO0	3.81
SD3LA0	1.53	NB4LA0	4.82	NB8GV0	5.14
SD3SL0	1.53	NB4SL0	4.82	NB8LA0	5.80
SD3DU0	0.10	NB4CH0	10.12	NB8SL0	5.80
SD3NE0	9.73	NB4NE0	13.72	NB8CH0	8.10
SD3AP0	1.28	NB4AP0	5.63	NB8NE0	11.70

Table 28. (Continued)

Coded route	Oppor. Cost	Coded route	Oppor. Cost	Coded route	Oppor. Cost
NB8AP0	2.77	KA5GV0	2.85	KA9PF0	3.40
NB8SE0	2.77	KA5NE0	12.60	KA9MT0	8.58
NB8PF0	2.00	KA5AP0	4.09	KA9MO5	3.04
NB8MT0	2.18	KA5SE0	4.09	KA9MO7	1.41
NB8NB2	4.81	KA5PF0	0.90	KA9MO8	1.36
KA1PH0	13.25	KA5MT0	3.88	DU0MX01	17.32
KA1NO0	5.40	KA6PH0	11.03	DU0MX02	1.90
KA1GV0	5.47	KA6CS0	3.00	DU0PA01	16.23
KA1NE0	14.52	KA6NO0	3.72	DU0PA02	1.17
KA1AP0	6.01	KA6GV0	5.05	DU0JM01	15.13
KA1SE0	6.01	KA6LA0	5.40	DU0JM02	0.86
KA1DL0	3.22	KA6SL0	5.40	DU0TR01	15.04
KA1PF0	1.02	KA6NE0	12.30	DU0TR02	0.49
KA1NB1	0.98	KA6AP0	2.82	DU0VZ01	15.36
KA1NB2	3.85	KA6SE0	2.82	DU0VZ02	0.77
KA2PH0	11.73	KA6PF0	3.40	DU0BZ01	19.32
KA2NO0	2.18	KA6MT0	8.38	DU0BZ02	0.97
KA2GV0	2.25	KA6MO5	2.78	DU0UR01	21.22
KA2NE0	12.60	KA6MO7	2.25	DU0UR02	1.32
KA2AP0	4.09	KA6MO8	1.55	DU0PU01	18.71
KA2SE0	4.09	KA7PH0	11.23	DU0PU02	1.49
KA2PF0	1.50	KA7NO0	2.38	DU0CL01	20.30
KA2MT0	1.48	KA7GV0	2.45	DU0CL02	1.63
KA2NB2	4.27	KA7NE0	12.50	DU0SW01	14.32
KA3PH0	12.73	KA7AP0	3.99	DU0SW02	0.0
KA3NO0	3.27	KA7SE0	3.99	DU0NW01	14.38
KA3GV0	4.60	KA7DL0	0.20	DU0NW02	0.01
KA3NE0	12.40	KA7MT0	2.58	DU0FN01	15.54
KA3AP0	2.74	KA8PH0	11.33	DU0FN02	0.01
KA3SE0	2.74	KA8NO0	2.58	DU0DN01	14.50
KA3PF0	2.90	KA8GV0	2.65	DU0DN02	0.02
KA3MT0	7.88	KA8LA0	1.90	DU0UK01	13.15
KA3MO5	2.68	KA8SL0	1.90	DU0IR01	12.88
KA3MO7	1.88	KA8NE0	13.40	DU0NH01	12.57
KA4PH0	12.23	KA8AP0	4.09	DU0NH02	0.01
KA4NO0	3.48	KA8SE0	4.09	DU0BL01	12.57
KA4GV0	3.55	KA8PF0	0.90	DU0BL02	0.01
KA4LA0	0.0	KA8MT0	5.08	DU0FR01	14.62
KA4SL0	0.0	KA9PH0	12.03	DU0FR02	0.01
KA4NE0	13.50	KA9NO0	5.22	DU0WG01	12.97
KA4AP0	4.99	KA9GV0	6.55	DU0WG02	0.0
KA4SE0	4.99	KA9LA0	4.40	DU0EG01	14.67
KA4DL0	1.90	KA9SL0	4.40	DU0PO01	16.61
KA4MT0	2.18	KA9NE0	13.30	DU0PO02	0.0
KA5PH0	11.33	KA9AP0	4.69	DU0SI01	15.89
KA5NO0	2.78	KA9SE0	4.69	DU0PG01	14.60

Table 28. (Continued)

Coded route	Oppor. Cost	Coded route	Oppor. Cost	Coded route	Oppor. Cost
DUOPG02	0.01	CHOVZ01	15.23	CHOPK01	32.96
DUOIT01	16.53	CHOVZ02	0.75	CHOPK02	3.21
DUOIT02	0.12	CHOBZ01	19.20	CHOVN01	36.99
DUOTK01	18.39	CHOBZ02	0.96	CHOVN02	4.73
DUOTK02	0.48	CHOUR01	21.08	CHOPP01	35.59
DUOMR01	16.57	CHOUR02	1.31	CHOPP02	4.51
DUOMR02	0.01	CHOPU01	18.57	CHOHK01	35.30
DUOTU01	17.86	CHOPU02	1.48	CHOHK02	4.46
DUOTU02	0.01	CHOCL01	21.01	CHOJP01	30.67
DUOUA01	18.34	CHOCL02	1.93	CHOJP02	3.73
DUOUA02	0.47	CHOSW01	14.19	CHOCN01	8.33
DUOIS01	18.59	CHONW01	14.24	CHOCN02	0.0
DUOIS02	0.50	CHOFN01	15.41	CHOAG01	20.54
DUOSN01	17.43	CHODN01	14.37	CHOAU01	28.99
DUOSN02	0.27	CHOUK01	13.01	CHOAU02	3.58
DUONG01	19.69	CHOIR01	12.74	TOOMX01	16.33
DUONG02	0.01	CHOIR02	0.0	TOOMX02	1.90
DUOSA01	22.45	CHONH01	12.44	TOOPA01	15.23
DUOSA02	1.38	CHOBL01	12.44	TOOPA02	1.16
DUOKN01	28.95	CHOFR01	14.49	TOOJM01	14.14
DUOKN02	2.44	CHOWG01	12.84	TOOJM02	0.85
DUOID01	32.96	CHOEG01	14.55	TOOTR01	14.04
DUOID02	3.18	CHOEG02	0.0	TOOTR02	0.48
DUOPK01	33.09	CHOPO01	16.48	TOOVZ01	14.36
DUOPK02	3.22	CHOSI01	15.75	TOOVZ02	0.76
DUOVN01	37.12	CHOSI02	0.0	TOOBZ01	18.33
DUOVN02	4.74	CHOPG01	14.47	TOOBZ02	0.97
DUOPP01	35.72	CHOIT01	16.39	TOOUR01	20.22
DUOPP02	4.51	CHOIT02	0.11	TOOUR02	1.32
DUOHK01	35.43	CHOTK01	18.25	TOOPU01	17.71
DUOHK02	4.46	CHOTK02	0.47	TOOPU02	1.48
DUOJP01	30.80	CHOMR01	16.43	TOOCL01	20.14
DUOJP02	3.73	CHOTU01	17.73	TOOCL02	1.94
DUOCN01	8.45	CHOUA01	18.22	TOOSW01	13.33
DUOAG01	20.67	CHOUA02	0.46	TOOSW02	0.0
DUOAG02	0.01	CHOIS01	18.46	TOONW01	13.38
DUOAU01	29.13	CHOIS02	0.49	TOONW02	0.01
DUOAU02	3.58	CHOSN01	17.29	TOOFN01	14.54
CHOMX01	17.19	CHOSN02	0.26	TOOFN02	0.0
CHOMX02	1.89	CHONG01	19.56	TOODN01	13.51
CHOPA01	16.09	CHOSA01	22.33	TOODN02	0.01
CHOPA02	1.16	CHOSA02	1.37	TOOUK01	12.15
CHOJM01	15.00	CHOKN01	28.81	TOOUK02	0.0
CHOJM02	0.85	CHOKN02	2.43	TOOIR01	11.88
CHOTR01	14.91	CHOID01	32.82	TOOIR02	0.0
CHOTR02	0.48	CHOID02	3.18	TOONH01	11.58

Table 28. (Continued)

Coded route	Oppor. Cost	Coded route	Oppor. Cost	Coded route	Oppor. Cost
TOONH02	0.0	TOOCN01	7.46	PHONW01	15.01
TOOBL01	11.57	TOOCN02	0.0	PHONW02	2.34
TOOFR01	13.62	TOOAG01	19.68	PHONW03	9.30
TOOFR02	0.0	TOOAG02	0.0	PHONW04	0.35
TOOWG01	11.97	TOOAU01	28.13	PHOFN01	16.16
TOOWG02	0.0	TOOAU02	3.58	PHOFN02	2.33
TOOEG01	13.68	PHOMX01	12.83	PHOFN03	9.72
TOOEG02	0.0	PHOMX02	2.31	PHOFN04	0.08
TOOPO01	15.62	PHOMX03	8.98	PHODN01	15.61
TOOPO02	0.0	PHOMX04	1.01	PHODN02	2.52
TOOSI01	14.89	PHOPA01	12.59	PHODN03	9.64
TOOSI02	0.0	PHOPA02	1.90	PHODN04	0.44
TOOPG01	13.61	PHOPA03	8.63	PHOUK01	13.19
TOOPG02	0.0	PHOPA04	0.58	PHOUK02	2.11
TOOIT01	15.53	PHOJM01	11.49	PHOUK03	8.50
TOOIT02	0.11	PHOJM02	1.58	PHOUK04	0.50
TOOTK01	17.39	PHOJM03	8.04	PHOIR01	13.62
TOOTK02	0.47	PHOJM04	0.44	PHOIR02	2.37
TOOMR01	15.57	PHOTR01	12.18	PHOIR03	8.82
TOOMR02	0.01	PHOTR02	1.50	PHOIR04	0.73
TOOTU01	16.87	PHOTR03	8.23	PHONH01	13.03
TOOTU02	0.0	PHOTR04	0.18	PHONH02	2.27
TOOUA01	17.35	PHOVZ01	12.19	PHONH03	8.06
TOOUA02	0.46	PHOVZ02	1.66	PHONH04	0.54
TOOIS01	17.59	PHOVZ03	8.34	PHOBL01	12.56
TOOIS02	0.50	PHOVZ04	0.37	PHOBL02	2.09
TOOSN01	16.43	PHOBZ01	17.56	PHOBL03	7.79
TOOSN02	0.26	PHOBZ02	2.40	PHOBL04	0.44
TOONG01	18.70	PHOBZ03	10.74	PHOFR01	14.41
TOONG02	0.0	PHOBZ04	0.05	PHOFR02	2.02
TOOSA01	21.46	PHOUR01	19.45	PHOFR03	8.88
TOOSA02	1.37	PHOUR02	2.75	PHOFR04	0.10
TOOKN01	27.95	PHOUR03	11.66	PHOWG01	12.98
TOOKN02	2.43	PHOUR04	0.04	PHOWG02	2.09
TOOID01	31.96	PHOPU01	15.91	PHOWG03	7.94
TOOID02	3.17	PHOPU02	2.52	PHOWG04	0.34
TOOPK01	32.09	PHOPU03	10.23	PHOEG01	14.68
TOOPK02	3.21	PHOPU04	0.58	PHOEG02	2.09
TOOVN01	36.13	PHOCL01	18.34	PHOPO01	17.24
TOOVN02	4.73	PHOCL02	2.98	PHOPO02	2.32
TOOPP01	34.73	PHOCL03	11.40	PHOPO03	10.59
TOOPP02	4.51	PHOCL04	0.59	PHOPO04	0.03
TOOHK01	34.41	PHOSW01	14.95	PHOSI01	15.67
TOOHK02	4.45	PHOSW02	2.33	PHOSI02	2.01
TOOJP01	29.80	PHOSW03	9.28	PHOSI03	9.82
TOOJP02	3.73	PHOSW04	0.36	PHOPG01	14.71

Table 28. (Continued)

Coded route	Oppor. Cost	Coded route	Oppor. Cost	Coded route	Oppor. Cost
PHOPG02	2.14	PHOHK01	32.92	CSOPU01	17.85
PHOPG03	9.55	PHOHK02	5.61	CSOPU02	5.07
PHOPG04	0.38	PHOHK03	18.84	CSOPU03	12.56
PHOIT01	16.32	PHOHK04	0.65	CSOPU04	3.26
PHOIT02	2.13	PHOJP01	28.02	CSOCL01	20.28
PHOIT03	10.13	PHOJP02	4.77	CSOCL02	5.52
PHOTK01	18.13	PHOJP03	16.05	CSOCL03	13.73
PHOTK02	2.47	PHOJP04	0.56	CSOCL04	3.27
PHOTK03	11.00	PHOCN01	13.15	CSOSW01	18.60
PHOMR01	16.21	PHOCN02	3.85	CSOSW02	5.51
PHOMR02	1.97	PHOCN03	9.60	CSOSW03	12.62
PHOMR03	10.47	PHOCN04	2.64	CSOSW04	3.43
PHOMR04	0.02	PHOAG01	19.65	CSONW01	18.71
PHOTU01	17.71	PHOAG02	1.71	CSONW02	5.53
PHOTU02	2.04	PHOAU01	26.34	CSONW03	12.68
PHOUA01	18.10	PHOAU02	4.63	CSONW04	3.44
PHOUA02	2.46	PHOAU03	14.87	CSOFN01	19.55
PHOUA03	10.98	PHOAU04	0.57	CSOFN02	5.41
PHOIS01	18.39	CSOMX01	14.61	CSOFN03	12.91
PHOIS02	2.51	CSOMX02	4.79	CSOFN04	3.10
PHOIS03	11.12	CSOMX03	11.21	CSODN01	18.77
PHOSN01	16.49	CSOMX04	3.65	CSODN02	5.51
PHOSN02	2.00	CSOPA01	14.54	CSODN03	12.69
PHOSN03	10.59	CSOPA02	4.44	CSODN04	3.41
PHONG01	18.67	CSOPA03	10.96	CSOUK01	17.01
PHONG02	1.71	CSOPA04	3.25	CSOUK02	5.36
PHOSA01	21.43	CSOJM01	13.45	CSOUK03	11.96
PHOSA02	3.09	CSOJM02	4.13	CSOUK04	3.61
PHOSA03	12.59	CSOJM03	10.37	CSOIR01	17.16
PHOKN01	27.92	CSOJM04	3.12	CSOIR02	5.51
PHOKN02	4.14	CSOTR01	14.44	CSOIR03	12.11
PHOKN03	16.09	CSOTR02	4.17	CSOIR04	3.77
PHOID01	31.93	CSOTR03	10.75	CSONH01	16.40
PHOID02	4.89	CSOTR04	2.93	CSONH02	5.35
PHOID03	18.02	CSOVZ01	14.65	CSONH03	11.25
PHOPK01	32.06	CSOVZ02	4.40	CSONH04	3.55
PHOPK02	4.91	CSOVZ03	10.97	CSOBL01	16.37
PHOPK03	18.08	CSOVZ04	3.17	CSOBL02	5.34
PHOVN01	34.51	CSOBZ01	20.17	CSOBL03	11.23
PHOVN02	5.84	CSOBZ02	5.19	CSOBL04	3.54
PHOVN03	19.57	CSOBZ03	13.47	CSOFR01	18.00
PHOVN04	0.58	CSOBZ04	2.88	CSOFR02	5.17
PHOPP01	32.92	CSOUR01	22.11	CSOFR03	12.19
PHOPP02	5.55	CSOUR02	5.56	CSOFR04	3.16
PHOPP03	18.80	CSOUR03	14.41	CSOWG01	16.78
PHOPP04	0.58	CSOUR04	2.89	CSOWG02	5.33

Table 28. (Continued)

Coded route	Oppor. Cost	Coded route	Oppor. Cost	Coded route	Oppor. Cost
CS0WG03	11.38	CS0SA03	15.44	NO0PA03	7.57
CS0WG04	3.44	CS0SA04	2.88	NO0PA04	0.01
CS0EG01	18.49	CS0KN01	30.74	NO0JM01	10.45
CS0EG02	5.33	CS0KN02	7.01	NO0JM02	1.04
CS0PO01	20.88	CS0KN03	18.95	NO0JM03	7.31
CS0PO02	5.51	CS0KN04	2.88	NO0TR01	12.20
CS0PO03	13.94	CS0ID01	34.75	NO0TR02	1.36
CS0PO04	3.10	CS0ID02	7.75	NO0TR03	8.14
CS0SI01	19.25	CS0ID03	20.87	NO0VZ01	11.39
CS0SI02	5.17	CS0ID04	2.87	NO0VZ02	1.20
CS0SI03	13.13	CS0PK01	34.88	NO0VZ03	7.76
CS0SI04	3.07	CS0PK02	7.79	NO0VZ04	0.0
CS0PG01	18.17	CS0PK03	20.94	NO0BZ01	18.23
CS0PG02	5.25	CS0PK04	2.88	NO0BZ02	2.49
CS0PG03	12.78	CS0VN01	36.46	NO0BZ03	11.05
CS0PG04	3.41	CS0VN02	8.40	NO0UR01	20.11
CS0IT01	19.91	CS0VN03	21.90	NO0UR02	2.84
CS0IT02	5.28	CS0VN04	3.26	NO0UR03	11.96
CS0IT03	13.44	CS0PP01	34.87	NO0PU01	14.30
CS0IT04	3.05	CS0PP02	8.09	NO0PU02	1.76
CS0TK01	21.72	CS0PP03	21.13	NO0PU03	9.17
CS0TK02	5.63	CS0PP04	3.26	NO0PU04	0.01
CS0TK03	14.32	CS0HK01	34.89	NO0CL01	16.73
CS0TK04	3.06	CS0HK02	8.16	NO0CL02	2.22
CS0MR01	19.93	CS0HK03	21.18	NO0CL03	10.34
CS0MR02	5.17	CS0HK04	3.34	NO0CL04	0.03
CS0MR03	13.86	CS0JP01	30.01	NO0SW01	17.89
CS0MR04	3.11	CS0JP02	7.34	NO0SW02	3.27
CS0TU01	21.25	CS0JP03	18.41	NO0SW03	10.95
CS0TU02	5.18	CS0JP04	3.26	NO0SW04	0.85
CS0UA01	21.58	CS0CN01	16.87	NO0NW01	18.05
CS0UA02	5.58	CS0CN02	7.05	NO0NW02	3.32
CS0UA03	14.24	CS0CN03	12.99	NO0NW03	11.03
CS0UA04	3.03	CS0CN04	5.74	NO0NW04	0.87
CS0IS01	21.97	CS0AG01	22.75	NO0FN01	18.75
CS0IS02	5.67	CS0AG02	4.69	NO0FN02	3.14
CS0IS03	14.43	CS0AU01	28.31	NO0FN03	11.17
CS0IS04	3.06	CS0AU02	7.18	NO0FN04	0.49
CS0SN01	19.55	CS0AU03	17.21	NO0DN01	18.49
CS0SN02	4.96	CS0AU04	3.26	NO0DN02	3.44
CS0SN03	13.58	NO0MX01	9.96	NO0DN03	11.27
CS0SN04	2.94	NO0MX02	1.07	NO0DN04	0.92
CS0NG01	21.77	NO0MX03	7.16	NO0UK01	16.82
CS0NG02	4.69	NO0MX04	0.16	NO0UK02	3.32
CS0SA01	24.25	NO0PA01	10.99	NO0UK03	10.57
CS0SA02	5.95	NO0PA02	1.15	NO0UK04	1.15

Table 28. (Continued)

Coded route	Oppor. Cost	Coded route	Oppor. Cost	Coded route	Oppor. Cost
NO0IR01	16.40	NO0TU01	20.54	NO0CN01	16.48
NO0IR02	3.26	NO0TU02	2.95	NO0CN02	4.94
NO0IR03	10.40	NO0UA01	21.03	NO0CN03	11.50
NO0IR04	1.17	NO0UA02	3.41	NO0CN04	3.22
NO0NH01	16.04	NO0UA03	12.65	NO0AG01	21.30
NO0NH02	3.23	NO0UA04	0.48	NO0AG02	2.18
NO0NH03	9.77	NO0IS01	21.12	NO0AU01	26.14
NO0NH04	1.04	NO0IS02	3.38	NO0AU02	4.39
NO0BL01	15.90	NO0IS03	12.67	NO0AU03	14.64
NO0BL02	3.19	NO0IS04	0.43	NO0AU04	0.33
NO0BL03	9.69	NO0SN01	18.40	GV0MX01	8.68
NO0BL04	1.01	NO0SN02	2.56	GV0MX02	0.56
NO0FR01	17.18	NO0SN03	11.65	GV0MX03	6.84
NO0FR02	2.90	NO0SN04	0.25	GV0PA01	10.34
NO0FR03	10.45	NO0NG01	20.32	GV0PA02	0.87
NO0FR04	0.54	NO0NG02	2.18	GV0PA03	7.63
NO0WG01	16.22	NO0SA01	22.27	GV0JM01	9.89
NO0WG02	3.15	NO0SA02	3.25	GV0JM02	0.80
NO0WG03	9.79	NO0SA03	13.00	GV0JM03	7.41
NO0WG04	0.89	NO0SA04	0.0	GV0JM04	0.0
NO0EG01	17.92	NO0KN01	28.77	GV0TR01	11.77
NO0EG02	3.15	NO0KN02	4.30	GV0TR02	1.16
NO0PO01	19.83	NO0KN03	16.50	GV0TR03	8.33
NO0PO02	3.15	NO0KN04	0.0	GV0TR04	0.02
NO0PO03	12.05	NO0ID01	32.78	GV0VZ01	10.82
NO0PO04	0.44	NO0ID02	5.05	GV0VZ02	0.96
NO0SI01	18.57	NO0ID03	18.42	GV0VZ03	7.87
NO0SI02	2.94	NO0PK01	32.90	GV0BZ01	17.80
NO0SI03	11.46	NO0PK02	5.07	GV0BZ02	2.30
NO0SI04	0.49	NO0PK03	18.49	GV0BZ03	11.25
NO0PG01	17.44	NO0PK04	0.0	GV0BZ04	0.04
NO0PG02	3.00	NO0VN01	32.91	GV0UR01	20.05
NO0PG03	11.09	NO0VN02	5.09	GV0UR02	2.78
NO0PG04	0.81	NO0VN03	18.50	GV0UR03	12.36
NO0IT01	19.10	NO0VN04	0.02	GV0UR04	0.11
NO0IT02	3.01	NO0PP01	31.31	GV0PU01	13.67
NO0IT03	11.70	NO0PP02	4.80	GV0PU02	1.50
NO0IT04	0.45	NO0PP03	17.73	GV0PU03	9.23
NO0TK01	21.02	NO0PP04	0.02	GV0CL01	16.10
NO0TK02	3.40	NO0HK01	31.29	GV0CL02	1.96
NO0TK03	12.64	NO0HK02	4.84	GV0CL03	10.40
NO0TK04	0.47	NO0HK03	17.75	GV0SW01	17.06
NO0MR01	19.04	NO0HK04	0.08	GV0SW02	2.93
NO0MR02	2.87	NO0JP01	26.42	GV0SW03	10.89
NO0MR03	12.07	NO0JP02	4.02	GV0SW04	0.79
NO0MR04	0.49	NO0JP03	14.99	GV0NW01	16.86

Table 28. (Continued)

Coded route	Oppor. Cost	Coded route	Oppor. Cost	Coded route	Oppor. Cost
GV0NW02	2.85	GV0PG02	2.82	GV0PK04	0.03
GV0NW03	10.77	GV0PG03	11.29	GV0VN01	32.28
GV0NW04	0.72	GV0PG04	0.85	GV0VN02	4.83
GV0FN01	17.51	GV0IT01	18.78	GV0VN03	18.57
GV0FN02	2.65	GV0IT02	2.86	GV0PP01	30.67
GV0FN03	10.88	GV0IT03	11.96	GV0PP02	4.52
GV0FN04	0.33	GV0IT04	0.50	GV0PP03	17.80
GV0DN01	17.23	GV0TK01	20.56	GV0HK01	30.39
GV0DN02	2.94	GV0TK02	3.19	GV0HK02	4.48
GV0DN03	10.96	GV0TK03	12.81	GV0HK03	17.66
GV0DN04	0.75	GV0TK04	0.50	GV0JP01	25.84
GV0UK01	16.25	GV0MR01	18.69	GV0JP02	3.78
GV0UK02	3.07	GV0MR02	2.71	GV0JP03	15.09
GV0UK03	10.68	GV0MR03	12.31	GV0CN01	16.08
GV0UK04	1.14	GV0MR04	0.53	GV0CN02	4.76
GV0IR01	16.00	GV0TU01	20.12	GV0CN03	11.71
GV0IR02	3.08	GV0TU02	2.75	GV0CN04	3.26
GV0IR03	10.60	GV0UA01	20.61	GV0AG01	21.39
GV0IR04	1.21	GV0UA02	3.21	GV0AG02	2.18
GV0NH01	15.49	GV0UA03	12.84	GV0AU01	24.14
GV0NH02	3.00	GV0UA04	0.52	GV0AU02	3.62
GV0NH03	9.89	GV0IS01	20.77	GV0AU03	13.90
GV0NH04	1.05	GV0IS02	3.22	LA0MX01	25.69
GV0BL01	15.51	GV0IS03	12.91	LA0MX02	9.73
GV0BL02	3.01	GV0IS04	0.48	LA0MX03	18.85
GV0BL03	9.90	GV0SN01	17.99	LA0MX04	7.39
GV0BL04	1.05	GV0SN02	2.38	LA0PA01	21.80
GV0FR01	16.87	GV0SN03	11.84	LA0PA02	7.97
GV0FR02	2.75	GV0SN04	0.29	LA0PA03	16.31
GV0FR03	10.71	GV0NG01	20.41	LA0PA04	6.11
GV0FR04	0.61	GV0NG02	2.18	LA0JM01	23.31
GV0WG01	15.90	GV0SA01	21.83	LA0JM02	8.63
GV0WG02	3.00	GV0SA02	3.05	LA0JM03	17.28
GV0WG03	10.05	GV0SA03	13.18	LA0JM04	6.57
GV0WG04	0.95	GV0SA04	0.03	LA0TR01	24.28
GV0EG01	17.61	GV0KN01	28.32	LA0TR02	8.66
GV0EG02	3.00	GV0KN02	4.11	LA0TR03	17.65
GV0PO01	19.43	GV0KN03	16.68	LA0TR04	6.38
GV0PO02	2.96	GV0KN04	0.03	LA0VZ01	23.74
GV0PO03	12.25	GV0ID01	32.34	LA0VZ02	8.60
GV0PO04	0.48	GV0ID02	4.85	LA0VZ03	17.42
GV0SI01	18.14	GV0ID03	18.61	LA0VZ04	6.44
GV0SI02	2.76	GV0ID04	0.02	LA0VZ05	13.20
GV0SI03	11.66	GV0PK01	32.46	LA0VZ06	5.02
GV0SI04	0.52	GV0PK02	4.88	LA0BZ01	30.51
GV0PG01	17.03	GV0PK03	18.67	LA0BZ02	9.87

Table 28. (Continued)

Coded route	Oppor. Cost	Coded route	Oppor. Cost	Coded route	Oppor. Cost
LA0BZ03	20.68	LA0NH03	20.39	LA0TK05	15.87
LA0BZ04	6.44	LA0NH04	7.85	LA0TK06	4.65
LA0BZ05	14.45	LA0NH05	14.27	LA0MR01	32.68
LA0BZ06	4.25	LA0NH06	5.66	LA0MR02	10.75
LA0UR01	31.27	LA0BL01	29.71	LA0MR03	22.51
LA0UR02	9.80	LA0BL02	11.13	LA0MR04	7.23
LA0UR03	20.90	LA0BL03	20.24	LA0MR05	15.97
LA0UR04	6.17	LA0BL04	7.79	LA0MR06	4.95
LA0PU01	21.67	LA0BL05	14.17	LA0TU01	34.22
LA0PU02	7.30	LA0BL06	5.61	LA0TU02	10.85
LA0PU03	15.84	LA0FR01	30.99	LA0UA01	34.63
LA0PU04	5.32	LA0FR02	10.83	LA0UA02	11.27
LA0CL01	23.83	LA0FR03	20.99	LA0UA03	23.07
LA0CL02	7.66	LA0FR04	7.33	LA0UA04	7.22
LA0CL03	16.85	LA0WG01	30.38	LA0IS01	34.77
LA0CL04	5.26	LA0WG02	11.23	LA0IS02	11.27
LA0CL05	12.25	LA0WG03	20.54	LA0IS03	23.12
LA0CL06	3.68	LA0WG04	7.76	LA0IS04	7.18
LA0SW01	31.65	LA0WG05	14.27	LA0IS05	15.84
LA0SW02	11.20	LA0WG06	5.50	LA0IS06	4.60
LA0SW03	21.46	LA0EG01	32.08	LA0SN01	31.22
LA0SW04	7.62	LA0EG02	11.23	LA0SN02	10.14
LA0NW01	31.04	LA0PO01	34.39	LA0SN03	21.59
LA0NW02	10.96	LA0PO02	11.37	LA0SN04	6.80
LA0NW03	21.08	LA0PO03	23.04	LA0NG01	32.74
LA0NW04	7.46	LA0PO04	7.39	LA0NG02	9.61
LA0FN01	32.04	LA0SI01	32.26	LA0SA01	29.41
LA0FN02	10.89	LA0SI02	10.84	LA0SA02	8.69
LA0FN03	21.40	LA0SI03	21.93	LA0SA03	19.53
LA0FN04	7.15	LA0SI04	7.24	LA0SA04	5.24
LA0DN01	31.81	LA0PG01	31.37	LA0SA05	13.27
LA0DN02	11.20	LA0PG02	11.00	LA0SA06	3.05
LA0DN03	21.51	LA0PG03	21.71	LA0KN01	39.49
LA0DN04	7.59	LA0PG04	7.63	LA0KN02	11.09
LA0UK01	30.88	LA0PG05	15.58	LA0KN03	25.19
LA0UK02	11.35	LA0PG06	5.48	LA0KN04	6.07
LA0UK03	21.28	LA0IT01	32.89	LA0ID01	34.86
LA0UK04	7.98	LA0IT02	10.95	LA0ID02	8.60
LA0UK05	15.30	LA0IT03	22.23	LA0ID03	21.93
LA0UK06	5.87	LA0IT04	7.22	LA0ID04	4.07
LA0IR01	30.80	LA0IT05	15.52	LA0PK01	35.93
LA0IR02	11.42	LA0IT06	4.86	LA0PK02	8.98
LA0IR03	21.30	LA0TK01	34.72	LA0PK03	22.55
LA0IR04	8.09	LA0TK02	11.30	LA0PK04	4.30
LA0NH01	29.97	LA0TK03	23.11	LA0VN01	26.32
LA0NH02	11.23	LA0TK04	7.23	LA0VN02	5.39

Table 28. (Continued)

Coded route	Oppor. Cost	Coded route	Oppor. Cost	Coded route	Oppor. Cost
LA0VN03	16.79	SL0VZ03	17.65	SL0IR01	31.95
LA0VN04	2.10	SL0VZ04	6.56	SL0IR02	11.88
LA0PP01	25.94	SL0VZ05	12.75	SL0IR03	21.52
LA0PP02	5.55	SL0VZ06	4.84	SL0IR04	8.21
LA0PP03	16.75	SL0BZ01	31.65	SL0NH01	31.11
LA0PP04	2.37	SL0BZ02	10.32	SL0NH02	11.69
LA0HK01	24.82	SL0BZ03	20.90	SL0NH03	20.62
LA0HK02	5.19	SL0BZ04	6.55	SL0NH04	7.96
LA0HK03	16.12	SL0BZ05	13.98	SL0NH05	13.81
LA0HK04	2.20	SL0BZ06	4.07	SL0NH06	5.48
LA0JP01	22.02	SL0UR01	31.49	SL0BL01	30.88
LA0JP02	5.15	SL0UR02	9.90	SL0BL02	11.60
LA0JP03	14.59	SL0UR03	20.58	SL0BL03	20.48
LA0JP04	2.59	SL0UR04	6.07	SL0BL04	7.91
LA0JP05	9.75	SL0PU01	22.85	SL0BL05	13.72
LA0JP06	0.92	SL0PU02	7.77	SL0BL06	5.44
LA0CN01	29.03	SL0PU03	16.09	SL0FR01	32.13
LA0CN02	12.42	SL0PU04	5.43	SL0FR02	11.29
LA0CN03	21.29	SL0CL01	25.00	SL0FR03	21.22
LA0CN04	9.72	SL0CL02	8.12	SL0FR04	7.43
LA0AG01	33.72	SL0CL03	17.10	SL0WG01	31.52
LA0AG02	9.60	SL0CL04	5.37	SL0WG02	11.69
LA0AU01	23.29	SL0CL05	11.80	SL0WG03	20.77
LA0AU02	6.11	SL0CL06	3.52	SL0WG04	7.86
LA0AU03	15.19	SL0SW01	32.80	SL0WG05	13.80
LA0AU04	3.28	SL0SW02	11.66	SL0WG06	5.33
LA0AU05	10.06	SL0SW03	21.68	SL0EG01	34.22
LA0AU06	1.48	SL0SW04	7.73	SL0EG02	12.06
SL0MX01	26.86	SL0NW01	32.31	SL0PO01	35.09
SL0MX02	10.20	SL0NW02	11.46	SL0PO02	11.66
SL0MX03	19.09	SL0NW03	21.39	SL0PO03	23.00
SL0MX04	7.50	SL0NW04	7.60	SL0PO04	7.40
SL0PA01	22.93	SL0FN01	33.18	SL0SI01	33.42
SL0PA02	8.42	SL0FN02	11.35	SL0SI02	11.32
SL0PA03	16.54	SL0FN03	21.63	SL0SI03	22.18
SL0PA04	6.22	SL0FN04	7.26	SL0SI04	7.36
SL0JM01	24.46	SL0DN01	32.98	SL0PG01	32.51
SL0JM02	9.08	SL0DN02	11.67	SL0PG02	11.45
SL0JM03	17.51	SL0DN03	21.75	SL0PG03	21.93
SL0JM04	6.68	SL0DN04	7.70	SL0PG04	7.74
SL0TR01	25.42	SL0UK01	32.02	SL0PG05	15.11
SL0TR02	9.11	SL0UK02	11.80	SL0PG06	5.31
SL0TR03	17.88	SL0UK03	21.50	SL0IT01	34.03
SL0TR04	6.49	SL0UK04	8.10	SL0IT02	11.41
SL0VZ01	24.89	SL0UK05	14.84	SL0IT03	22.45
SL0VZ02	9.06	SL0UK06	5.69	SL0IT04	7.34

Table 28. (Continued)

Coded route	Oppor. Cost	Coded route	Oppor. Cost
SL0IT05	15.07	SL0PK01	32.35
SL0IT06	4.69	SL0PK02	7.67
SL0TK01	35.90	SL0PK03	19.95
SL0TK02	11.77	SL0PK04	3.32
SL0TK03	23.36	SL0VN01	24.62
SL0TK04	7.35	SL0VN02	4.79
SL0TK05	15.42	SL0VN03	15.31
SL0TK06	4.49	SL0VN04	1.56
SL0MR01	33.82	SL0PP01	22.95
SL0MR02	11.21	SL0PP02	4.46
SL0MR03	22.74	SL0PP03	14.49
SL0MR04	7.33	SL0PP04	1.54
SL0MR05	15.50	SL0HK01	22.54
SL0MR06	4.77	SL0HK02	4.37
SL0TU01	35.37	SL0HK03	14.29
SL0TU02	11.30	SL0HK04	1.51
SL0UA01	35.53	SL0JP01	17.92
SL0UA02	11.64	SL0JP02	3.64
SL0UA03	23.15	SL0JP03	11.67
SL0UA04	7.27	SL0JP04	1.49
SL0IS01	35.94	SL0JP05	7.33
SL0IS02	11.74	SL0CN01	30.52
SL0IS03	23.36	SL0CN02	13.00
SL0IS04	7.30	SL0CN03	21.72
SL0IS05	15.39	SL0CN04	9.91
SL0IS06	4.43	SL0AG01	34.82
SL0SN01	32.37	SL0AG02	10.04
SL0SN02	10.60	SL0AU01	22.41
SL0SN03	21.82	SL0AU02	5.80
SL0SN04	6.92	SL0AU03	14.20
SL0NG01	33.84	SL0AU04	2.92
SL0NG02	10.04	SL0AU05	8.85
SL0SA01	35.57	SL0AU06	1.02
SL0SA02	11.03		
SL0SA03	22.77		
SL0SA04	6.51		
SL0SA05	14.68		
SL0SA06	3.59		
SL0KN01	37.18		
SL0KN02	10.25		
SL0KN03	23.34		
SL0KN04	5.38		
SL0ID01	31.31		
SL0ID02	7.30		
SL0ID03	19.33		
SL0ID04	3.10		

Table 29. Opportunity Cost: model I, objective function 2

Coded route	Oppor. Cost	Coded route	Oppor. Cost	Coded route	Oppor. Cost
SP0LA0	4.08	OH1SE0	2.90	IN1IN8	1.61
SP0SL0	11.96	OH1MC2	2.89	IN1WI6	2.78
SP0SE0	3.48	OH1MC3	2.23	IN1WI7	4.53
SP0DL0	0.75	OH1OH3	0.48	IN2PH0	0.41
SP0PF0	5.22	OH1OH9	0.96	IN2NO0	4.22
SP0MT0	6.48	OH1IN8	3.98	IN2CH0	2.36
MC5PH0	1.12	OH2PH0	0.39	IN2TO0	2.03
MC5CH0	4.12	OH2TO0	2.96	IN2MC2	1.86
MC5TO0	3.11	OH2AP0	1.64	IN2IN8	2.50
MC5MC1	2.74	OH2SE0	4.00	IN2WI6	3.48
MC5MC2	0.64	OH2MC3	3.53	IN3PH0	0.39
MC5WI3	4.21	OH2OH9	1.60	IN3CH0	3.13
MC5WI5	4.91	OH4PH0	0.14	IN3TO0	2.52
MC5WI6	3.85	OH4CH0	4.38	IN3MC2	2.47
MC6PH0	1.18	OH4TO0	2.69	IN3MC3	1.95
MC6TO0	3.33	OH4AP0	0.34	IN3OH3	0.45
MC6MC2	3.26	OH4SE0	1.92	IN3OH9	0.76
MC6MC3	1.18	OH4DL0	6.11	IN3IN8	3.08
MC6OH3	1.71	OH4OH3	0.39	IN4PH0	0.35
MC7PH0	0.78	OH4OH9	0.31	IN4NO0	3.19
MC7CH0	3.03	OH4IN8	3.27	IN4CH0	2.19
MC7TO0	2.28	OH5TO0	3.41	IN4TO0	2.29
MC7MC2	1.19	OH5AP0	0.30	IN4NE0	-0.16
MC7MC3	0.75	OH5SE0	2.37	IN4SE0	0.45
MC7WI3	3.56	OH5DL0	7.19	IN4DL0	3.15
MC7WI5	3.97	OH5OH3	1.28	IN4IN8	0.86
MC7WI6	3.00	OH5IN8	4.34	IN4MO6	3.31
MC8PH0	0.83	OH7TO0	3.61	IN5PH0	0.40
MC8CH0	3.61	OH7NE0	0.70	IN5NO0	3.67
MC8TO0	2.94	OH7SE0	1.17	IN5CH0	2.73
MC8MC2	1.75	OH7DL0	5.58	IN5TO0	2.55
MC8MC3	1.32	OH7OH3	1.21	IN5NE0	0.29
MC8OH3	0.94	OH7OH9	0.65	IN5SE0	0.65
MC8WI5	5.08	OH7IN8	3.49	IN5DL0	3.87
MC8WI6	4.07	OH8PH0	0.62	IN5OH9	0.49
MC9PH0	0.71	OH8TO0	4.76	IN5IN8	1.00
MC9CH0	4.89	OH8NE0	0.94	IN6PH0	0.16
MC9TO0	1.65	OH8SE0	1.86	IN6NO0	3.42
MC9MC2	2.84	OH8DL0	7.16	IN6CH0	3.04
MC9MC3	2.29	OH8OH3	1.79	IN6TO0	2.27
MC9OH3	0.81	OH8OH9	1.20	IN6AP0	0.06
MC9OH9	1.76	OH8IN8	4.51	IN6SE0	1.11
OH1PH0	0.44	IN1PH0	0.40	IN6DL0	4.68
OH1CH0	4.06	IN1NO0	2.60	IN6OH3	0.38
OH1TO0	1.79	IN1CH0	0.74	IN6OH9	0.29
OH1AP0	1.20	IN1TO0	2.02	IN6IN8	2.64

Table 29. (Continued)

Coded route	Oppor. Cost	Coded route	Oppor. Cost	Coded route	Oppor. Cost
IN7PH0	1.23	IL2NE0	0.44	IL7AP0	0.37
IN7NO0	1.70	IL2AP0	1.20	IL7DL0	1.68
IN7CH0	3.49	IL2SE0	1.68	IL7IN8	1.50
IN7NE0	1.32	IL2DL0	3.37	IL7MO5	2.78
IN7AP0	0.17	IL2WI3	2.44	IL7MO6	2.63
IN7DL0	2.77	IL2WI5	2.46	IL8NO0	1.36
IN7MO6	3.43	IL2WI6	2.14	IL8CH0	3.63
IN9PH0	2.05	IL2WI7	3.28	IL8NE0	2.33
IN9NO0	1.01	IL3PH0	0.81	IL8AP0	0.95
IN9NE0	2.22	IL3CH0	0.58	IL8DL0	0.99
IN9AP0	0.68	IL3NE0	0.44	IL8IN8	1.61
IN9DL0	2.31	IL3AP0	0.35	IL8MO5	2.53
IN9IN8	1.60	IL3DL0	0.44	IL8MO6	1.61
IN9MO6	3.27	IL3WI7	2.25	IL8MO8	0.58
WI8NO0	2.17	IL3MO5	0.52	IL9NO0	1.65
WI8CH0	0.50	IL4PH0	0.36	IL9CH0	3.85
WI8WI1	2.48	IL4NO0	0.09	IL9NE0	2.20
WI8WI2	1.37	IL4CH0	1.21	IL9AP0	0.77
WI8WI3	1.04	IL4NE0	0.03	IL9DL0	1.72
WI8WI4	2.13	IL4DL0	1.37	IL9IN8	1.89
WI8WI5	0.14	IL4IN8	0.58	IL9MO5	3.45
WI8WI6	0.74	IL4WI7	2.99	IL9MO6	3.04
WI8WI7	0.75	IL4MO5	1.83	IL9MO8	1.43
WI9NO0	2.27	IL4MO6	1.18	MN4PH0	3.57
WI9CH0	0.65	IL5PH0	0.30	MN4NO0	2.91
WI9MC1	0.59	IL5NO0	1.40	MN4GV0	7.90
WI9MC2	0.13	IL5CH0	0.65	MN4LA0	4.64
WI9MC3	0.22	IL5SE0	0.20	MN4SL0	4.96
WI9WI2	2.38	IL5DL0	2.11	MN4NE0	2.35
WI9WI3	1.17	IL5IN8	0.69	MN4WI1	0.65
WI9WI4	3.52	IL5WI7	3.75	MN4MN1	0.93
WI9WI5	1.47	IL5MO6	2.02	MN4MN2	0.18
WI9WI7	3.23	IL6PH0	1.31	MN5PH0	3.38
IL1PH0	0.60	IL6CS0	0.10	MN5NO0	1.43
IL1NO0	0.57	IL6NO0	0.41	MN5GV0	8.67
IL1AP0	0.77	IL6CH0	1.75	MN5LA0	6.39
IL1SE0	1.06	IL6NE0	1.14	MN5SL0	6.82
IL1DL0	2.26	IL6AP0	0.51	MN5NE0	2.15
IL1WI2	2.17	IL6DL0	0.83	MN5AP0	4.29
IL1WI3	1.34	IL6IN8	0.97	MN5SE0	4.61
IL1WI4	2.91	IL6MO5	1.39	MN5WI1	1.13
IL1WI5	1.54	IL6MO6	0.83	MN5WI2	1.54
IL1WI6	0.90	IL6MO8	0.22	MN5WI4	1.67
IL1WI7	2.21	IL7NO0	2.21	MN5MN1	1.78
IL2PH0	1.00	IL7CH0	2.40	MN5MN2	1.47
IL2NO0	1.10	IL7NE0	1.21	MN7PH0	2.53

Table 29. (Continued)

Coded route	Oppor. Cost	Coded route	Oppor. Cost	Coded route	Oppor. Cost
MN7NO0	2.52	IA2PH0	0.98	IA7NO0	1.22
MN7GV0	5.84	IA2CS0	1.21	IA7GV0	3.87
MN7LA0	3.38	IA2NO0	0.47	IA7CH0	2.04
MN7SL0	4.67	IA2GV0	5.28	IA7AP0	2.11
MN7NE0	1.55	IA2CH0	0.44	IA7SE0	1.31
MN7AP0	2.89	IA2NE0	0.12	IA7MO5	0.36
MN7SE0	2.71	IA2AP0	1.27	IA8CS0	0.87
MN7WI1	0.32	IA2SE0	1.24	IA8NO0	1.18
MN7WI4	0.99	IA2DL0	1.06	IA8GV0	4.21
MN7NB2	2.30	IA2WI7	0.77	IA8CH0	1.13
MN8PH0	2.19	IA3NO0	0.37	IA8AP0	1.25
MN8NO0	0.78	IA3GV0	5.99	IA8SE0	0.67
MN8GV0	6.68	IA3CH0	0.33	IA8WI7	1.65
MN8LA0	5.18	IA3AP0	1.21	IA8MO6	0.47
MN8SL0	6.39	IA3SE0	1.35	IA9GV0	4.86
MN8NE0	1.18	IA3DL0	1.64	IA9CH0	0.86
MN8AP0	2.72	IA3WI1	0.75	IA9AP0	1.00
MN8SE0	2.79	IA3WI2	0.26	IA9SE0	0.60
MN8WI1	0.14	IA3WI4	0.56	IA9DL0	0.49
MN8WI2	0.67	IA3WI5	0.02	IA9WI7	1.72
MN8WI4	0.62	IA4PH0	1.56	IA9MO5	0.53
MN8WI7	1.38	IA4NO0	1.33	IA9MO6	0.56
MN9PH0	1.51	IA4DU0	0.81	MO1NO0	0.98
MN9CS0	2.22	IA4CH0	0.97	MO1GV0	3.97
MN9GV0	6.90	IA4NE0	0.88	MO1CH0	2.72
MN9LA0	6.21	IA4AP0	1.43	MO1NE0	2.68
MN9SL0	7.49	IA4SE0	0.93	MO1AP0	2.35
MN9DU0	0.05	IA5NO0	0.41	MO1SE0	1.38
MN9NE0	0.50	IA5GV0	4.26	MO1MO5	0.39
MN9AP0	2.14	IA5AP0	0.55	MO1MO6	1.17
MN9SE0	2.40	IA5SE0	0.29	MO1MO7	0.20
MN9WI1	0.26	IA5WI4	0.56	MO2NO0	1.78
MN9WI2	0.08	IA5WI7	0.14	MO2GV0	4.82
MN9WI3	0.07	IA6PH0	1.00	MO2CH0	2.89
MN9WI4	0.18	IA6GV0	5.54	MO2NE0	2.77
MN9WI5	0.28	IA6DU0	1.96	MO2AP0	2.31
MN9WI6	0.33	IA6CH0	0.41	MO2SE0	1.42
MN9WI7	0.74	IA6NE0	0.35	MO2DL0	0.55
IA1NO0	2.32	IA6AP0	1.04	MO2MO5	0.61
IA1GV0	4.87	IA6SE0	0.96	MO2MO6	1.17
IA1CH0	1.18	IA6DL0	1.16	MO2MO7	1.13
IA1NE0	0.87	IA6WI2	1.27	MO3CS0	1.19
IA1AP0	1.91	IA6WI4	1.56	MO3NO0	0.38
IA1SE0	1.64	IA6WI5	0.78	MO3GV0	5.07
IA1DL0	0.90	IA6WI6	0.67	MO3CH0	2.45
IA1WI4	0.52	IA6WI7	1.34	MO3NE0	2.22

Table 29. (Continued)

Coded route	Oppor. Cost	Coded route	Oppor. Cost	Coded route	Oppor. Cost
MO3AP0	1.70	SD3AP0	4.09	NB4SD4	2.55
MO3SE0	0.95	SD3SE0	4.04	NB4NB1	0.15
MO3DL0	0.65	SD3SD1	1.06	NB4NB2	2.61
MO3MO5	0.45	SD6PH0	2.72	NB5PH0	4.48
MO3MO6	1.00	SD6NO0	2.52	NB5NO0	4.80
MO4NO0	3.32	SD6GV0	5.38	NB5GV0	4.07
MO4GV0	4.37	SD6LA0	2.19	NB5LA0	0.92
MO4NE0	4.47	SD6SL0	3.46	NB5SL0	4.03
MO4AP0	3.40	SD6NE0	1.75	NB5CH0	3.91
MO4SE0	2.03	SD6AP0	3.02	NB5NE0	3.86
MO4DL0	0.29	SD6SE0	2.71	NB5AP0	4.01
MO4MO5	1.26	SD6SD1	0.72	NB5SE0	3.00
MO4MO6	2.18	SD6SD4	1.01	NB5NB2	1.29
MO4MO7	0.75	SD6NB2	1.13	NB6PH0	2.31
MO9CS0	0.45	SD8SD1	0.88	NB6NO0	1.93
MO9NO0	1.07	SD8SD4	1.18	NB6GV0	2.77
MO9GV0	5.00	SD9PH0	2.23	NB6LA0	0.90
MO9AP0	1.51	SD9NO0	1.30	NB6SL0	3.91
MO9DL0	0.65	SD9GV0	3.87	NB6CH0	1.75
MO9IN8	2.72	SD9LA0	0.73	NB6NE0	1.71
MO9MO5	3.42	SD9SL0	2.61	NB6AP0	1.88
MO9MO6	3.43	SD9NE0	1.38	NB6SE0	0.99
MO9MO8	0.90	SD9AP0	2.25	NB6PF0	0.03
ND9NE0	3.59	SD9SE0	1.69	NB6NB2	0.62
ND9AP0	5.68	SD9NB2	0.39	NB7PH0	5.25
ND9SE0	5.70	NB3PH0	2.55	NB7NO0	4.85
ND9MN2	0.49	NB3NO0	1.43	NB7GV0	3.93
ND9SD1	1.05	NB3GV0	3.51	NB7LA0	0.85
ND9SD4	2.19	NB3LA0	1.06	NB7SL0	4.56
SD2PH0	4.30	NB3SL0	3.61	NB7CH0	4.75
SD2NO0	5.54	NB3CH0	1.96	NB7NE0	4.73
SD2GV0	7.05	NB3NE0	1.85	NB7AP0	4.58
SD2LA0	2.05	NB3AP0	2.32	NB7SE0	3.37
SD2SL0	2.30	NB3SE0	1.57	NB7DL0	1.10
SD2DU0	0.71	NB3MT0	0.13	NB7PF0	0.14
SD2NE0	3.13	NB3NB2	0.33	NB7NB1	0.48
SD2AP0	4.84	NB4PH0	6.81	NB7NB2	2.21
SD2SE0	4.64	NB4NO0	6.62	NB8PH0	3.66
SD2SD4	0.52	NB4GV0	5.57	NB8NO0	2.38
SD2NB2	1.80	NB4LA0	0.98	NB8GV0	3.46
SD3PH0	3.47	NB4SL0	4.23	NB8LA0	2.44
SD3NO0	3.25	NB4CH0	6.24	NB8SL0	6.05
SD3GV0	7.05	NB4NE0	6.18	NB8CH0	3.21
SD3LA0	3.28	NB4AP0	6.30	NB8NE0	3.19
SD3SL0	3.73	NB4SE0	5.17	NB8AP0	2.98
SD3NE0	2.31	NB4MT0	0.05	NB8SE0	1.90

Table 29. (Continued)

Coded route	Oppor. Cost	Coded route	Oppor. Cost	Coded route	Oppor. Cost
NB8PF0	1.81	KA5SE0	2.54	KA9MO5	2.13
NB8MT0	1.66	KA5PF0	1.35	KA9MO7	0.31
NB8NB2	2.86	KA5MT0	1.20	KA9MO8	0.31
KA1PH0	7.49	KA6PH0	4.65	DU0MX01	17.18
KA1NO0	6.04	KA6CS0	2.60	DU0MX02	1.76
KA1GV0	4.69	KA6NO0	2.08	DU0PA01	16.09
KA1NE0	7.04	KA6GV0	3.65	DU0PA02	1.03
KA1AP0	6.60	KA6LA0	4.80	DU0JM01	14.99
KA1SE0	5.14	KA6SL0	9.31	DU0JM02	0.72
KA1DL0	2.52	KA6NE0	4.44	DU0TR01	14.90
KA1PF0	0.18	KA6AP0	3.52	DU0TR02	0.35
KA1NB1	1.46	KA6SE0	2.11	DU0VZ01	15.22
KA1NB2	3.92	KA6PF0	4.60	DU0VZ02	0.63
KA2PH0	4.22	KA6MT0	4.43	DU0BZ01	19.18
KA2NO0	2.86	KA6MO5	1.37	DU0BZ02	0.83
KA2GV0	3.16	KA6MO7	0.65	DU0UR01	21.08
KA2NE0	3.80	KA7PH0	6.10	DU0UR02	1.18
KA2AP0	3.42	KA7NO0	3.61	DU0PU01	18.57
KA2SE0	2.18	KA7GV0	2.16	DU0PU02	1.35
KA2PF0	1.26	KA7SL0	5.54	DU0CL01	20.16
KA2MT0	1.08	KA7NE0	5.86	DU0CL02	1.49
KA2NB2	2.79	KA7AP0	4.85	DU0SW01	14.32
KA3PH0	4.04	KA7SE0	3.11	DU0NW01	14.37
KA3NO0	1.49	KA7DL0	0.27	DU0NW02	0.0
KA3GV0	3.61	KA7MT0	0.06	DU0FN01	15.53
KA3NE0	3.71	KA8PH0	5.80	DU0FN02	0.0
KA3AP0	3.15	KA8NO0	3.53	DU0DN01	14.49
KA3SE0	1.93	KA8GV0	2.46	DU0DN02	0.01
KA3PF0	3.43	KA8LA0	2.11	DU0UK01	13.15
KA3MT0	3.25	KA8SL0	7.47	DU0IR01	12.88
KA3MO5	0.99	KA8NE0	5.62	DU0NH01	12.56
KA4PH0	7.26	KA8AP0	4.49	DU0BL01	12.56
KA4NO0	5.18	KA8SE0	2.76	DU0FR01	14.61
KA4GV0	3.71	KA8PF0	2.14	DU0FR02	0.0
KA4LA0	0.28	KA8MT0	2.12	DU0WG01	12.97
KA4SL0	5.43	KA8MO7	0.11	DU0EG01	14.67
KA4NE0	6.92	KA9PH0	5.44	DU0PO01	16.61
KA4AP0	6.18	KA9NO0	3.82	DU0SI01	15.89
KA4SE0	4.55	KA9GV0	3.43	DU0PG01	14.59
KA4DL0	1.79	KA9LA0	5.08	DU0PG02	0.0
KA4PF0	0.06	KA9SL0	10.11	DU0IT01	16.41
KA5PH0	5.12	KA9NE0	5.34	DU0IT02	0.0
KA5NO0	3.67	KA9AP0	4.09	DU0TK01	17.91
KA5GV0	2.74	KA9SE0	2.45	DU0TK02	0.0
KA5NE0	4.82	KA9PF0	5.08	DU0MR01	16.56
KA5AP0	4.05	KA9MT0	4.99	DU0MR02	0.0

Table 29. (Continued)

Coded route	Oppor. Cost	Coded route	Oppor. Cost	Coded route	Oppor. Cost
DUOTU01	17.85	CHOSW01	14.20	CHOJP01	30.54
DUOTU02	0.0	CHOSW02	0.01	CHOJP02	3.60
DUOUA01	17.87	CHONW01	14.24	CHOCN01	8.34
DUOUA02	0.0	CHOFN01	15.41	CHOCN02	0.01
DUOIS01	18.09	CHODN01	14.37	CHOAG01	20.54
DUOSN01	17.16	CHOUK01	13.02	CHOAG02	0.0
DUONG01	19.68	CHOUK02	0.01	CHOAU01	28.86
DUONG02	0.0	CHOIR01	12.75	CHOAU02	3.45
DUOSA01	22.31	CHOIR02	0.01	TOOMX01	16.20
DUOSA02	1.24	CHONH01	12.44	TOOMX02	1.77
DUOKN01	28.81	CHOBL01	12.44	TOOPA01	15.10
DUOKN02	2.30	CHOBL02	0.0	TOOPA02	1.03
DUOID01	32.82	CHOFR01	14.49	TOOJM01	14.01
DUOID02	3.04	CHOWG01	12.85	TOOJM02	0.72
DUOPK01	32.95	CHOWG02	0.01	TOOTR01	13.91
DUOPK02	3.08	CHOEG01	14.56	TOOTR02	0.35
DUOVN01	36.98	CHOEG02	0.01	TOOVZ01	14.23
DUOVN02	4.60	CHOPO01	16.49	TOOVZ02	0.63
DUOPP01	35.58	CHOPO02	0.01	TOOBZ01	18.20
DUOPP02	4.37	CHOSI01	15.76	TOOBZ02	0.84
DUOHK01	35.29	CHOSI02	0.01	TOOUR01	20.09
DUOHK02	4.32	CHOPG01	14.47	TOOUR02	1.19
DUOJP01	30.66	CHOIT01	16.28	TOOPU01	17.58
DUOJP02	3.59	CHOTK01	17.78	TOOPU02	1.35
DUOCN01	8.45	CHOMR01	16.43	TOOCL01	20.01
DUOAG01	20.66	CHOTU01	17.73	TOOCL02	1.81
DUOAU01	28.99	CHOUA01	17.76	TOOSW01	13.34
DUOAU02	3.44	CHOIS01	17.97	TOOSW02	0.01
CHOMX01	17.06	CHOIS02	0.0	TOONW01	13.38
CHOMX02	1.76	CHOSN01	17.03	TOONW02	0.01
CHOPA01	15.96	CHOSN02	0.0	TOOFN01	14.54
CHOPA02	1.03	CHONG01	19.56	TOOFN02	0.0
CHOJM01	14.87	CHOSA01	22.20	TOODN01	13.51
CHOJM02	0.72	CHOSA02	1.24	TOODN02	0.01
CHOTR01	14.78	CHOKN01	28.68	TOOUK01	12.16
CHOTR02	0.35	CHOKN02	2.30	TOOUK02	0.01
CHOVZ01	15.10	CHOID01	32.69	TOOIR01	11.89
CHOVZ02	0.62	CHOID02	3.05	TOOIR02	0.01
CHOBZ01	19.07	CHOPK01	32.83	TOONH01	11.58
CHOBZ02	0.83	CHOPK02	3.08	TOONH02	0.0
CHOUR01	20.95	CHOVN01	36.86	TOOBL01	11.57
CHOUR02	1.18	CHOVN02	4.60	TOOBL02	0.0
CHOPU01	18.44	CHOPP01	35.46	TOOFR01	13.62
CHOPU02	1.35	CHOPP02	4.38	TOOFR02	0.0
CHOCL01	20.88	CHOHK01	35.17	TOOWG01	11.98
CHOCL02	1.80	CHOHK02	4.33	TOOWG02	0.01

Table 29. (Continued)

Coded route	Oppor. Cost	Coded route	Oppor. Cost	Coded route	Oppor. Cost
TOOEG01	13.69	PHOMX02	6.26	PHOFN04	4.16
TOOEG02	0.01	PHOMX03	12.93	PHODN01	19.69
TOOPO01	15.63	PHOMX04	4.96	PHODN02	6.60
TOOPO02	0.01	PHOPA01	16.54	PHODN03	13.72
TOOSI01	14.90	PHOPA02	5.85	PHODN04	4.52
TOOSI02	0.01	PHOPA03	12.58	PHOUK01	17.28
TOOPG01	13.61	PHOPA04	4.53	PHOUK02	6.20
TOOPG02	0.0	PHOJM01	15.44	PHOUK03	12.59
TOOIT01	15.42	PHOJM02	5.53	PHOUK04	4.59
TOOTK01	16.92	PHOJM03	11.99	PHOIR01	17.71
TOOTK02	0.0	PHOJM04	4.39	PHOIR02	6.46
TOOMR01	15.57	PHOTR01	16.13	PHOIR03	12.91
TOOMR02	0.01	PHOTR02	5.45	PHOIR04	4.82
TOOTU01	16.87	PHOTR03	12.18	PHONH01	17.11
TOOTU02	0.0	PHOTR04	4.13	PHONH02	6.35
TOOUA01	16.89	PHOVZ01	16.14	PHONH03	12.14
TOOUA02	0.0	PHOVZ02	5.61	PHONH04	4.62
TOOIS01	17.10	PHOVZ03	12.29	PHOBL01	16.64
TOOIS02	0.01	PHOVZ04	4.32	PHOBL02	6.17
TOOSN01	16.17	PHOBZ01	21.51	PHOBL03	11.87
TOOSN02	0.0	PHOBZ02	6.35	PHOBL04	4.52
TOONG01	18.70	PHOBZ03	14.69	PHOFR01	18.49
TOONG02	0.0	PHOBZ04	4.00	PHOFR02	6.10
TOOSA01	21.33	PHOUR01	23.40	PHOFR03	12.96
TOOSA02	1.24	PHOUR02	6.70	PHOFR04	4.18
TOOKN01	27.82	PHOUR03	15.61	PHOWG01	17.07
TOOKN02	2.30	PHOUR04	3.99	PHOWG02	6.18
TOOID01	31.83	PHOPU01	19.86	PHOWG03	12.03
TOOID02	3.04	PHOPU02	6.47	PHOWG04	4.43
TOOPK01	31.96	PHOPU03	14.18	PHOEG01	18.77
TOOPK02	3.08	PHOPU04	4.53	PHOEG02	6.18
TOOVN01	36.00	PHOCL01	22.29	PHOPO01	21.33
TOOVN02	4.60	PHOCL02	6.93	PHOPO02	6.41
TOOPP01	34.60	PHOCL03	15.35	PHOPO03	14.68
TOOPP02	4.38	PHOCL04	4.54	PHOPO04	4.12
TOOHK01	34.28	PHOSW01	19.04	PHOSI01	19.76
TOOHK02	4.32	PHOSW02	6.42	PHOSI02	6.10
TOOJP01	29.67	PHOSW03	13.37	PHOSI03	13.91
TOOJP02	3.60	PHOSW04	4.45	PHOSI04	4.09
TOOCN01	7.47	PHONW01	19.09	PHOPG01	18.79
TOOCN02	0.01	PHONW02	6.42	PHOPG02	6.22
TOOAG01	19.68	PHONW03	13.38	PHOPG03	13.63
TOOAG02	0.0	PHONW04	4.43	PHOPG04	4.46
TOOAU01	28.00	PHOFN01	20.24	PHOIT01	20.29
TOOAU02	3.45	PHOFN02	6.41	PHOIT02	6.10
PHOMX01	16.78	PHOFN03	13.80	PHOIT03	14.10

Table 29. (Continued)

Coded route	Oppor. Cost	Coded route	Oppor. Cost	Coded route	Oppor. Cost
PH0IT04	3.97	PH0PP02	9.50	CS0UR02	7.07
PH0TK01	21.74	PH0PP03	22.75	CS0UR03	15.92
PH0TK02	6.08	PH0PP04	4.53	CS0UR04	4.40
PH0TK03	14.61	PH0HK01	36.87	CS0PU01	19.36
PH0TK04	3.61	PH0HK02	9.56	CS0PU02	6.58
PH0MR01	20.29	PH0HK03	22.79	CS0PU03	14.07
PH0MR02	6.05	PH0HK04	4.60	CS0PU04	4.77
PH0MR03	14.55	PH0JP01	31.97	CS0CL01	21.79
PH0MR04	4.10	PH0JP02	8.72	CS0CL02	7.03
PH0TU01	21.79	PH0JP03	20.00	CS0CL03	15.24
PH0TU02	6.12	PH0JP04	4.51	CS0CL04	4.78
PH0UA01	21.72	PH0CN01	17.24	CS0SW01	20.25
PH0UA02	6.08	PH0CN02	7.94	CS0SW02	7.16
PH0UA03	14.60	PH0CN03	13.69	CS0SW03	14.27
PH0UA04	3.62	PH0CN04	6.73	CS0SW04	5.08
PH0IS01	21.98	PH0AG01	23.73	CS0NW01	20.35
PH0IS02	6.10	PH0AG02	5.79	CS0NW02	7.17
PH0IS03	14.71	PH0AU01	30.29	CS0NW03	14.32
PH0IS04	3.59	PH0AU02	8.58	CS0NW04	5.08
PH0SN01	20.31	PH0AU03	18.82	CS0FN01	21.19
PH0SN02	5.82	PH0AU04	4.52	CS0FN02	7.05
PH0SN03	14.41	CS0MX01	16.12	CS0FN03	14.55
PH0SN04	3.82	CS0MX02	6.30	CS0FN04	4.74
PH0NG01	22.75	CS0MX03	12.72	CS0DN01	20.41
PH0NG02	5.79	CS0MX04	5.16	CS0DN02	7.15
PH0SA01	25.38	CS0PA01	16.05	CS0DN03	14.33
PH0SA02	7.04	CS0PA02	5.95	CS0DN04	5.05
PH0SA03	16.54	CS0PA03	12.47	CS0UK01	18.66
PH0SA04	3.95	CS0PA04	4.76	CS0UK02	7.01
PH0KN01	31.87	CS0JM01	14.96	CS0UK03	13.61
PH0KN02	8.09	CS0JM02	5.64	CS0UK04	5.26
PH0KN03	20.04	CS0JM03	11.88	CS0IR01	18.81
PH0KN04	3.95	CS0JM04	4.63	CS0IR02	7.16
PH0ID01	35.88	CS0TR01	15.95	CS0IR03	13.76
PH0ID02	8.84	CS0TR02	5.68	CS0IR04	5.42
PH0ID03	21.97	CS0TR03	12.26	CS0NH01	18.04
PH0ID04	3.95	CS0TR04	4.44	CS0NH02	6.99
PH0PK01	36.01	CS0VZ01	16.16	CS0NH03	12.89
PH0PK02	8.86	CS0VZ02	5.91	CS0NH04	5.19
PH0PK03	22.03	CS0VZ03	12.48	CS0BL01	18.01
PH0PK04	3.95	CS0VZ04	4.68	CS0BL02	6.98
PH0VN01	38.46	CS0BZ01	21.68	CS0BL03	12.87
PH0VN02	9.79	CS0BZ02	6.70	CS0BL04	5.18
PH0VN03	23.52	CS0BZ03	14.98	CS0FR01	19.64
PH0VN04	4.53	CS0BZ04	4.39	CS0FR02	6.81
PH0PP01	36.87	CS0UR01	23.62	CS0FR03	13.83

Table 29. (Continued)

Coded route	Oppor. Cost	Coded route	Oppor. Cost	Coded route	Oppor. Cost
CS0FR04	4.80	CS0NG02	6.33	NO0MX04	0.16
CS0WG01	18.43	CS0SA01	25.76	NO0PA01	10.99
CS0WG02	6.98	CS0SA02	7.46	NO0PA02	1.15
CS0WG03	13.03	CS0SA03	16.95	NO0PA03	7.57
CS0WG04	5.09	CS0SA04	4.39	NO0PA04	0.01
CS0EG01	20.14	CS0KN01	32.25	NO0JM01	10.45
CS0EG02	6.98	CS0KN02	8.52	NO0JM02	1.04
CS0PO01	22.53	CS0KN03	20.46	NO0JM03	7.31
CS0PO02	7.16	CS0KN04	4.39	NO0TR01	12.20
CS0PO03	15.59	CS0ID01	36.26	NO0TR02	1.36
CS0PO04	4.75	CS0ID02	9.26	NO0TR03	8.14
CS0SI01	20.90	CS0ID03	22.38	NO0VZ01	11.39
CS0SI02	6.82	CS0ID04	4.38	NO0VZ02	1.20
CS0SI03	14.78	CS0PK01	36.39	NO0VZ03	7.76
CS0SI04	4.72	CS0PK02	9.30	NO0VZ04	0.0
CS0PG01	19.81	CS0PK03	22.45	NO0BZ01	18.23
CS0PG02	6.89	CS0PK04	4.39	NO0BZ02	2.49
CS0PG03	14.42	CS0VN01	37.97	NO0BZ03	11.05
CS0PG04	5.05	CS0VN02	9.91	NO0UR01	20.11
CS0IT01	21.44	CS0VN03	23.41	NO0UR02	2.84
CS0IT02	6.81	CS0VN04	4.77	NO0UR03	11.96
CS0IT03	14.97	CS0PP01	36.38	NO0PU01	14.30
CS0IT04	4.58	CS0PP02	9.60	NO0PU02	1.76
CS0TK01	22.89	CS0PP03	22.64	NO0PU03	9.17
CS0TK02	6.80	CS0PP04	4.77	NO0PU04	0.01
CS0TK03	15.49	CS0HK01	36.40	NO0CL01	16.73
CS0TK04	4.23	CS0HK02	9.67	NO0CL02	2.22
CS0MR01	21.57	CS0HK03	22.69	NO0CL03	10.34
CS0MR02	6.81	CS0HK04	4.85	NO0CL04	0.03
CS0MR03	15.50	CS0JP01	31.52	NO0SW01	18.03
CS0MR04	4.75	CS0JP02	8.85	NO0SW02	3.41
CS0TU01	22.89	CS0JP03	19.92	NO0SW03	11.09
CS0TU02	6.82	CS0JP04	4.77	NO0SW04	0.99
CS0UA01	22.76	CS0CN01	18.52	NO0NW01	18.18
CS0UA02	6.76	CS0CN02	8.70	NO0NW02	3.45
CS0UA03	15.42	CS0CN03	14.64	NO0NW03	11.16
CS0UA04	4.21	CS0CN04	7.39	NO0NW04	1.00
CS0IS01	23.12	CS0AG01	24.39	NO0FN01	18.88
CS0IS02	6.82	CS0AG02	6.33	NO0FN02	3.27
CS0IS03	15.58	CS0AU01	29.82	NO0FN03	11.30
CS0IS04	4.21	CS0AU02	8.69	NO0FN04	0.62
CS0SN01	20.93	CS0AU03	18.72	NO0DN01	18.62
CS0SN02	6.34	CS0AU04	4.77	NO0DN02	3.57
CS0SN03	14.96	NO0MX01	9.96	NO0DN03	11.40
CS0SN04	4.32	NO0MX02	1.07	NO0DN04	1.05
CS0NG01	23.41	NO0MX03	7.16	NO0UK01	16.96

Table 29. (Continued)

Coded route	Oppor. Cost	Coded route	Oppor. Cost	Coded route	Oppor. Cost
NO0UK02	3.46	NO0MR02	3.00	NO0CN01	16.62
NO0UK03	10.71	NO0MR03	12.20	NO0CN02	5.08
NO0UK04	1.29	NO0MR04	0.62	NO0CN03	11.64
NO0IR01	16.54	NO0TU01	20.67	NO0CN04	3.36
NO0IR02	3.40	NO0TU02	3.08	NO0AG01	21.43
NO0IR03	10.54	NO0UA01	20.70	NO0AG02	2.31
NO0IR04	1.31	NO0UA02	3.08	NO0AU01	26.14
NO0NH01	16.17	NO0UA03	12.32	NO0AU02	4.39
NO0NH02	3.36	NO0UA04	0.15	NO0AU03	14.64
NO0NH03	9.90	NO0IS01	20.76	NO0AU04	0.33
NO0NH04	1.17	NO0IS02	3.02	GV0MX01	8.68
NO0BL01	16.03	NO0IS03	12.31	GV0MX02	0.56
NO0BL02	3.32	NO0IS04	0.07	GV0MX03	6.84
NO0BL03	9.82	NO0SN01	18.27	GV0PA01	10.34
NO0BL04	1.14	NO0SN02	2.43	GV0PA02	0.87
NO0FR01	17.31	NO0SN03	11.52	GV0PA03	7.63
NO0FR02	3.03	NO0SN04	0.12	GV0JM01	9.89
NO0FR03	10.58	NO0NG01	20.45	GV0JM02	0.80
NO0FR04	0.67	NO0NG02	2.31	GV0JM03	7.41
NO0WG01	16.36	NO0SA01	22.27	GV0JM04	0.0
NO0WG02	3.29	NO0SA02	3.25	GV0TR01	11.77
NO0WG03	9.93	NO0SA03	13.00	GV0TR02	1.16
NO0WG04	1.03	NO0KN01	28.77	GV0TR03	8.33
NO0EG01	18.06	NO0KN02	4.30	GV0TR04	0.02
NO0EG02	3.29	NO0KN03	16.50	GV0VZ01	10.82
NO0PO01	19.97	NO0ID01	32.78	GV0VZ02	0.96
NO0PO02	3.29	NO0ID02	5.05	GV0VZ03	7.87
NO0PO03	12.19	NO0ID03	18.42	GV0BZ01	17.80
NO0PO04	0.58	NO0PK01	32.90	GV0BZ02	2.30
NO0SI01	18.71	NO0PK02	5.07	GV0BZ03	11.25
NO0SI02	3.08	NO0PK03	18.49	GV0BZ04	0.04
NO0SI03	11.60	NO0VN01	32.91	GV0UR01	20.05
NO0SI04	0.63	NO0VN02	5.09	GV0UR02	2.78
NO0PG01	17.57	NO0VN03	18.50	GV0UR03	12.36
NO0PG02	3.13	NO0VN04	0.02	GV0UR04	0.11
NO0PG03	11.22	NO0PP01	31.31	GV0PU01	13.67
NO0PG04	0.94	NO0PP02	4.80	GV0PU02	1.50
NO0IT01	19.12	NO0PP03	17.73	GV0PU03	9.23
NO0IT02	3.03	NO0PP04	0.02	GV0CL01	16.10
NO0IT03	11.72	NO0HK01	31.29	GV0CL02	1.96
NO0IT04	0.47	NO0HK02	4.84	GV0CL03	10.40
NO0TK01	20.68	NO0HK03	17.75	GV0SW01	17.20
NO0TK02	3.06	NO0HK04	0.08	GV0SW02	3.07
NO0TK03	12.30	NO0JP01	26.42	GV0SW03	11.03
NO0TK04	0.13	NO0JP02	4.02	GV0SW04	0.93
NO0MR01	19.17	NO0JP03	14.99	GV0NW01	16.99

Table 29. (Continued)

Coded route	Oppor. Cost	Coded route	Oppor. Cost	Coded route	Oppor. Cost
GVONW02	2.98	GVOPG02	2.95	GVOPK04	0.03
GVONW03	10.90	GVOPG03	11.42	GVOVN01	32.28
GVONW04	0.85	GVOPG04	0.98	GVOVN02	4.83
GVOFN01	17.64	GVOIT01	18.80	GVOVN03	18.57
GVOFN02	2.78	GVOIT02	2.88	GVOPP01	30.67
GVOFN03	11.01	GVOIT03	11.98	GVOPP02	4.52
GVOFN04	0.46	GVOIT04	0.52	GVOPP03	17.80
GVODN01	17.36	GVOTK01	20.22	GVOHK01	30.39
GVODN02	3.07	GVOTK02	2.85	GVOHK02	4.48
GVODN03	11.09	GVOTK03	12.47	GVOHK03	17.66
GVODN04	0.88	GVOTK04	0.16	GVOJP01	25.84
GVOUK01	16.39	GVOMR01	18.82	GVOJP02	3.78
GVOUK02	3.21	GVOMR02	2.84	GVOJP03	15.09
GVOUK03	10.82	GVOMR03	12.44	GVOCN01	16.22
GVOUK04	1.28	GVOMR04	0.66	GVOCN02	4.90
GVOIR01	16.14	GVOTU01	20.25	GVOCN03	11.85
GVOIR02	3.22	GVOTU02	2.88	GVOCN04	3.40
GVOIR03	10.74	GVOUA01	20.28	GVOAG01	21.52
GVOIR04	1.35	GVOUA02	2.88	GVOAG02	2.31
GVONH01	15.62	GVOUA03	12.51	GVOAU01	24.14
GVONH02	3.13	GVOUA04	0.19	GVOAU02	3.62
GVONH03	10.02	GVOIS01	20.41	GVOAU03	13.90
GVONH04	1.18	GVOIS02	2.86	LAOMX01	28.11
GVOBL01	15.64	GVOIS03	12.55	LAOMX02	12.15
GVOBL02	3.14	GVOIS04	0.12	LAOMX03	21.27
GVOBL03	10.03	GVOSN01	17.86	LAOMX04	9.81
GVOBL04	1.18	GVOSN02	2.25	LAOPA01	24.22
GVOFR01	17.00	GVOSN03	11.71	LAOPA02	10.39
GVOFR02	2.88	GVOSN04	0.16	LAOPA03	18.73
GVOFR03	10.84	GVONG01	20.54	LAOPA04	8.53
GVOFR04	0.74	GVONG02	2.31	LAOJM01	25.73
GVOWG01	16.04	GVOSA01	21.83	LAOJM02	11.05
GVOWG02	3.14	GVOSA02	3.05	LAOJM03	19.70
GVOWG03	10.19	GVOSA03	13.18	LAOJM04	8.99
GVOWG04	1.09	GVOSA04	0.03	LAOTR01	26.70
GVOEG01	17.75	GVOKN01	28.32	LAOTR02	11.08
GVOEG02	3.14	GVOKN02	4.11	LAOTR03	20.07
GVOPO01	19.57	GVOKN03	16.68	LAOTR04	8.80
GVOPO02	3.10	GVOKN04	0.03	LAOVZ01	26.16
GVOPO03	12.39	GVOID01	32.34	LAOVZ02	11.02
GVOPO04	0.62	GVOID02	4.85	LAOVZ03	19.84
GVOSI01	18.28	GVOID03	18.61	LAOVZ04	8.86
GVOSI02	2.90	GVOID04	0.02	LAOVZ05	15.62
GVOSI03	11.80	GVOPK01	32.46	LAOVZ06	7.44
GVOSI04	0.66	GVOPK02	4.88	LAOBZ01	32.93
GVOPG01	17.16	GVOPK03	18.67	LAOBZ02	12.29

Table 29. (Continued)

Coded route	Oppor. Cost	Coded route	Oppor. Cost	Coded route	Oppor. Cost
LA0BZ03	23.10	LA0NH03	22.94	LA0TK05	17.95
LA0BZ04	8.86	LA0NH04	10.40	LA0TK06	6.73
LA0BZ05	16.87	LA0NH05	16.82	LA0MR01	35.23
LA0BZ06	6.67	LA0NH06	8.21	LA0MR02	13.30
LA0UR01	33.69	LA0BL01	32.26	LA0MR03	25.06
LA0UR02	12.22	LA0BL02	13.68	LA0MR04	9.78
LA0UR03	23.32	LA0BL03	22.79	LA0MR05	18.52
LA0UR04	8.59	LA0BL04	10.34	LA0MR06	7.50
LA0PU01	24.09	LA0BL05	16.72	LA0TU01	36.77
LA0PU02	9.72	LA0BL06	8.16	LA0TU02	13.40
LA0PU03	18.26	LA0FR01	33.54	LA0UA01	36.72
LA0PU04	7.74	LA0FR02	13.38	LA0UA02	13.36
LA0CL01	26.25	LA0FR03	23.54	LA0UA03	25.16
LA0CL02	10.08	LA0FR04	9.88	LA0UA04	9.31
LA0CL03	19.27	LA0WG01	32.94	LA0IS01	36.83
LA0CL04	7.68	LA0WG02	13.79	LA0IS02	13.33
LA0CL05	14.67	LA0WG03	23.10	LA0IS03	25.18
LA0CL06	6.10	LA0WG04	10.32	LA0IS04	9.24
LA0SW01	34.21	LA0WG05	16.83	LA0IS05	17.90
LA0SW02	13.76	LA0WG06	8.06	LA0IS06	6.66
LA0SW03	24.02	LA0EG01	34.64	LA0SN01	33.51
LA0SW04	10.18	LA0EG02	13.79	LA0SN02	12.43
LA0NW01	33.59	LA0PO01	36.95	LA0SN03	23.88
LA0NW02	13.51	LA0PO02	13.93	LA0SN04	9.09
LA0NW03	23.63	LA0PO03	25.60	LA0NG01	35.29
LA0NW04	10.01	LA0PO04	9.95	LA0NG02	12.16
LA0FN01	34.59	LA0SI01	34.82	LA0SA01	31.83
LA0FN02	13.44	LA0SI02	13.40	LA0SA02	11.11
LA0FN03	23.95	LA0SI03	24.49	LA0SA03	21.95
LA0FN04	9.70	LA0SI04	9.80	LA0SA04	7.66
LA0DN01	34.36	LA0PG01	33.92	LA0SA05	15.69
LA0DN02	13.75	LA0PG02	13.55	LA0SA06	5.47
LA0DN03	24.06	LA0PG03	24.26	LA0KN01	41.91
LA0DN04	10.14	LA0PG04	10.18	LA0KN02	13.51
LA0UK01	33.44	LA0PG05	18.13	LA0KN03	27.61
LA0UK02	13.91	LA0PG06	8.03	LA0KN04	8.49
LA0UK03	23.84	LA0IT01	35.33	LA0ID01	37.28
LA0UK04	10.54	LA0IT02	13.39	LA0ID02	11.02
LA0UK05	17.86	LA0IT03	24.67	LA0ID03	24.35
LA0UK06	8.43	LA0IT04	9.66	LA0ID04	6.49
LA0IR01	33.36	LA0IT05	17.96	LA0PK01	38.35
LA0IR02	13.98	LA0IT06	7.30	LA0PK02	11.40
LA0IR03	23.86	LA0TK01	36.80	LA0PK03	24.97
LA0IR04	10.65	LA0TK02	13.38	LA0PK04	6.72
LA0NH01	32.52	LA0TK03	25.19	LA0VN01	28.74
LA0NH02	13.78	LA0TK04	9.31	LA0VN02	7.81

Table 29. (Continued)

Coded route	Oppor. Cost	Coded route	Oppor. Cost	Coded route	Oppor. Cost
LAOVN03	19.21	SLOVZ03	17.65	SLOIR01	32.09
LAOVN04	4.52	SLOVZ04	6.56	SLOIR02	12.02
LAOPP01	28.36	SLOVZ05	12.75	SLOIR03	21.66
LAOPP02	7.97	SLOVZ06	4.84	SLOIR04	8.35
LAOPP03	19.17	SLOBZ01	31.65	SLONH01	31.24
LAOPP04	4.79	SLOBZ02	10.32	SLONH02	11.82
LAOHK01	27.24	SLOBZ03	20.90	SLONH03	20.75
LAOHK02	7.61	SLOBZ04	6.55	SLONH04	8.09
LAOHK03	18.54	SLOBZ05	13.98	SLONH05	13.94
LAOHK04	4.62	SLOBZ06	4.07	SLONH06	5.61
LAOJP01	24.44	SLOUR01	31.49	SLOBL01	31.01
LAOJP02	7.57	SLOUR02	9.90	SLOBL02	11.73
LAOJP03	17.01	SLOUR03	20.58	SLOBL03	20.61
LAOJP04	5.01	SLOUR04	6.07	SLOBL04	8.04
LAOJP05	12.17	SLOPU01	22.85	SLOBL05	13.85
LAOJP06	3.34	SLOPU02	7.77	SLOBL06	5.57
LAOCN01	31.59	SLOPU03	16.09	SLOFR01	32.26
LAOCN02	14.98	SLOPU04	5.43	SLOFR02	11.42
LAOCN03	23.85	SLOCL01	25.00	SLOFR03	21.35
LAOCN04	12.28	SLOCL02	8.12	SLOFR04	7.56
LAOAG01	36.27	SLOCL03	17.10	SLOWG01	31.66
LAOAG02	12.15	SLOCL04	5.37	SLOWG02	11.83
LAOAU01	25.71	SLOCL05	11.80	SLOWG03	20.91
LAOAU02	8.53	SLOCL06	3.52	SLOWG04	8.00
LAOAU03	17.61	SLOSW01	32.94	SLOWG05	13.94
LAOAU04	5.70	SLOSW02	11.80	SLOWG06	5.47
LAOAU05	12.48	SLOSW03	21.82	SLOEG01	34.36
LAOAU06	3.90	SLOSW04	7.87	SLOEG02	12.20
SLOMX01	26.86	SLONW01	32.44	SLOPO01	35.23
SLOMX02	10.20	SLONW02	11.59	SLOPO02	11.80
SLOMX03	19.09	SLONW03	21.52	SLOPO03	23.14
SLOMX04	7.50	SLONW04	7.73	SLOPO04	7.54
SLOPA01	22.93	SLOFN01	33.31	SLOSI01	33.56
SLOPA02	8.42	SLOFN02	11.48	SLOSI02	11.46
SLOPA03	16.54	SLOFN03	21.76	SLOSI03	22.32
SLOPA04	6.22	SLOFN04	7.39	SLOSI04	7.50
SLOJM01	24.46	SLODN01	33.11	SLOPG01	32.64
SLOJM02	9.08	SLODN02	11.80	SLOPG02	11.58
SLOJM03	17.51	SLODN03	21.88	SLOPG03	22.06
SLOJM04	6.68	SLODN04	7.83	SLOPG04	7.87
SLOTR01	25.42	SLOUK01	32.16	SLOPG05	15.24
SLOTR02	9.11	SLOUK02	11.94	SLOPG06	5.44
SLOTR03	17.88	SLOUK03	21.64	SLOIT01	34.05
SLOTR04	6.49	SLOUK04	8.24	SLOIT02	11.43
SLOVZ01	24.89	SLOUK05	14.98	SLOIT03	22.47
SLOVZ02	9.06	SLOUK06	5.83	SLOIT04	7.36

Table 29. (Continued)

Coded route	Oppor. Cost	Coded route	Oppor. Cost
SLOIT05	15.09	SLOPK01	32.35
SLOIT06	4.71	SLOPK02	7.67
SLOTK01	35.56	SLOPK03	19.95
SLOTK02	11.43	SLOPK04	3.32
SLOTK03	23.02	SLOVN01	24.62
SLOTK04	7.01	SLOVN02	4.79
SLOTK05	15.08	SLOVN03	15.31
SLOTK06	4.15	SLOVN04	1.56
SLOMR01	33.95	SLOPP01	22.95
SLOMR02	11.34	SLOPP02	4.46
SLOMR03	22.87	SLOPP03	14.49
SLOMR04	7.46	SLOPP04	1.54
SLOMR05	15.63	SLOHK01	22.54
SLOMR06	4.90	SLOHK02	4.37
SLOTU01	35.50	SLOHK03	14.29
SLOTU02	11.43	SLOHK04	1.51
SLOUA01	35.20	SLOJP01	17.92
SLOUA02	11.31	SLOJP02	3.64
SLOUA03	22.82	SLOJP03	11.67
SLOUA04	6.94	SLOJP04	1.49
SLOIS01	35.58	SLOJP05	7.33
SLOIS02	11.38	SLOCN01	30.66
SLOIS03	23.00	SLOCN02	13.14
SLOIS04	6.94	SLOCN03	21.86
SLOIS05	15.03	SLOCN04	10.05
SLOIS06	4.07	SLOAG01	34.95
SLOSN01	32.24	SLOAG02	10.17
SLOSN02	10.47	SLOAU01	22.41
SLOSN03	21.69	SLOAU02	5.80
SLOSN04	6.79	SLOAU03	14.20
SLONG01	33.97	SLOAU04	2.92
SLONG02	10.17	SLOAU05	8.85
SLOSA01	35.57	SLOAU06	1.02
SLOSA02	11.03		
SLOSA03	22.77		
SLOSA04	6.51		
SLOSA05	14.68		
SLOSA06	3.59		
SLOKN01	37.18		
SLOKN02	10.25		
SLOKN03	23.34		
SLOKN04	5.38		
SLOID01	31.31		
SLOID02	7.30		
SLOID03	19.33		
SLOID04	3.10		

Table 30. Opportunity Cost: model I, objective function 3

Coded route	Oppor. Cost	Coded route	Oppor. Cost	Coded route	Oppor. Cost
SP0LA0	2.08	OH1MC2	2.89	IN1WI6	2.04
SP0SL0	12.03	OH1MC3	2.23	IN1WI7	4.02
SP0SE0	1.87	OH1OH3	0.48	IN2PH0	0.41
SP0PF0	3.22	OH1OH9	0.96	IN2NO0	3.47
SP0MT0	4.51	OH1IN8	3.50	IN2CH0	2.39
MC5PH0	1.12	OH2PH0	0.39	IN2TO0	2.06
MC5CH0	4.15	OH2TO0	2.99	IN2MC2	1.86
MC5TO0	3.14	OH2AP0	1.36	IN2IN8	2.02
MC5MC1	2.74	OH2SE0	3.52	IN2WI6	2.74
MC5MC2	0.64	OH2MC3	3.53	IN3PH0	0.39
MC5WI3	3.47	OH2OH9	1.60	IN3CH0	3.16
MC5WI5	4.77	OH4PH0	0.14	IN3TO0	2.55
MC5WI6	3.11	OH4CH0	4.41	IN3MC2	2.47
MC6PH0	1.18	OH4TO0	2.72	IN3MC3	1.95
MC6TO0	3.36	OH4AP0	0.06	IN3OH3	0.45
MC6MC2	3.26	OH4SE0	1.44	IN3OH9	0.76
MC6MC3	1.18	OH4DL0	6.49	IN3IN8	2.60
MC6OH3	1.71	OH4OH3	0.39	IN4PH0	0.63
MC7PH0	0.78	OH4OH9	0.31	IN4NO0	3.22
MC7CH0	3.06	OH4IN8	2.79	IN4CH0	2.50
MC7TO0	2.31	OH5TO0	3.44	IN4TO0	2.60
MC7MC2	1.19	OH5AP0	0.02	IN4NE0	0.44
MC7MC3	0.75	OH5SE0	1.89	IN4SE0	0.25
MC7WI3	2.82	OH5DL0	7.57	IN4DL0	3.81
MC7WI5	3.83	OH5OH3	1.28	IN4IN8	0.66
MC7WI6	2.26	OH5IN8	3.86	IN4MO6	2.81
MC8PH0	0.83	OH7TO0	3.92	IN5PH0	0.68
MC8CH0	3.64	OH7NE0	0.98	IN5NO0	3.51
MC8TO0	2.97	OH7SE0	0.97	IN5CH0	3.04
MC8MC2	1.75	OH7DL0	6.24	IN5TO0	2.86
MC8MC3	1.32	OH7OH3	1.49	IN5NE0	0.57
MC8OH3	0.94	OH7OH9	0.93	IN5SE0	0.45
MC8WI5	4.94	OH7IN8	3.29	IN5DL0	4.53
MC8WI6	3.33	OH8PH0	0.90	IN5OH9	0.77
MC9PH0	0.71	OH8TO0	5.07	IN5IN8	0.80
MC9CH0	4.92	OH8NE0	1.22	IN6PH0	0.38
MC9TO0	1.68	OH8SE0	1.66	IN6NO0	3.20
MC9MC2	2.84	OH8DL0	7.82	IN6CH0	3.29
MC9MC3	2.29	OH8OH3	2.07	IN6TO0	2.52
MC9OH3	0.81	OH8OH9	1.48	IN6NE0	0.22
MC9OH9	1.76	OH8IN8	4.31	IN6SE0	0.85
OH1PH0	0.44	IN1PH0	0.40	IN6DL0	5.28
OH1CH0	4.09	IN1NO0	1.85	IN6OH3	0.60
OH1TO0	1.82	IN1CH0	0.77	IN6OH9	0.51
OH1AP0	0.92	IN1TO0	2.05	IN6IN8	2.38
OH1SE0	2.42	IN1IN8	1.13	IN7PH0	1.71

Table 30. (Continued)

Coded route	Oppor. Cost	Coded route	Oppor. Cost	Coded route	Oppor. Cost
IN7NO0	1.93	IL2AP0	0.89	IL7AP0	0.57
IN7CH0	4.00	IL2SE0	1.17	IL7DL0	2.54
IN7NE0	1.80	IL2DL0	3.72	IL7IN8	1.50
IN7AP0	0.37	IL2WI3	1.67	IL7MO5	2.70
IN7DL0	3.63	IL2WI5	2.29	IL7MO6	2.33
IN7MO6	3.13	IL2WI6	1.37	IL8NO0	1.66
IN9PH0	2.53	IL2WI7	2.74	IL8CH0	4.14
IN9NO0	1.24	IL3PH0	1.59	IL8NE0	2.81
IN9NE0	2.70	IL3CH0	1.39	IL8AP0	1.15
IN9AP0	0.88	IL3NE0	1.22	IL8DL0	1.85
IN9DL0	3.17	IL3AP0	0.85	IL8IN8	1.61
IN9IN8	1.60	IL3SE0	0.30	IL8MO5	2.45
IN9MO6	2.97	IL3DL0	1.60	IL8MO6	1.31
WI8NO0	1.16	IL3WI7	2.52	IL8MO8	1.11
WI8CH0	0.53	IL3MO5	0.74	IL9NO0	1.88
WI8WI1	2.19	IL4PH0	0.84	IL9CH0	4.36
WI8WI2	0.72	IL4CH0	1.72	IL9NE0	2.68
WI8WI3	0.30	IL4NE0	0.51	IL9AP0	0.97
WI8WI4	1.64	IL4AP0	0.20	IL9DL0	2.58
WI8WI6	0.0	IL4DL0	2.23	IL9IN8	1.89
WI8WI7	0.24	IL4IN8	0.58	IL9MO5	3.37
WI9NO0	2.27	IL4WI7	2.96	IL9MO6	2.74
WI9CH0	1.42	IL4MO5	1.75	IL9MO8	1.96
WI9NE0	0.74	IL4MO6	0.88	MN4PH0	3.54
WI9MC1	1.33	IL5PH0	0.58	MN4NO0	1.76
WI9MC2	0.87	IL5NO0	0.93	MN4GV0	9.00
WI9MC3	0.96	IL5CH0	0.96	MN4LA0	3.74
WI9WI2	2.47	IL5NE0	0.28	MN4SL0	6.13
WI9WI3	1.17	IL5DL0	2.77	MN4NE0	2.32
WI9WI4	3.77	IL5IN8	0.49	MN4WI1	0.33
WI9WI5	2.07	IL5WI7	3.52	MN4MN1	0.75
WI9WI7	3.46	IL5MO6	1.52	MN5PH0	3.35
IL1PH0	0.60	IL6PH0	1.79	MN5NO0	0.29
IL1CH0	0.03	IL6CS0	0.10	MN5GV0	9.77
IL1AP0	0.49	IL6NO0	0.64	MN5LA0	5.49
IL1SE0	0.58	IL6CH0	2.26	MN5SL0	7.99
IL1DL0	2.64	IL6NE0	1.62	MN5NE0	2.12
IL1WI2	1.52	IL6AP0	0.71	MN5AP0	3.98
IL1WI3	0.60	IL6DL0	1.69	MN5SE0	4.10
IL1WI4	2.42	IL6IN8	0.97	MN5WI1	0.81
IL1WI5	1.40	IL6MO5	1.31	MN5WI2	0.86
IL1WI6	0.16	IL6MO6	0.53	MN5WI4	1.15
IL1WI7	1.70	IL6MO8	0.75	MN5MN1	1.60
IL2PH0	0.97	IL7NO0	2.44	MN5MN2	1.29
IL2NO0	0.33	IL7CH0	2.91	MN7PH0	2.50
IL2NE0	0.41	IL7NE0	1.69	MN7NO0	0.64

Table 30. (Continued)

Coded route	Oppor. Cost	Coded route	Oppor. Cost	Coded route	Oppor. Cost
MN7GV0	6.94	IA2DU0	0.68	IA7GV0	5.27
MN7LA0	2.48	IA2CH0	1.12	IA7CH0	2.34
MN7SL0	5.84	IA2NE0	0.77	IA7AP0	2.10
MN7NE0	1.52	IA2AP0	1.64	IA7SE0	1.10
MN7AP0	2.58	IA2SE0	1.41	IA7DL0	0.65
MN7SE0	2.20	IA2DL0	2.09	IA7MO5	0.07
MN7WI4	0.47	IA2WI1	0.36	IA8CS0	0.95
MN7NB2	1.40	IA2WI4	0.16	IA8GV0	5.90
MN8PH0	2.52	IA2WI5	0.51	IA8CH0	1.72
MN8GV0	8.14	IA2WI7	0.91	IA8AP0	1.53
MN8LA0	4.64	IA3GV0	7.86	IA8SE0	0.75
MN8SL0	7.92	IA3CH0	1.10	IA8DL0	0.94
MN8DU0	0.36	IA3AP0	1.67	IA8WI7	1.70
MN8NE0	1.51	IA3SE0	1.61	IA8MO6	0.25
MN8AP0	2.77	IA3DL0	2.76	IA9GV0	6.77
MN8SE0	2.64	IA3WI1	1.20	IA9CH0	1.67
MN8WI1	0.18	IA3WI2	0.35	IA9AP0	1.50
MN8WI2	0.35	IA3WI4	0.81	IA9SE0	0.90
MN8WI4	0.46	IA3WI5	0.62	IA9DL0	1.65
MN8WI7	1.20	IA3WI7	0.23	IA9WI7	1.99
MN9PH0	2.63	IA4PH0	2.03	IA9MO5	0.75
MN9CS0	2.86	IA4DU0	1.31	IA9MO6	0.56
MN9GV0	9.15	IA4CH0	1.47	MO1GV0	5.52
MN9LA0	6.46	IA4NE0	1.35	MO1CH0	3.17
MN9SL0	9.81	IA4AP0	1.62	MO1NE0	3.10
MN9DU0	1.20	IA4SE0	0.92	MO1AP0	2.49
MN9NE0	1.62	IA4DL0	0.85	MO1SE0	1.32
MN9AP0	2.98	IA5GV0	5.76	MO1DL0	0.80
MN9SE0	3.04	IA5CH0	0.40	MO1MO5	0.25
MN9WI1	1.09	IA5AP0	0.64	MO1MO6	0.81
MN9WI2	0.55	IA5SE0	0.18	MO1MO7	0.89
MN9WI3	0.45	IA5DL0	0.75	MO2NO0	0.95
MN9WI4	0.81	IA5WI4	0.44	MO2GV0	5.90
MN9WI5	1.26	IA6PH0	1.78	MO2CH0	2.87
MN9WI6	0.71	IA6GV0	7.45	MO2NE0	2.72
MN9WI7	1.35	IA6DU0	2.77	MO2AP0	1.98
IA1NO0	0.28	IA6CH0	1.22	MO2SE0	0.89
IA1GV0	5.97	IA6NE0	1.13	MO2DL0	0.88
IA1CH0	1.18	IA6AP0	1.54	MO2MO6	0.34
IA1NE0	0.84	IA6SE0	1.26	MO2MO7	1.35
IA1AP0	1.60	IA6DL0	2.32	MO3CS0	1.10
IA1SE0	1.13	IA6WI2	1.40	MO3GV0	6.59
IA1DL0	1.25	IA6WI4	1.85	MO3CH0	2.87
IA2PH0	1.63	IA6WI5	1.42	MO3NE0	2.61
IA2CS0	1.38	IA6WI6	0.71	MO3AP0	1.81
IA2GV0	7.06	IA6WI7	1.61	MO3SE0	0.86

Table 30. (Continued)

Coded route	Oppor. Cost	Coded route	Oppor. Cost	Coded route	Oppor. Cost
MO3DL0	1.42	SD3SE0	3.71	NB4SD4	2.75
MO3MO5	0.28	SD3SD1	1.06	NB4NB1	0.15
MO3MO6	0.61	SD6PH0	2.69	NB4NB2	2.61
MO3MO8	0.44	SD6NO0	0.19	NB5PH0	5.35
MO4NO0	2.21	SD6GV0	6.48	NB5NO0	3.81
MO4GV0	5.45	SD6LA0	1.29	NB5GV0	6.07
MO4NE0	4.42	SD6SL0	4.63	NB5LA0	0.92
MO4AP0	3.07	SD6NE0	1.72	NB5SL0	6.10
MO4SE0	1.50	SD6AP0	2.71	NB5CH0	4.81
MO4DL0	0.62	SD6SE0	2.20	NB5NE0	4.73
MO4MO5	0.65	SD6SD1	0.54	NB5AP0	4.60
MO4MO6	1.35	SD6SD4	0.31	NB5SE0	3.39
MO4MO7	0.97	SD6NB2	0.23	NB5MT0	0.03
MO9CS0	0.45	SD8SD1	1.60	NB5NB2	1.29
MO9NO0	1.37	SD8SD4	1.38	NB6PH0	3.15
MO9GV0	6.61	SD9PH0	3.23	NB6NO0	0.47
MO9AP0	1.71	SD9GV0	6.00	NB6GV0	4.74
MO9DL0	1.51	SD9LA0	0.86	NB6LA0	0.87
MO9IN8	2.72	SD9SL0	4.81	NB6SL0	5.95
MO9MO5	3.34	SD9DU0	1.03	NB6CH0	2.62
MO9MO6	3.13	SD9NE0	2.38	NB6NE0	2.55
MO9MO8	1.43	SD9AP0	2.97	NB6AP0	2.44
ND9NE0	3.74	SD9SE0	2.21	NB6SE0	1.35
ND9AP0	5.55	SD9SD4	0.33	NB6NB2	0.59
ND9SE0	5.37	SD9NB2	0.52	NB7PH0	6.09
ND9MN2	0.49	NB3PH0	3.42	NB7NO0	5.06
ND9SD1	1.05	NB3GV0	5.51	NB7GV0	5.90
ND9SD4	1.67	NB3LA0	1.06	NB7LA0	0.82
SD2PH0	4.45	NB3SL0	5.68	NB7SL0	6.60
SD2NO0	4.58	NB3CH0	2.86	NB7CH0	5.62
SD2GV0	8.33	NB3NE0	2.72	NB7NE0	5.57
SD2LA0	1.33	NB3AP0	2.91	NB7AP0	5.14
SD2SL0	3.65	NB3SE0	1.96	NB7SE0	3.73
SD2DU0	0.89	NB3DL0	1.25	NB7DL0	2.32
SD2NE0	3.28	NB3MT0	0.16	NB7PF0	0.11
SD2AP0	4.71	NB3NB2	0.33	NB7NB1	0.45
SD2SE0	4.31	NB4PH0	7.68	NB7NB2	2.18
SD2NB2	1.08	NB4NO0	7.42	NB8PH0	3.28
SD3PH0	3.62	NB4GV0	7.57	NB8NO0	0.50
SD3NO0	2.28	NB4LA0	0.98	NB8GV0	4.21
SD3GV0	8.33	NB4SL0	6.30	NB8LA0	1.19
SD3LA0	2.56	NB4CH0	7.14	NB8SL0	6.87
SD3SL0	5.08	NB4NE0	7.05	NB8CH0	2.86
SD3DU0	0.18	NB4AP0	6.89	NB8NE0	2.81
SD3NE0	2.46	NB4SE0	5.56	NB8AP0	2.32
SD3AP0	3.96	NB4MT0	0.08	NB8SE0	1.04

Table 30. (Continued)

Coded route	Oppor. Cost	Coded route	Oppor. Cost	Coded route	Oppor. Cost
NB8PF0	0.56	KA5SE0	1.70	KA9MT0	3.79
NB8MT0	0.44	KA5DL0	0.02	KA9MO5	1.21
NB8NB2	1.61	KA5PF0	0.12	KA9MO7	0.22
KA1PH0	8.33	KA6PH0	4.60	DU0MX01	18.28
KA1NO0	7.73	KA6CS0	2.07	DU0MX02	2.86
KA1GV0	6.66	KA6NO0	0.81	DU0PA01	17.25
KA1NE0	7.88	KA6GV0	4.73	DU0PA02	2.19
KA1AP0	7.16	KA6LA0	3.88	DU0JM01	16.16
KA1SE0	5.50	KA6SL0	10.46	DU0JM02	1.89
KA1DL0	3.74	KA6NE0	4.39	DU0TR01	16.07
KA1PF0	0.15	KA6AP0	3.19	DU0TR02	1.52
KA1NB1	1.43	KA6SE0	1.58	DU0VZ01	16.39
KA1NB2	3.89	KA6DL0	0.33	DU0VZ02	1.80
KA2PH0	3.98	KA6PF0	3.68	DU0BZ01	20.35
KA2NO0	1.12	KA6MT0	3.54	DU0BZ02	2.00
KA2GV0	4.05	KA6MO5	0.76	DU0UR01	22.25
KA2NE0	3.56	KA6MO7	0.87	DU0UR02	2.35
KA2AP0	2.90	KA7PH0	6.97	DU0PU01	19.73
KA2SE0	1.46	KA7NO0	5.68	DU0PU02	2.51
KA2DL0	0.14	KA7GV0	4.16	DU0CL01	21.30
KA2PF0	0.15	KA7SL0	7.61	DU0CL02	2.63
KA2NB2	1.68	KA7NE0	6.73	DU0SW01	14.50
KA3PH0	3.77	KA7AP0	5.44	DU0SW02	0.18
KA3GV0	4.47	KA7SE0	3.50	DU0NW01	14.62
KA3NE0	3.44	KA7DL0	1.52	DU0NW02	0.25
KA3AP0	2.60	KA7MT0	0.09	DU0FN01	16.17
KA3SE0	1.18	KA8PH0	5.42	DU0FN02	0.64
KA3DL0	0.11	KA8NO0	4.28	DU0DN01	14.71
KA3PF0	2.29	KA8GV0	3.21	DU0DN02	0.23
KA3MT0	2.14	KA8LA0	0.86	DU0UK01	13.15
KA3MO5	0.16	KA8SL0	8.29	DU0IR01	12.88
KA4PH0	8.10	KA8NE0	5.24	DU0NH01	12.56
KA4NO0	7.22	KA8AP0	3.83	DU0BL01	12.59
KA4GV0	5.68	KA8SE0	1.90	DU0BL02	0.03
KA4LA0	0.25	KA8PF0	0.89	DU0FR01	15.11
KA4SL0	7.47	KA8MT0	0.90	DU0FR02	0.50
KA4NE0	7.76	KA9PH0	5.08	DU0WG01	13.11
KA4AP0	6.74	KA9NO0	2.35	DU0WG02	0.14
KA4SE0	4.91	KA9GV0	4.20	DU0EG01	14.67
KA4DL0	3.01	KA9LA0	3.85	DU0PO01	17.20
KA4PF0	0.03	KA9SL0	10.95	DU0PO02	0.59
KA5PH0	4.76	KA9NE0	4.98	DU0SI01	16.43
KA5NO0	2.59	KA9AP0	3.45	DU0SI02	0.54
KA5GV0	3.51	KA9SE0	1.61	DU0PG01	14.82
KA5NE0	4.46	KA9DL0	0.02	DU0PG02	0.23
KA5AP0	3.41	KA9PF0	3.85	DU0IT01	17.11

Table 30. (Continued)

Coded route	Oppor. Cost	Coded route	Oppor. Cost	Coded route	Oppor. Cost
DUOIT02	0.70	CHOBZ02	2.00	CHOSN02	1.05
DUOTK01	18.95	CHOUR01	22.12	CHONG01	19.56
DUOTK02	1.04	CHOUR02	2.35	CHOSA01	23.37
DUOMR01	17.11	CHOPU01	19.60	CHOSA02	2.41
DUOMR02	0.55	CHOPU02	2.51	CHOKN01	29.85
DUOTU01	17.85	CHOCL01	22.02	CHOKN02	3.47
DUOTU02	0.0	CHOCL02	2.94	CHOID01	33.86
DUOUA01	18.89	CHOSW01	14.38	CHOID02	4.22
DUOUA02	1.02	CHOSW02	0.19	CHOPK01	34.00
DUOIS01	19.19	CHONW01	14.49	CHOPK02	4.25
DUOIS02	1.10	CHONW02	0.25	CHOVN01	38.01
DUOSN01	18.21	CHOFN01	16.05	CHOVN02	5.75
DUOSN02	1.05	CHOFN02	0.64	CHOPP01	36.61
DUONG01	19.68	CHODN01	14.59	CHOPP02	5.53
DUONG02	0.0	CHODN02	0.22	CHOHK01	36.27
DUOSA01	23.48	CHOUK01	13.02	CHOHK02	5.43
DUOSA02	2.41	CHOUK02	0.01	CHOJP01	31.71
DUOKN01	29.98	CHOIR01	12.75	CHOJP02	4.77
DUOKN02	3.47	CHOIR02	0.01	CHOCN01	8.34
DUOID01	33.99	CHONH01	12.44	CHOCN02	0.01
DUOID02	4.21	CHOBL01	12.47	CHOAG01	20.54
DUOPK01	34.12	CHOBL02	0.03	CHOAG02	0.0
DUOPK02	4.25	CHOFR01	14.99	CHOAU01	29.96
DUOVN01	38.13	CHOFR02	0.50	CHOAU02	4.55
DUOVN02	5.75	CHOWG01	12.99	TOOMX01	17.30
DUOPP01	36.73	CHOWG02	0.15	TOOMX02	2.87
DUOPP02	5.52	CHOEG01	14.56	TOOPA01	16.26
DUOHK01	36.39	CHOEG02	0.01	TOOPA02	2.19
DUOHK02	5.42	CHOPO01	17.08	TOOJM01	15.18
DUOJP01	31.83	CHOPO02	0.60	TOOJM02	1.89
DUOJP02	4.76	CHOSI01	16.30	TOOTR01	15.08
DUOCN01	8.45	CHOSI02	0.55	TOOTR02	1.52
DUOAG01	20.66	CHOPG01	14.70	TOOVZ01	15.40
DUOAU01	30.09	CHOPG02	0.23	TOOVZ02	1.80
DUOAU02	4.54	CHOIT01	16.98	TOOBZ01	19.37
CHOMX01	18.16	CHOIT02	0.70	TOOBZ02	2.01
CHOMX02	2.86	CHOTK01	18.82	TOOUR01	21.26
CHOPA01	17.12	CHOTK02	1.04	TOOUR02	2.36
CHOPA02	2.19	CHOMR01	16.98	TOOPU01	18.74
CHOJM01	16.04	CHOMR02	0.55	TOOPU02	2.51
CHOJM02	1.89	CHOTU01	17.73	TOOCL01	21.15
CHOTR01	15.95	CHOUA01	18.78	TOOCL02	2.95
CHOTR02	1.52	CHOUA02	1.02	TOOSW01	13.52
CHOVZ01	16.27	CHOIS01	19.07	TOOSW02	0.19
CHOVZ02	1.79	CHOIS02	1.10	TOONW01	13.63
CHOBZ01	20.24	CHOSN01	18.08	TOONW02	0.26

Table 30. (Continued)

Coded route	Oppor. Cost	Coded route	Oppor. Cost	Coded route	Oppor. Cost
TOOFN01	15.18	TOOPK02	4.25	PHOPU04	5.72
TOOFN02	0.64	TOOVN01	37.15	PHOCL01	23.46
TOODN01	13.73	TOOVN02	5.75	PHOCL02	8.10
TOODN02	0.23	TOOPP01	35.75	PHOCL03	16.52
TOOUK01	12.16	TOOPP02	5.53	PHOCL04	5.71
TOOUK02	0.01	TOOHK01	35.38	PHOSW01	19.25
TOOIR01	11.89	TOOHK02	5.42	PHOSW02	6.63
TOOIR02	0.01	TOOJP01	30.84	PHOSW03	13.58
TOONH01	11.58	TOOJP02	4.77	PHOSW04	4.66
TOOBL01	11.60	TOOCN01	7.47	PHONW01	19.37
TOOBL02	0.03	TOOCN02	0.01	PHONW02	6.70
TOOFR01	14.12	TOOAG01	19.68	PHONW03	13.66
TOOFR02	0.50	TOOAG02	0.0	PHONW04	4.71
TOOWG01	12.12	TOOAU01	29.10	PHOFN01	20.91
TOOWG02	0.15	TOOAU02	4.55	PHOFN02	7.08
TOOEG01	13.69	PHOMX01	17.91	PHOFN03	14.47
TOOEG02	0.01	PHOMX02	7.39	PHOFN04	4.83
TOOPO01	16.22	PHOMX03	14.06	PHODN01	19.94
TOOPO02	0.60	PHOMX04	6.09	PHODN02	6.85
TOOSI01	15.44	PHOPA01	17.73	PHODN03	13.97
TOOSI02	0.55	PHOPA02	7.04	PHODN04	4.77
TOOPG01	13.84	PHOPA03	13.77	PHOUK01	17.31
TOOPG02	0.23	PHOPA04	5.72	PHOUK02	6.23
TOOIT01	16.12	PHOJM01	16.64	PHOUK03	12.62
TOOIT02	0.70	PHOJM02	6.73	PHOUK04	4.62
TOOTK01	17.96	PHOJM03	13.19	PHOIR01	17.74
TOOTK02	1.04	PHOJM04	5.59	PHOIR02	6.49
TOOMR01	16.12	PHOTR01	17.33	PHOIR03	12.94
TOOMR02	0.56	PHOTR02	6.65	PHOIR04	4.85
TOOTU01	16.87	PHOTR03	13.38	PHONH01	17.14
TOOTU02	0.0	PHOTR04	5.33	PHONH02	6.38
TOOUA01	17.91	PHOVZ01	17.34	PHONH03	12.17
TOOUA02	1.02	PHOVZ02	6.81	PHONH04	4.65
TOOIS01	18.20	PHOVZ03	13.49	PHOBL01	16.70
TOOIS02	1.11	PHOVZ04	5.52	PHOBL02	6.23
TOOSN01	17.22	PHOBZ01	22.71	PHOBL03	11.93
TOOSN02	1.05	PHOBZ02	7.55	PHOBL04	4.58
TOONG01	18.70	PHOBZ03	15.89	PHOFR01	19.02
TOONG02	0.0	PHOBZ04	5.20	PHOFR02	6.63
TOOSA01	22.50	PHOUR01	24.60	PHOFR03	13.49
TOOSA02	2.41	PHOUR02	7.90	PHOFR04	4.71
TOOKN01	28.99	PHOUR03	16.81	PHOWG01	17.24
TOOKN02	3.47	PHOUR04	5.19	PHOWG02	6.35
TOOID01	33.00	PHOPU01	21.05	PHOWG03	12.20
TOOID02	4.21	PHOPU02	7.66	PHOWG04	4.60
TOOPK01	33.13	PHOPU03	15.37	PHOEG01	18.80

Table 30. (Continued)

Coded route	Oppor. Cost	Coded route	Oppor. Cost	Coded route	Oppor. Cost
PH0EG02	6.21	PH0KN02	9.29	CS0JM02	7.32
PH0PO01	21.95	PH0KN03	21.24	CS0JM03	13.56
PH0PO02	7.03	PH0KN04	5.15	CS0JM04	6.31
PH0PO03	15.30	PH0ID01	37.08	CS0TR01	17.63
PH0PO04	4.74	PH0ID02	10.04	CS0TR02	7.36
PH0SI01	20.33	PH0ID03	23.17	CS0TR03	13.94
PH0SI02	6.67	PH0ID04	5.15	CS0TR04	6.12
PH0SI03	14.48	PH0PK01	37.21	CS0VZ01	17.84
PH0SI04	4.66	PH0PK02	10.06	CS0VZ02	7.59
PH0PG01	19.05	PH0PK03	23.23	CS0VZ03	14.16
PH0PG02	6.48	PH0PK04	5.15	CS0VZ04	6.36
PH0PG03	13.89	PH0VN01	39.64	CS0BZ01	23.36
PH0PG04	4.72	PH0VN02	10.97	CS0BZ02	8.38
PH0IT01	21.02	PH0VN03	24.70	CS0BZ03	16.66
PH0IT02	6.83	PH0VN04	5.71	CS0BZ04	6.07
PH0IT03	14.83	PH0PP01	38.05	CS0UR01	25.30
PH0IT04	4.70	PH0PP02	10.68	CS0UR02	8.75
PH0TK01	22.81	PH0PP03	23.93	CS0UR03	17.60
PH0TK02	7.15	PH0PP04	5.71	CS0UR04	6.08
PH0TK03	15.68	PH0HK01	38.00	CS0PU01	21.03
PH0TK04	4.68	PH0HK02	10.69	CS0PU02	8.25
PH0MR01	20.87	PH0HK03	23.92	CS0PU03	15.74
PH0MR02	6.63	PH0HK04	5.73	CS0PU04	6.44
PH0MR03	15.13	PH0JP01	33.17	CS0CL01	23.44
PH0MR04	4.68	PH0JP02	9.92	CS0CL02	8.68
PH0TU01	21.82	PH0JP03	21.20	CS0CL03	16.89
PH0TU02	6.15	PH0JP04	5.71	CS0CL04	6.43
PH0UA01	22.77	PH0CN01	17.27	CS0SW01	20.94
PH0UA02	7.13	PH0CN02	7.97	CS0SW02	7.85
PH0UA03	15.65	PH0CN03	13.72	CS0SW03	14.96
PH0UA04	4.67	PH0CN04	6.76	CS0SW04	5.77
PH0IS01	23.11	PH0AG01	23.76	CS0NW01	21.11
PH0IS02	7.23	PH0AG02	5.82	CS0NW02	7.93
PH0IS03	15.84	PH0AU01	31.42	CS0NW03	15.08
PH0IS04	4.72	PH0AU02	9.71	CS0NW04	5.84
PH0SN01	21.39	PH0AU03	19.95	CS0FN01	22.34
PH0SN02	6.90	PH0AU04	5.65	CS0FN02	8.20
PH0SN03	15.49	CS0MX01	17.73	CS0FN03	15.70
PH0SN04	4.90	CS0MX02	7.91	CS0FN04	5.89
PH0NG01	22.78	CS0MX03	14.33	CS0DN01	21.14
PH0NG02	5.82	CS0MX04	6.77	CS0DN02	7.88
PH0SA01	26.58	CS0PA01	17.72	CS0DN03	15.06
PH0SA02	8.24	CS0PA02	7.62	CS0DN04	5.78
PH0SA03	17.74	CS0PA03	14.14	CS0UK01	19.17
PH0SA04	5.15	CS0PA04	6.43	CS0UK02	7.52
PH0KN01	33.07	CS0JM01	16.64	CS0UK03	14.12

Table 30. (Continued)

Coded route	Oppor. Cost	Coded route	Oppor. Cost	Coded route	Oppor. Cost
CSOUK04	5.77	CSOMR04	5.81	CSOJP02	10.53
CSOIR01	19.32	CSOTU01	23.40	CSOJP03	21.60
CSOIR02	7.67	CSOTU02	7.33	CSOJP04	6.45
CSOIR03	14.27	CSOUA01	24.29	CSOCN01	19.03
CSOIR04	5.93	CSOUA02	8.29	CSOCN02	9.21
CSONH01	18.55	CSOUA03	16.95	CSOCN03	15.15
CSONH02	7.50	CSOUA04	5.74	CSOCN04	7.90
CSONH03	13.40	CSOIS01	24.73	CSOAG01	24.90
CSONH04	5.70	CSOIS02	8.43	CSOAG02	6.84
CSOBL01	18.55	CSOIS03	17.19	CSOAU01	31.43
CSOBL02	7.52	CSOIS04	5.82	CSOAU02	10.30
CSOBL03	13.41	CSOSN01	22.49	CSOAU03	20.33
CSOBL04	5.72	CSOSN02	7.90	CSOAU04	6.38
CSOFR01	20.65	CSOSN03	16.52	NOOMX01	9.89
CSOFR02	7.82	CSOSN04	5.88	NOOMX02	1.00
CSOFR03	14.84	CSONG01	23.92	NOOMX03	7.09
CSOFR04	5.81	CSONG02	6.84	NOOMX04	0.09
CSOWG01	19.08	CSOSA01	27.44	NOOPA01	10.98
CSOWG02	7.63	CSOSA02	9.14	NOOPA02	1.14
CSOWG03	13.68	CSOSA03	18.63	NOOPA03	7.56
CSOWG04	5.74	CSOSA04	6.07	NOOJM01	10.45
CSOEG01	20.65	CSOKN01	33.93	NOOJM02	1.04
CSOEG02	7.49	CSOKN02	10.20	NOOJM03	7.31
CSOPO01	23.63	CSOKN03	22.14	NOOTR01	12.20
CSOPO02	8.26	CSOKN04	6.07	NOOTR02	1.36
CSOPO03	16.69	CSOID01	37.94	NOOTR03	8.14
CSOPO04	5.85	CSOID02	10.94	NOOVZ01	11.39
CSOSI01	21.95	CSOID03	24.06	NOOVZ02	1.20
CSOSI02	7.87	CSOID04	6.06	NOOVZ03	7.76
CSOSI03	15.83	CSOPK01	38.07	NOOBZ01	18.23
CSOSI04	5.77	CSOPK02	10.98	NOOBZ02	2.49
CSOPG01	20.55	CSOPK03	24.13	NOOBZ03	11.05
CSOPG02	7.63	CSOPK04	6.07	NOOUR01	20.11
CSOPG03	15.16	CSOVN01	39.63	NOOUR02	2.84
CSOPG04	5.79	CSOVN02	11.57	NOOUR03	11.96
CSOIT01	22.65	CSOVN03	25.07	NOOPU01	14.29
CSOIT02	8.02	CSOVN04	6.43	NOOPU02	1.75
CSOIT03	16.18	CSOPP01	38.04	NOOPU03	9.16
CSOIT04	5.79	CSOPP02	11.26	NOOCL01	16.70
CSOTK01	24.44	CSOPP03	24.30	NOOCL02	2.19
CSOTK02	8.35	CSOPP04	6.43	NOOCL03	10.31
CSOTK03	17.04	CSOHK01	38.01	NOOSW01	17.04
CSOTK04	5.78	CSOHK02	11.28	NOOSW02	2.42
CSOMR01	22.63	CSOHK03	24.30	NOOSW03	10.10
CSOMR02	7.87	CSOHK04	6.46	NOONW01	17.26
CSOMR03	16.56	CSOJP01	33.20	NOONW02	2.53

Table 30. (Continued)

Coded route	Oppor. Cost	Coded route	Oppor. Cost	Coded route	Oppor. Cost
NOONW03	10.24	NOOTK03	12.17	NOOAG01	20.26
NOONW04	0.08	NOOMR01	18.55	NOOAG02	1.14
NOOFN01	18.35	NOOMR02	2.38	NOOAU01	26.07
NOOFN02	2.74	NOOMR03	11.58	NOOAU02	4.32
NOOFN03	10.77	NOOTU01	19.50	NOOAU03	14.57
NOOFN04	0.09	NOOTU02	1.91	NOOAU04	0.26
NOODN01	17.67	NOOUA01	20.55	GVOMX01	8.68
NOODN02	2.62	NOOUA02	2.93	GVOMX02	0.56
NOODN03	10.45	NOOUA03	12.17	GVOMX03	6.84
NOODN04	0.10	NOOIS01	20.69	GVOPA01	10.40
NOOUK01	15.79	NOOIS02	2.95	GVOPA02	0.93
NOOUK02	2.29	NOOIS03	12.24	GVOPA03	7.69
NOOUK03	9.54	NOOSN01	18.15	GVOPA04	0.06
NOOUK04	0.12	NOOSN02	2.31	GVOJM01	9.96
NOOIR01	15.37	NOOSN03	11.40	GVOJM02	0.87
NOOIR02	2.23	NOONG01	19.28	GVOJM03	7.48
NOOIR03	9.37	NOONG02	1.14	GVOJM04	0.07
NOOIR04	0.14	NOOSA01	22.27	GVOTR01	11.84
NOONH01	15.00	NOOSA02	3.25	GVOTR02	1.23
NOONH02	2.19	NOOSA03	13.00	GVOTR03	8.40
NOONH03	8.73	NOOKN01	28.77	GVOTR04	0.09
NOOBL01	14.89	NOOKN02	4.30	GVOVZ01	10.89
NOOBL02	2.18	NOOKN03	16.50	GVOVZ02	1.03
NOOBL03	8.68	NOOID01	32.78	GVOVZ03	7.94
NOOFR01	16.64	NOOID02	5.05	GVOVZ04	0.07
NOOFR02	2.36	NOOID03	18.42	GVOBZ01	17.87
NOOFR03	9.91	NOOPK01	32.90	GVOBZ02	2.37
NOOWG01	15.33	NOOPK02	5.07	GVOBZ03	11.32
NOOWG02	2.26	NOOPK03	18.49	GVOBZ04	0.11
NOOWG03	8.90	NOOVN01	32.89	GVOUR01	20.12
NOOEG01	16.89	NOOVN02	5.07	GVOUR02	2.85
NOOEG02	2.12	NOOVN03	18.48	GVOUR03	12.43
NOOPO01	19.39	NOOPP01	31.29	GVOUR04	0.18
NOOPO02	2.71	NOOPP02	4.78	GVOPU01	13.73
NOOPO03	11.61	NOOPP03	17.71	GVOPU02	1.56
NOOSI01	18.08	NOOHK01	31.22	GVOPU03	9.29
NOOSI02	2.45	NOOHK02	4.77	GVOPU04	0.06
NOOSI03	10.97	NOOHK03	17.68	GVOCL01	16.14
NOOPG01	16.63	NOOHK04	0.01	GVOCL02	2.00
NOOPG02	2.19	NOOJP01	26.42	GVOCL03	10.44
NOOPG03	10.28	NOOJP02	4.02	GVOCL04	0.04
NOOIT01	18.65	NOOJP03	14.99	GVOSW01	16.28
NOOIT02	2.56	NOOCN01	15.45	GVOSW02	2.15
NOOIT03	11.25	NOOCN02	3.91	GVOSW03	10.11
NOOTK01	20.55	NOOCN03	10.47	GVOSW04	0.01
NOOTK02	2.93	NOOCN04	2.19	GVONW01	16.14

Table 30. (Continued)

Coded route	Oppor. Cost	Coded route	Oppor. Cost	Coded route	Oppor. Cost
GV0NW02	2.13	GV0IT01	18.40	GV0VN03	18.62
GV0NW03	10.05	GV0IT02	2.48	GV0VN04	0.05
GV0FN01	17.18	GV0IT03	11.58	GV0PP01	30.72
GV0FN02	2.32	GV0IT04	0.12	GV0PP02	4.57
GV0FN03	10.55	GV0TK01	20.16	GV0PP03	17.85
GV0DN01	16.48	GV0TK02	2.79	GV0PP04	0.05
GV0DN02	2.19	GV0TK03	12.41	GV0HK01	30.39
GV0DN03	10.21	GV0TK04	0.10	GV0HK02	4.48
GV0UK01	15.29	GV0MR01	18.27	GV0HK03	17.66
GV0UK02	2.11	GV0MR02	2.29	GV0JP01	25.91
GV0UK03	9.72	GV0MR03	11.89	GV0JP02	3.85
GV0UK04	0.18	GV0MR04	0.11	GV0JP03	15.16
GV0IR01	15.04	GV0TU01	19.15	GV0JP04	0.07
GV0IR02	2.12	GV0TU02	1.78	GV0CN01	15.12
GV0IR03	9.64	GV0UA01	20.20	GV0CN02	3.80
GV0IR04	0.25	GV0UA02	2.80	GV0CN03	10.75
GV0NH01	14.52	GV0UA03	12.43	GV0CN04	2.30
GV0NH02	2.03	GV0UA04	0.11	GV0AG01	20.42
GV0NH03	8.92	GV0IS01	20.41	GV0AG02	1.21
GV0NH04	0.08	GV0IS02	2.86	GV0AU01	24.14
GV0BL01	14.57	GV0IS03	12.55	GV0AU02	3.62
GV0BL02	2.07	GV0IS04	0.12	GV0AU03	13.90
GV0BL03	8.96	GV0SN01	17.81	LA0MX01	30.11
GV0BL04	0.11	GV0SN02	2.20	LA0MX02	14.15
GV0FR01	16.40	GV0SN03	11.66	LA0MX03	23.27
GV0FR02	2.28	GV0SN04	0.11	LA0MX04	11.81
GV0FR03	10.24	GV0NG01	19.44	LA0PA01	26.28
GV0FR04	0.14	GV0NG02	1.21	LA0PA02	12.45
GV0WG01	15.08	GV0SA01	21.90	LA0PA03	20.79
GV0WG02	2.18	GV0SA02	3.12	LA0PA04	10.59
GV0WG03	9.23	GV0SA03	13.25	LA0JM01	27.80
GV0WG04	0.13	GV0SA04	0.10	LA0JM02	13.12
GV0EG01	16.65	GV0KN01	28.39	LA0JM03	21.77
GV0EG02	2.04	GV0KN02	4.18	LA0JM04	11.06
GV0PO01	19.06	GV0KN03	16.75	LA0TR01	28.77
GV0PO02	2.59	GV0KN04	0.10	LA0TR02	13.15
GV0PO03	11.88	GV0ID01	32.41	LA0TR03	22.14
GV0PO04	0.11	GV0ID02	4.92	LA0TR04	10.87
GV0SI01	17.72	GV0ID03	18.68	LA0VZ01	28.23
GV0SI02	2.34	GV0ID04	0.09	LA0VZ02	13.09
GV0SI03	11.24	GV0PK01	32.53	LA0VZ03	21.91
GV0SI04	0.10	GV0PK02	4.95	LA0VZ04	10.93
GV0PG01	16.29	GV0PK03	18.74	LA0VZ05	17.69
GV0PG02	2.08	GV0PK04	0.10	LA0VZ06	9.51
GV0PG03	10.55	GV0VN01	32.33	LA0BZ01	35.00
GV0PG04	0.11	GV0VN02	4.88	LA0BZ02	14.36

Table 30. (Continued)

Coded route	Oppor. Cost	Coded route	Oppor. Cost	Coded route	Oppor. Cost
LAOBZ03	25.17	LAONH03	23.84	LAOTK05	19.89
LAOBZ04	10.93	LAONH04	11.30	LAOTK06	8.67
LAOBZ05	18.94	LAONH05	17.72	LAOMR01	36.68
LAOBZ06	8.74	LAONH06	9.11	LAOMR02	14.75
LAOUR01	35.76	LAOBL01	33.19	LAOMR03	26.51
LAOUR02	14.29	LAOBL02	14.61	LAOMR04	11.23
LAOUR03	25.39	LAOBL03	23.72	LAOMR05	19.97
LAOUR04	10.66	LAOBL04	11.27	LAOMR06	8.95
LAOPU01	26.15	LAOBL05	17.65	LAOTU01	37.67
LAOPU02	11.78	LAOBL06	9.09	LAOTU02	14.30
LAOPU03	20.32	LAOFR01	34.94	LAOUA01	38.64
LAOPU04	9.80	LAOFR02	14.78	LAOUA02	15.28
LAOCL01	28.29	LAOFR03	24.94	LAOUA03	27.08
LAOCL02	12.12	LAOFR04	11.28	LAOUA04	11.23
LAOCL03	21.31	LAOWG01	33.98	LAOIS01	38.83
LAOCL04	9.72	LAOWG02	14.83	LAOIS02	15.33
LAOCL05	16.71	LAOWG03	24.14	LAOIS03	27.18
LAOCL06	8.14	LAOWG04	11.36	LAOIS04	11.24
LAOSW01	35.29	LAOWG05	17.87	LAOIS05	19.90
LAOSW02	14.84	LAOWG06	9.10	LAOIS06	8.66
LAOSW03	25.10	LAOEG01	35.54	LAOSN01	35.46
LAOSW04	11.26	LAOEG02	14.69	LAOSN02	14.38
LAONW01	34.74	LAOPO01	38.44	LAOSN03	25.83
LAONW02	14.66	LAOPO02	15.42	LAOSN04	11.04
LAONW03	24.78	LAOPO03	27.09	LAONG01	36.19
LAONW04	11.16	LAOPO04	11.44	LAONG02	13.06
LAOFN01	36.13	LAOSI01	36.26	LAOSA01	33.90
LAOFN02	14.98	LAOSI02	14.84	LAOSA02	13.18
LAOFN03	25.49	LAOSI03	25.93	LAOSA03	24.02
LAOFN04	11.24	LAOSI04	11.24	LAOSA04	9.73
LAODN01	35.48	LAOPG01	35.05	LAOSA05	17.76
LAODN02	14.87	LAOPG02	14.68	LAOSA06	7.54
LAODN03	25.18	LAOPG03	25.39	LAOKN01	43.98
LAODN04	11.26	LAOPG04	11.31	LAOKN02	15.58
LAOUK01	34.34	LAOPG05	19.26	LAOKN03	29.68
LAOUK02	14.81	LAOPG06	9.16	LAOKN04	10.56
LAOUK03	24.74	LAOIT01	36.93	LAOID01	39.35
LAOUK04	11.44	LAOIT02	14.99	LAOID02	13.09
LAOUK05	18.76	LAOIT03	26.27	LAOID03	26.42
LAOUK06	9.33	LAOIT04	11.26	LAOID04	8.56
LAOIR01	34.26	LAOIT05	19.56	LAOPK01	40.42
LAOIR02	14.88	LAOIT06	8.90	LAOPK02	13.47
LAOIR03	24.76	LAOTK01	38.74	LAOPK03	27.04
LAOIR04	11.55	LAOTK02	15.32	LAOPK04	8.79
LAONH01	33.42	LAOTK03	27.13	LAOVN01	30.79
LAONH02	14.68	LAOTK04	11.25	LAOVN02	9.86

Table 30. (Continued)

Coded route	Oppor. Cost	Coded route	Oppor. Cost	Coded route	Oppor. Cost
LAOVN03	21.26	SLOVZ03	17.65	SLOIR01	30.92
LAOVN04	6.57	SLOVZ04	6.56	SLOIR02	10.85
LAOPP01	30.41	SLOVZ05	12.75	SLOIR03	20.49
LAOPP02	10.02	SLOVZ06	4.84	SLOIR04	7.18
LAOPP03	21.22	SLOBZ01	31.65	SLONH01	30.07
LAOPP04	6.84	SLOBZ02	10.32	SLONH02	10.65
LAOHK01	29.24	SLOBZ03	20.90	SLONH03	19.58
LAOHK02	9.61	SLOBZ04	6.55	SLONH04	6.92
LAOHK03	20.54	SLOBZ05	13.98	SLONH05	12.77
LAOHK04	6.62	SLOBZ06	4.07	SLONH06	4.44
LAOJP01	26.51	SLOUR01	31.49	SLOBL01	29.87
LAOJP02	9.64	SLOUR02	9.90	SLOBL02	10.59
LAOJP03	19.08	SLOUR03	20.58	SLOBL03	19.47
LAOJP04	7.08	SLOUR04	6.07	SLOBL04	6.90
LAOJP05	14.24	SLOPU01	22.84	SLOBL05	12.71
LAOJP06	5.41	SLOPU02	7.76	SLOBL06	4.43
LAOCN01	32.49	SLOPU03	16.08	SLOFR01	31.59
LAOCN02	15.88	SLOPU04	5.42	SLOFR02	10.75
LAOCN03	24.75	SLOCL01	24.97	SLOFR03	20.68
LAOCN04	13.18	SLOCL02	8.09	SLOFR04	6.89
LAOAG01	37.17	SLOCL03	17.07	SLOWG01	30.63
LAOAG02	13.05	SLOCL04	5.34	SLOWG02	10.80
LAOAU01	27.71	SLOCL05	11.77	SLOWG03	19.88
LAOAU02	10.53	SLOCL06	3.49	SLOWG04	6.97
LAOAU03	19.61	SLOSW01	31.95	SLOWG05	12.91
LAOAU04	7.70	SLOSW02	10.81	SLOWG06	4.44
LAOAU05	14.48	SLOSW03	20.83	SLOEG01	33.19
LAOAU06	5.90	SLOSW04	6.88	SLOEG02	11.03
SLOMX01	26.79	SLONW01	31.52	SLOPO01	34.65
SLOMX02	10.13	SLONW02	10.67	SLOPO02	11.22
SLOMX03	19.02	SLONW03	20.60	SLOPO03	22.56
SLOMX04	7.43	SLONW04	6.81	SLOPO04	6.96
SLOPA01	22.92	SLOFN01	32.78	SLOSI01	32.93
SLOPA02	8.41	SLOFN02	10.95	SLOSI02	10.83
SLOPA03	16.53	SLOFN03	21.23	SLOSI03	21.69
SLOPA04	6.21	SLOFN04	6.86	SLOSI04	6.87
SLOJM01	24.46	SLODN01	32.16	SLOPG01	31.70
SLOJM02	9.08	SLODN02	10.85	SLOPG02	10.64
SLOJM03	17.51	SLODN03	20.93	SLOPG03	21.12
SLOJM04	6.68	SLODN04	6.88	SLOPG04	6.93
SLOTR01	25.42	SLOUK01	30.99	SLOPG05	14.30
SLOTR02	9.11	SLOUK02	10.77	SLOPG06	4.50
SLOTR03	17.88	SLOUK03	20.47	SLOIT01	33.58
SLOTR04	6.49	SLOUK04	7.07	SLOIT02	10.96
SLOVZ01	24.89	SLOUK05	13.81	SLOIT03	22.00
SLOVZ02	9.06	SLOUK06	4.66	SLOIT04	6.89

Table 30. (Continued)

Coded route	Oppor. Cost	Coded route	Oppor. Cost
SLOIT05	14.62	SLOPK01	32.35
SLOIT06	4.24	SLOPK02	7.67
SLOTK01	35.43	SLOPK03	19.95
SLOTK02	11.30	SLOPK04	3.32
SLOTK03	22.89	SLOVN01	24.60
SLOTK04	6.88	SLOVN02	4.77
SLOTK05	14.95	SLOVN03	15.29
SLOTK06	4.02	SLOVN04	1.54
SLOMR01	33.33	SLOPP01	22.93
SLOMR02	10.72	SLOPP02	4.44
SLOMR03	22.25	SLOPP03	14.47
SLOMR04	6.84	SLOPP04	1.52
SLOMR05	15.01	SLOHK01	22.47
SLOMR06	4.28	SLOHK02	4.30
SLOTU01	34.33	SLOHK03	14.22
SLOTU02	10.26	SLOHK04	1.44
SLOUA01	35.05	SLOJP01	17.92
SLOUA02	11.16	SLOJP02	3.64
SLOUA03	22.67	SLOJP03	11.67
SLOUA04	6.79	SLOJP04	1.49
SLOIS01	35.51	SLOJP05	7.33
SLOIS02	11.31	SLOCN01	29.49
SLOIS03	22.93	SLOCN02	11.97
SLOIS04	6.87	SLOCN03	20.69
SLOIS05	14.96	SLOCN04	8.88
SLOIS06	4.00	SLOAG01	33.78
SLOSN01	32.12	SLOAG02	9.00
SLOSN02	10.35	SLOAU01	22.34
SLOSN03	21.57	SLOAU02	5.73
SLOSN04	6.67	SLOAU03	14.13
SLONG01	32.80	SLOAU04	2.85
SLONG02	9.00	SLOAU05	8.78
SLOSA01	35.57	SLOAU06	0.95
SLOSA02	11.03		
SLOSA03	22.77		
SLOSA04	6.51		
SLOSA05	14.68		
SLOSA06	3.59		
SLOKN01	37.18		
SLOKN02	10.25		
SLOKN03	23.34		
SLOKN04	5.38		
SLOID01	31.31		
SLOID02	7.30		
SLOID03	19.33		
SLOID04	3.10		

Table 31. Opportunity Cost: model V, objective function 1

Coded route	Oppor. Cost	Coded route	Oppor. Cost	Coded route	Oppor. Cost
SE0CS0	0.42	MC7IA5	5.50	OH4IL2	2.47
SE0NO0	1.91	MC7IA6	4.06	OH4IL3	5.16
SE0GV0	2.41	MC8PH0	1.27	OH4IL4	3.17
SE0NE0	4.75	MC8CH0	1.60	OH4IL5	2.10
DL0GV0	1.16	MC8TO0	0.22	OH5PH0	0.86
DL0AP0	0.35	MC8OH3	0.17	OH5CS0	3.18
DL0MO1	7.28	MC8IN3	0.21	OH5NO0	3.09
DL0KA8	7.12	MC8IN4	1.76	OH5CH0	4.08
SP0NO0	3.99	MC8IN5	1.72	OH5TO0	1.75
SP0KA8	6.31	MC8IL2	1.48	OH5NE0	0.69
MC5PH0	0.69	MC8IL3	4.65	OH5AP0	2.26
MC5CH0	1.48	MC8IL4	2.80	OH5OH3	0.87
MC5TO0	0.68	MC8IL5	1.88	OH5IN3	1.83
MC5NE0	1.12	MC8IA6	5.16	OH5IN4	2.80
MC5OH3	0.05	MC9PH0	2.35	OH5IN5	2.30
MC5IN3	1.00	MC9CH0	3.30	OH5IL2	3.82
MC5IN4	1.94	MC9NE0	0.18	OH5IL4	4.51
MC5IN5	1.96	MC9OH2	0.66	OH5IL5	3.44
MC5IL2	1.32	MC9OH3	0.46	OH7PH0	1.33
MC5IL3	4.52	MC9IN3	2.20	OH7CH0	3.63
MC5IL4	2.79	MC9IN4	3.04	OH7TO0	2.23
MC5IL5	1.94	MC9IN5	2.84	OH7AP0	1.71
MC5IA6	4.77	MC9IL2	3.17	OH7OH2	1.11
MC6PH0	1.27	MC9IL3	6.27	OH7OH3	1.12
MC6CH0	2.72	MC9IL4	4.35	OH7IN3	2.05
MC6TO0	1.26	MC9IL5	3.36	OH7IN4	1.89
MC6OH2	0.17	OH1PH0	1.21	OH7IN5	1.83
MC6OH3	0.06	OH1CH0	2.63	OH7IL2	3.23
MC6IN3	1.50	OH1NE0	0.84	OH7IL3	5.58
MC6IN4	2.91	OH1AP0	3.15	OH7IL4	3.62
MC6IN5	2.81	OH1OH3	0.29	OH7IL5	2.58
MC6IL2	2.59	OH1IN4	1.96	OH8PH0	0.54
MC6IL4	3.97	OH1IN5	1.70	OH8CH0	3.73
MC6IL5	3.06	OH1IL2	2.45	OH8TO0	2.01
MC7PH0	0.79	OH1IL3	5.40	OH8AP0	0.01
MC7CH0	1.16	OH1IL4	3.43	OH8OH2	0.60
MC7TO0	0.70	OH1IL5	2.40	OH8IN3	1.60
MC7NE0	0.62	OH1IA6	6.27	OH8IN4	2.09
MC7OH3	0.22	OH4PH0	0.28	OH8IN5	1.54
MC7IN3	0.24	OH4CH0	2.75	OH8IL2	3.38
MC7IN4	0.96	OH4NE0	0.51	OH8IL4	3.82
MC7IN5	1.06	OH4AP0	1.68	OH8IL5	2.78
MC7IL2	0.40	OH4OH2	0.53	IN1PH0	1.19
MC7IL3	3.59	OH4IN3	0.64	IN1NO0	2.00
MC7IL4	1.80	OH4IN4	1.48	IN1GV0	3.16
MC7IL5	0.93	OH4IN5	1.55	IN1TO0	2.60

Table 31. (Continued)

Coded route	Oppor. Cost	Coded route	Oppor. Cost	Coded route	Oppor. Cost
IN1NE0	2.22	IN7NE0	3.64	WI4GV0	1.39
IN1OH2	1.55	IN7OH2	2.24	WI4CH0	1.73
IN1OH3	1.82	IN7OH3	2.37	WI4NE0	3.06
IN1IN3	1.15	IN7IN3	2.05	WI4IN3	2.25
IN1IN5	1.27	IN7IN4	0.60	WI4IN4	2.20
IN1IL2	0.95	IN7IN5	1.26	WI4IL2	0.39
IN1IL3	3.42	IN7IL2	2.17	WI4IL3	2.39
IN1IL4	2.01	IN7IL3	3.75	WI4IL4	1.67
IN1IL5	0.45	IN7IL4	2.00	WI4IL5	1.42
IN1IA5	5.85	IN7IL5	1.78	WI4MN8	2.25
IN1IA6	4.42	IN7IA5	6.65	WI4IA5	2.28
IN1MO1	7.69	IN7IA6	5.36	WI4IA6	1.42
IN2PH0	1.13	IN8PH0	0.32	WI4MO1	4.99
IN2NO0	3.16	IN8CS0	1.39	WI6NO0	2.48
IN2GV0	4.32	IN8NO0	0.65	WI6GV0	3.64
IN2CH0	1.16	IN8GV0	1.81	WI6DU0	1.74
IN2TO0	1.90	IN8CH0	2.49	WI6CH0	0.48
IN2NE0	2.06	IN8TO0	2.36	WI6TO0	1.34
IN2OH2	1.11	IN8NE0	1.55	WI6NE0	1.89
IN2OH3	1.37	IN8AP0	2.00	WI6OH2	0.93
IN2IN4	0.94	IN8OH2	1.39	WI6OH3	1.11
IN2IN5	0.38	IN8OH3	1.48	WI6IN3	0.91
IN2IL2	2.12	IN8IN3	1.36	WI6IN4	1.32
IN2IL3	4.15	IN8IN4	0.40	WI6IN5	1.63
IN2IL4	2.18	IN8IL2	1.85	WI6IL3	2.64
IN2IL5	1.88	IN8IL3	3.59	WI6IL4	1.34
IN2IA5	6.54	IN8IL4	1.79	WI6IL5	0.81
IN2IA6	5.10	IN8IL5	0.90	WI6MN8	4.46
IN6PH0	1.00	IN8IA6	5.16	WI6IA5	3.64
IN6CH0	2.30	IN9NO0	0.17	WI6IA6	2.35
IN6TO0	1.85	IN9GV0	1.33	WI8NO0	2.51
IN6NE0	0.53	IN9CH0	2.51	WI8GV0	3.67
IN6AP0	1.04	IN9TO0	2.94	WI8DU0	3.17
IN6OH2	0.69	IN9NE0	0.93	WI8TO0	3.01
IN6OH3	0.88	IN9OH2	2.03	WI8NE0	2.79
IN6IN4	0.67	IN9IN3	1.85	WI8OH2	2.59
IN6IL2	1.94	IN9IN4	0.65	WI8IN3	2.24
IN6IL3	4.51	IN9IN5	0.70	WI8IN4	2.13
IN6IL4	2.51	IN9IL2	1.70	WI8IN5	2.57
IN6IL5	1.44	IN9IL3	2.87	WI8IL2	0.82
IN6IA6	5.69	IN9IL4	1.36	WI8IL3	2.80
IN7PH0	1.31	IN9IL5	0.82	WI8IL4	1.73
IN7NO0	0.54	IN9IA5	5.79	WI8IL5	1.39
IN7GV0	1.70	IN9IA6	4.58	WI8MN8	5.04
IN7CH0	2.88	IN9MO1	6.58	WI8IA5	3.78
IN7TO0	3.13	WI4NO0	0.23	WI8IA6	2.44

Table 31. (Continued)

Coded route	Oppor. Cost	Coded route	Oppor. Cost	Coded route	Oppor. Cost
WI8MO1	6.31	IL6IN3	2.17	IL9AP0	1.65
WI9NO0	2.52	IL6IN4	0.91	IL9OH2	2.83
WI9GV0	3.68	IL6IN5	1.35	IL9IN3	2.55
WI9DU0	3.81	IL6IL2	0.82	IL9IN4	1.27
WI9CH0	0.52	IL6IL3	1.46	IL9IN5	1.43
WI9TO0	2.43	IL6IL4	0.36	IL9IL2	2.09
WI9NE0	2.38	IL6IL5	0.90	IL9IL3	3.05
WI9OH2	2.02	IL6MN8	6.67	IL9IL4	2.01
WI9OH3	2.25	IL6IA5	4.25	IL9IL5	1.35
WI9IN3	1.75	IL6IA6	3.08	IL9IA5	5.95
WI9IN4	1.92	IL6MO1	5.22	IL9IA6	4.78
WI9IN5	2.28	IL7CS0	2.69	IL9MO1	6.67
WI9IL3	3.31	IL7GV0	1.16	MN1NE0	7.54
WI9IL4	1.91	IL7CH0	3.50	MN1MN8	2.40
WI9IL5	1.29	IL7TO0	3.03	MN4NO0	1.08
WI9MN8	5.99	IL7NE0	3.82	MN4GV0	2.24
WI9IA5	4.70	IL7AP0	1.01	MN4NE0	5.14
WI9IA6	3.31	IL7OH2	2.27	MN4MN8	0.88
WI9MO1	7.13	IL7IN3	1.84	MN4IA5	2.04
IL1PH0	4.09	IL7IN4	1.22	MN4IA6	1.82
IL1NO0	1.63	IL7IN5	0.86	MN4MO1	4.04
IL1GV0	2.79	IL7IL2	1.07	MN5NO0	1.19
IL1DU0	4.94	IL7IL3	2.30	MN5GV0	2.35
IL1TO0	3.69	IL7IL4	0.64	MN5NE0	5.84
IL1NE0	4.62	IL7IA5	5.21	MN5AP0	3.40
IL1AP0	3.58	IL7IA6	3.97	MN5IL2	2.73
IL1OH2	3.21	IL7MO1	6.26	MN5IL3	4.28
IL1IN3	2.70	IL8GV0	1.16	MN5MN8	1.92
IL1IN4	2.18	IL8CH0	5.30	MN5IA5	3.56
IL1IN5	2.67	IL8TO0	3.76	MN5IA6	3.17
IL1IL2	0.09	IL8NE0	3.92	MN5MO1	5.90
IL1IL3	3.34	IL8AP0	1.50	MN6NO0	0.59
IL1IL4	1.44	IL8IN3	2.59	MN6GV0	1.75
IL1IL5	2.07	IL8IN4	1.27	MN6CH0	3.15
IL1MN8	6.37	IL8IN5	1.53	MN6NE0	5.74
IL1IA5	4.49	IL8IL2	1.81	MN6AP0	2.80
IL1IA6	3.43	IL8IL3	2.44	MN6IL2	2.28
IL1MO1	6.65	IL8IL4	1.53	MN6IL3	4.00
IL6PH0	4.39	IL8IL5	0.93	MN6MN8	2.72
IL6CS0	2.49	IL8IA5	5.28	MN6IA5	3.42
IL6GV0	1.16	IL8IA6	4.19	MN6IA6	2.91
IL6CH0	1.50	IL8MO1	5.83	MN6MO1	5.93
IL6TO0	3.36	IL9GV0	1.16	MN7NO0	2.58
IL6NE0	3.92	IL9CH0	5.84	MN7GV0	3.74
IL6AP0	1.59	IL9TO0	3.68	MN7NE0	5.64
IL6OH2	2.69	IL9NE0	3.96	MN7IL3	2.22

Table 31. (Continued)

Coded route	Oppor. Cost	Coded route	Oppor. Cost	Coded route	Oppor. Cost
MN7MN8	0.80	IA3DU0	1.79	IA8IN4	1.23
MN7IA5	1.30	IA3CH0	1.99	IA8IN5	1.76
MN7IA6	1.24	IA3NE0	3.25	IA8IL3	0.21
MN7MO1	3.05	IA3AP0	2.08	IA8IL4	0.24
MN9CS0	3.17	IA3IN3	2.43	IA8IL5	0.28
MN9NO0	0.53	IA3IN4	1.99	IA8MN8	2.71
MN9GV0	1.69	IA3IN5	2.50	IA8IA6	0.82
MN9CH0	2.16	IA3IL2	0.26	IA8MO1	1.79
MN9NE0	5.94	IA3IL3	1.67	IA8KA8	4.37
MN9AP0	3.06	IA3IL4	1.20	IA9GV0	1.16
MN9IN4	2.99	IA3IL5	1.08	IA9DU0	3.50
MN9IL2	1.20	IA3MN8	2.72	IA9CH0	1.88
MN9IL3	2.75	IA3IA5	1.77	IA9NE0	2.96
MN9IL4	2.26	IA3MO1	4.19	IA9AP0	0.77
MN9IL5	2.11	IA4NO0	1.43	IA9IN3	2.38
MN9MN8	2.04	IA4GV0	2.59	IA9IN4	1.47
MN9IA5	2.38	IA4DU0	1.15	IA9IN5	1.99
MN9IA6	2.27	IA4CH0	0.47	IA9IL2	0.25
MN9MO1	4.90	IA4NE0	2.87	IA9IL3	0.67
IA1NO0	2.05	IA4AP0	1.83	IA9IL4	0.47
IA1GV0	3.21	IA4IL2	0.16	IA9IL5	0.51
IA1CH0	0.39	IA4IL3	0.67	IA9MN8	4.06
IA1NE0	3.01	IA4IL4	0.63	IA9IA5	1.77
IA1AP0	2.17	IA4IL5	0.65	IA9IA6	0.26
IA1IL2	0.09	IA4MN8	1.17	IA9MO1	3.14
IA1IL3	0.92	IA4IA6	0.02	MO2GV0	1.16
IA1IL4	0.77	IA4MO1	1.26	MO2CH0	3.00
IA1MN8	0.35	IA4KA8	3.66	MO2IN4	0.94
IA1MO1	1.78	IA7NO0	0.03	MO2IN5	1.43
IA2CS0	4.22	IA7GV0	1.19	MO2IL2	0.13
IA2NO0	1.83	IA7CH0	1.37	MO2IL4	0.02
IA2GV0	2.99	IA7NE0	3.25	MO2IL5	0.05
IA2DU0	0.69	IA7IL2	0.04	MO2MN8	3.78
IA2CH0	1.37	IA7IL3	0.23	MO2IA5	1.08
IA2NE0	3.07	IA7IL4	0.28	MO2IA6	0.78
IA2AP0	3.26	IA7IL5	0.32	MO2MO1	1.40
IA2IN4	1.75	IA7MN8	1.67	MO2KA8	3.98
IA2IL2	0.06	IA7IA6	0.0	MO3CS0	2.39
IA2IL3	1.17	IA7KA8	2.40	MO3GV0	1.16
IA2IL4	0.88	IA8CS0	2.90	MO3CH0	4.00
IA2IL5	0.81	IA8NO0	0.51	MO3IN3	2.74
IA2MN8	1.10	IA8GV0	1.67	MO3IN4	1.57
IA2IA6	0.91	IA8DU0	2.46	MO3IN5	2.05
IA2MO1	2.92	IA8CH0	1.41	MO3IL2	0.94
IA3NO0	1.43	IA8NE0	3.37	MO3IL3	0.92
IA3GV0	2.59	IA8AP0	1.57	MO3IL4	0.70

Table 31. (Continued)

Coded route	Oppor. Cost	Coded route	Oppor. Cost	Coded route	Oppor. Cost
MO3IL5	0.72	MO7IA6	1.36	NB3NEO	5.08
MO3MN8	5.47	MO7MO1	0.92	NB3APO	0.90
MO3IA5	2.95	MO7KA8	0.67	NB3IL3	0.64
MO3IA6	1.91	MO9CSO	2.39	NB3MN8	0.58
MO3MO1	3.49	MO9GVO	1.16	NB3IA6	0.09
MO3KA8	6.07	MO9CHO	4.45	NB3MO1	0.47
MO4GVO	1.16	MO9IN3	4.10	NB3KA8	1.60
MO4IN4	1.41	MO9IN4	2.83	NB4NOO	2.33
MO4IL2	0.93	MO9IN5	2.98	NB4GVO	2.23
MO4IL3	0.77	MO9IL2	3.50	NB4CHO	4.63
MO4IL4	0.66	MO9IL3	4.03	NB4NEO	6.15
MO4IL5	0.64	MO9IL4	3.01	NB4APO	2.33
MO4MN8	4.54	MO9IL5	2.60	NB4MO1	0.76
MO4IA5	2.20	MO9IA5	6.75	NB5CSO	6.21
MO4IA6	1.73	MO9IA6	5.75	NB5NOO	1.57
MO4MO1	1.70	MO9MO1	6.92	NB5GVO	1.47
MO4KA8	2.73	ND6NEO	7.54	NB5LAO	0.34
MO5GVO	1.16	ND6MN8	1.30	NB5SLO	0.34
MO5CHO	3.55	ND9NEO	7.44	NB5CHO	3.77
MO5IN4	2.72	ND9MN8	0.61	NB5NEO	5.29
MO5IN5	3.14	ND9IA5	1.67	NB5APO	1.47
MO5IL2	2.40	SD3NEO	7.54	NB5MTO	1.46
MO5IL3	2.29	SD3MN8	0.66	NB5MN8	0.72
MO5IL4	2.05	SD3IA5	1.65	NB5IA5	0.02
MO5IL5	1.99	SD3IA6	1.53	NB5IA6	0.10
MO5MN8	6.83	SD3MO1	3.39	NB8GVO	1.16
MO5IA5	4.33	SD6NOO	0.70	NB8LAO	1.74
MO5IA6	3.61	SD6GVO	1.42	NB8SLO	1.74
MO5MO1	4.17	SD6NEO	6.64	NB8CHO	3.37
MO5KA8	6.10	SD6MN8	0.06	NB8NEO	4.89
MO6GVO	1.16	SD6IA5	0.59	NB8APO	0.23
MO6CHO	3.07	SD6IA6	0.58	NB8IL3	0.51
MO6IN3	3.28	SD6MO1	2.01	NB8MN8	1.88
MO6IN4	1.98	SD9NOO	0.66	NB8IA5	0.44
MO6IN5	2.35	SD9GVO	1.82	NB8IA6	0.44
MO6IL2	1.99	SD9DUO	0.08	NB8MO1	0.38
MO6IL3	1.89	SD9NEO	6.62	NB8KA8	0.72
MO6IL4	1.52	SD9APO	2.97	KA2NOO	0.45
MO6IL5	1.36	SD9IA6	0.06	KA2GVO	1.61
MO6IA5	4.75	SD9MO1	0.93	KA2NEO	5.86
MO6IA6	3.79	SD9KA8	2.17	KA2APO	1.62
MO6MO1	5.07	NB3NOO	0.50	KA2MTO	3.08
MO7NOO	0.76	NB3GVO	1.66	KA2IL3	0.66
MO7GVO	0.66	NB3LAO	1.33	KA2MN8	2.05
MO7IL3	0.25	NB3SLO	1.33	KA2IA5	0.68
MO7IA5	1.84	NB3CHO	3.56	KA2IA6	0.67

Table 31. (Continued)

Coded route	Oppor. Cost	Coded route	Oppor. Cost	Coded route	Oppor. Cost
KA2MO1	0.02	DUOUR01	22.13	DUOKN02	3.35
KA3GV0	1.16	DUOUR02	2.23	DUOID01	33.87
KA3NE0	6.13	DUOPU01	19.61	DUOID02	4.09
KA3AP0	0.74	DUOPU02	2.39	DUOPK01	34.00
KA3IL3	1.43	DUOCL01	21.18	DUOPK02	4.13
KA3IL4	1.47	DUOCL02	2.51	DUOVN01	38.01
KA3MN8	3.74	DUOSW01	14.38	DUOVN02	5.63
KA3IA5	1.86	DUOSW02	0.06	DUOPP01	36.61
KA3IA6	1.72	DUONW01	14.42	DUOPP02	5.40
KA3MO1	1.01	DUONW02	0.05	DUOHK01	36.26
KA3KA8	1.93	DUOFN01	15.96	DUOHK02	5.29
KA5NO0	3.31	DUOFN02	0.43	DUOJP01	31.71
KA5GV0	3.21	DUODN01	14.49	DUOJP02	4.64
KA5NE0	8.23	DUODN02	0.01	DUOCN01	8.45
KA5AP0	3.99	DUOUK01	13.15	DUOAG01	20.66
KA5MT0	4.59	DUOIR01	12.88	DUOAU01	29.87
KA5IA5	3.30	DUONH01	12.56	DUOAU02	4.32
KA5MO1	2.41	DUOBL01	12.56	CHOMX01	17.95
KA6PH0	6.75	DUOFR01	14.99	CHOMX02	2.65
KA6CS0	1.77	DUOFR02	0.38	CHOPA01	17.00
KA6GV0	1.16	DUOWG01	12.99	CHOPA02	2.07
KA6NE0	5.58	DUOWG02	0.02	CHOJM01	15.92
KA6AP0	0.37	DUOEG01	14.67	CHOJM02	1.77
KA6IL3	1.47	DUOPO01	17.08	CHOTR01	15.83
KA6IL4	1.46	DUOPO02	0.47	CHOTR02	1.40
KA6MN8	4.44	DUOSI01	16.31	CHOVZ01	16.15
KA6IA5	2.35	DUOSI02	0.42	CHOVZ02	1.67
KA6IA6	2.09	DUOPG01	14.70	CHOBZ01	20.12
KA6MO1	1.56	DUOPG02	0.11	CHOBZ02	1.88
KA6KA8	1.83	DUOIT01	16.99	CHOUR01	22.00
KA9IL3	0.08	DUOIT02	0.58	CHOUR02	2.23
KA9IA5	1.16	DUOTK01	18.83	CHOPU01	19.48
KA9IA6	0.85	DUOTK02	0.92	CHOPU02	2.39
KA9MO1	0.08	DUOMR01	16.99	CHOCL01	21.90
DUOMX01	18.07	DUOMR02	0.43	CHOCL02	2.82
DUOMX02	2.65	DUOTU01	17.85	CHOSW01	14.26
DUOPA01	17.13	DUOUA01	18.77	CHOSW02	0.07
DUOPA02	2.07	DUOUA02	0.90	CHONW01	14.29
DUOJM01	16.04	DUOIS01	19.07	CHONW02	0.05
DUOJM02	1.77	DUOIS02	0.98	CHOFN01	15.84
DUOTR01	15.95	DUOSN01	18.09	CHOFN02	0.43
DUOTR02	1.40	DUOSN02	0.93	CHODN01	14.37
DUOVZ01	16.27	DUONG01	19.68	CHOUK01	13.02
DUOVZ02	1.68	DUOSA01	23.36	CHOUK02	0.01
DUOBZ01	20.23	DUOSA02	2.29	CHOIR01	12.75
DUOBZ02	1.88	DUOKN01	29.86	CHOIR02	0.01

Table 31. (Continued)

Coded route	Oppor. Cost	Coded route	Oppor. Cost	Coded route	Oppor. Cost
CHONH01	12.44	CHOJP02	4.65	TOOPO01	16.10
CHOBL01	12.44	CHOCN01	8.34	TOOPO02	0.48
CHOBL02	0.0	CHOCN02	0.01	TOOSI01	15.32
CHOFR01	14.87	CHOAG01	20.54	TOOSI02	0.43
CHOFR02	0.38	CHOAG02	0.0	TOOPG01	13.72
CHOWG01	12.87	CHOAU01	29.74	TOOPG02	0.11
CHOWG02	0.03	CHOAU02	4.33	TOOIT01	16.00
CHOEG01	14.56	TOOMX01	17.09	TOOIT02	0.58
CHOEG02	0.01	TOOMX02	2.66	TOOTK01	17.84
CHOPO01	16.96	TOOPA01	16.14	TOOTK02	0.92
CHOPO02	0.48	TOOPA02	2.07	TOOMR01	16.00
CHOSI01	16.18	TOOJM01	15.06	TOOMR02	0.44
CHOSI02	0.43	TOOJM02	1.77	TOOTU01	16.87
CHOPG01	14.58	TOOTR01	14.96	TOOTU02	0.0
CHOPG02	0.11	TOOTR02	1.40	TOOUA01	17.79
CHOIT01	16.86	TOOVZ01	15.28	TOOUA02	0.90
CHOIT02	0.58	TOOVZ02	1.68	TOOIS01	18.08
CHOTK01	18.70	TOOBZ01	19.25	TOOIS02	0.99
CHOTK02	0.92	TOOBZ02	1.89	TOOSN01	17.10
CHOMR01	16.86	TOOUR01	21.14	TOOSN02	0.93
CHOMR02	0.43	TOOUR02	2.24	TOONG01	18.70
CHOTU01	17.73	TOOPU01	18.62	TOONG02	0.0
CHOTU02	0.0	TOOPU02	2.39	TOOSA01	22.38
CHOUA01	18.66	TOOCL01	21.03	TOOSA02	2.29
CHOUA02	0.90	TOOCL02	2.83	TOOKN01	28.87
CHOIS01	18.95	TOOSW01	13.40	TOOKN02	3.35
CHOIS02	0.98	TOOSW02	0.07	TOOID01	32.88
CHOSN01	17.96	TOONW01	13.43	TOOID02	4.09
CHOSN02	0.93	TOONW02	0.06	TOOPK01	33.01
CHONG01	19.56	TOOFN01	14.97	TOOPK02	4.13
CHONG02	0.0	TOOFN02	0.43	TOOVN01	37.03
CHOSA01	23.25	TOODN01	13.51	TOOVN02	5.63
CHOSA02	2.29	TOODN02	0.01	TOOPP01	35.63
CHOKN01	29.73	TOOUK01	12.16	TOOPP02	5.41
CHOKN02	3.35	TOOUK02	0.01	TOOHK01	35.25
CHOID01	33.74	TOOIR01	11.89	TOOHK02	5.29
CHOID02	4.10	TOOIR02	0.01	TOOJP01	30.72
CHOPK01	33.88	TOONH01	11.58	TOOJP02	4.65
CHOPK02	4.13	TOOBL01	11.57	TOOCN01	7.47
CHOVN01	37.89	TOOBL02	0.0	TOOCN02	0.01
CHOVN02	5.63	TOOFR01	14.00	TOOAG01	19.68
CHOPP01	36.49	TOOFR02	0.38	TOOAG02	0.0
CHOPP02	5.41	TOOWG01	12.00	TOOAU01	28.88
CHOHK01	36.14	TOOWG02	0.03	TOOAU02	4.33
CHOHK02	5.30	TOOEG01	13.69	PHOMX01	13.23
CHOJP01	31.59	TOOEG02	0.01	PHOMX02	2.71

Table 31. (Continued)

Coded route	Oppor. Cost	Coded route	Oppor. Cost	Coded route	Oppor. Cost
PHOMX03	9.38	PHODN01	15.25	PHOTK01	18.22
PHOMX04	1.41	PHODN02	2.16	PHOTK02	2.56
PHOPA01	13.14	PHODN03	9.28	PHOTK03	11.09
PHOPA02	2.45	PHODN04	0.08	PHOTK04	0.09
PHOPA03	9.18	PHOUK01	12.84	PHOMR01	16.28
PHOPA04	1.13	PHOUK02	1.76	PHOMR02	2.04
PHOJM01	12.05	PHOUK03	8.15	PHOMR03	10.54
PHOJM02	2.14	PHOUK04	0.15	PHOMR04	0.09
PHOJM03	8.60	PHOIR01	13.27	PHOTU01	17.35
PHOJM04	1.00	PHOIR02	2.02	PHOTU02	1.68
PHOTR01	12.74	PHOIR03	8.47	PHOUA01	18.18
PHOTR02	2.06	PHOIR04	0.38	PHOUA02	2.54
PHOTR03	8.79	PHONH01	12.67	PHOUA03	11.06
PHOTR04	0.74	PHONH02	1.91	PHOUA04	0.08
PHOVZ01	12.75	PHONH03	7.70	PHOIS01	18.52
PHOVZ02	2.22	PHONH04	0.18	PHOIS02	2.64
PHOVZ03	8.90	PHOBL01	12.20	PHOIS03	11.25
PHOVZ04	0.93	PHOBL02	1.73	PHOIS04	0.13
PHOBZ01	18.12	PHOBL03	7.43	PHOSN01	16.80
PHOBZ02	2.96	PHOBL04	0.08	PHOSN02	2.31
PHOBZ03	11.30	PHOFR01	14.43	PHOSN03	10.90
PHOBZ04	0.61	PHOFR02	2.04	PHOSN04	0.31
PHOUR01	20.01	PHOFR03	8.90	PHONG01	18.31
PHOUR02	3.31	PHOFR04	0.12	PHONG02	1.35
PHOUR03	12.22	PHOWG01	12.65	PHOSA01	21.99
PHOUR04	0.60	PHOWG02	1.76	PHOSA02	3.65
PHOPU01	16.46	PHOWG03	7.61	PHOSA03	13.15
PHOPU02	3.07	PHOWG04	0.01	PHOSA04	0.56
PHOPU03	10.78	PHOEG01	14.33	PHOKN01	28.48
PHOPU04	1.13	PHOEG02	1.74	PHOKN02	4.70
PHOCL01	18.87	PHOPO01	17.36	PHOKN03	16.65
PHOCL02	3.51	PHOPO02	2.44	PHOKN04	0.56
PHOCL03	11.93	PHOPO03	10.71	PHOID01	32.49
PHOCL04	1.12	PHOPO04	0.15	PHOID02	5.45
PHOSW01	14.66	PHOSI01	15.74	PHOID03	18.58
PHOSW02	2.04	PHOSI02	2.08	PHOID04	0.56
PHOSW03	8.99	PHOSI03	9.89	PHOPK01	32.62
PHOSW04	0.07	PHOSI04	0.07	PHOPK02	5.47
PHONW01	14.70	PHOPG01	14.46	PHOPK03	18.64
PHONW02	2.03	PHOPG02	1.89	PHOPK04	0.56
PHONW03	8.99	PHOPG03	9.30	PHOVN01	35.05
PHONW04	0.04	PHOPG04	0.13	PHOVN02	6.38
PHOFN01	16.23	PHOIT01	16.43	PHOVN03	20.11
PHOFN02	2.40	PHOIT02	2.24	PHOVN04	1.12
PHOFN03	9.79	PHOIT03	10.24	PHOPP01	33.46
PHOFN04	0.15	PHOIT04	0.11	PHOPP02	6.09

Table 31. (Continued)

Coded route	Oppor. Cost	Coded route	Oppor. Cost	Coded route	Oppor. Cost
PHOPP03	19.34	CSOUR03	11.92	CSOWG02	1.95
PHOPP04	1.12	CSOUR04	0.40	CSOWG03	8.00
PHOHK01	33.40	CSOPU01	15.35	CSOWG04	0.06
PHOHK02	6.09	CSOPU02	2.57	CSOEG01	15.09
PHOHK03	19.32	CSOPU03	10.06	CSOEG02	1.93
PHOHK04	1.13	CSOPU04	0.76	CSOPO01	17.95
PHOJP01	28.58	CSOCL01	17.76	CSOPO02	2.58
PHOJP02	5.33	CSOCL02	3.00	CSOPO03	11.01
PHOJP03	16.61	CSOCL03	11.21	CSOPO04	0.17
PHOJP04	1.12	CSOCL04	0.75	CSOSI01	16.27
PHOCN01	12.80	CSOSW01	15.26	CSOSI02	2.19
PHOCN02	3.50	CSOSW02	2.17	CSOSI03	10.15
PHOCN03	9.25	CSOSW03	9.28	CSOSI04	0.09
PHOCN04	2.29	CSOSW04	0.09	CSOPG01	14.87
PHOAG01	19.29	CSONW01	15.35	CSOPG02	1.95
PHOAG02	1.35	CSONW02	2.17	CSOPG03	9.48
PHOAU01	26.73	CSONW03	9.32	CSOPG04	0.11
PHOAU02	5.02	CSONW04	0.08	CSOIT01	16.97
PHOAU03	15.26	CSOFN01	16.57	CSOIT02	2.34
PHOAU04	0.96	CSOFN02	2.43	CSOIT03	10.50
CSOMX01	11.96	CSOFN03	9.93	CSOIT04	0.11
CSOMX02	2.14	CSOFN04	0.12	CSOTK01	18.76
CSOMX03	8.56	CSODN01	15.36	CSOTK02	2.67
CSOMX04	1.00	CSODN02	2.10	CSOTK03	11.36
CSOPA01	12.04	CSODN03	9.28	CSOTK04	0.10
CSOPA02	1.94	CSOUK01	13.61	CSOMR01	16.95
CSOPA03	8.46	CSOUK02	1.96	CSOMR02	2.19
CSOPA04	0.75	CSOUK03	8.56	CSOMR03	10.88
CSOJM01	10.96	CSOUK04	0.21	CSOMR04	0.13
CSOJM02	1.64	CSOIR01	13.76	CSOTU01	17.84
CSOJM03	7.88	CSOIR02	2.11	CSOTU02	1.77
CSOJM04	0.63	CSOIR03	8.71	CSOUA01	18.61
CSOTR01	11.95	CSOIR04	0.37	CSOUA02	2.61
CSOTR02	1.68	CSONH01	12.99	CSOUA03	11.27
CSOTR03	8.26	CSONH02	1.94	CSOUA04	0.06
CSOTR04	0.44	CSONH03	7.84	CSOIS01	19.05
CSOVZ01	12.16	CSONH04	0.14	CSOIS02	2.75
CSOVZ02	1.91	CSOBL01	12.96	CSOIS03	11.51
CSOVZ03	8.48	CSOBL02	1.93	CSOIS04	0.14
CSOVZ04	0.68	CSOBL03	7.82	CSOSN01	16.81
CSOBZ01	17.68	CSOBL04	0.13	CSOSN02	2.22
CSOBZ02	2.70	CSOFR01	14.97	CSOSN03	10.84
CSOBZ03	10.98	CSOFR02	2.14	CSOSN04	0.20
CSOBZ04	0.39	CSOFR03	9.16	CSONG01	18.36
CSOUR01	19.62	CSOFR04	0.13	CSONG02	1.28
CSOUR02	3.07	CSOWG01	13.40	CSOSA01	21.76

Table 31. (Continued)

Coded route	Oppor. Cost	Coded route	Oppor. Cost	Coded route	Oppor. Cost
CS0SA02	3.46	NO0PA03	7.56	NO0BL01	14.98
CS0SA03	12.95	NO0JM01	10.45	NO0BL02	2.27
CS0SA04	0.39	NO0JM02	1.04	NO0BL03	8.77
CS0KN01	28.25	NO0JM03	7.31	NO0BL04	0.09
CS0KN02	4.52	NO0TR01	12.20	NO0FR01	16.64
CS0KN03	16.46	NO0TR02	1.36	NO0FR02	2.36
CS0KN04	0.39	NO0TR03	8.14	NO0FR03	9.91
CS0ID01	32.26	NO0VZ01	11.39	NO0WG01	15.33
CS0ID02	5.26	NO0VZ02	1.20	NO0WG02	2.26
CS0ID03	18.38	NO0VZ03	7.76	NO0WG03	8.90
CS0ID04	0.38	NO0BZ01	18.23	NO0EG01	17.01
CS0PK01	32.39	NO0BZ02	2.49	NO0EG02	2.24
CS0PK02	5.30	NO0BZ03	11.05	NO0PO01	19.39
CS0PK03	18.45	NO0UR01	20.11	NO0PO02	2.71
CS0PK04	0.39	NO0UR02	2.84	NO0PO03	11.61
CS0VN01	33.95	NO0UR03	11.96	NO0SI01	18.08
CS0VN02	5.89	NO0PU01	14.29	NO0SI02	2.45
CS0VN03	19.39	NO0PU02	1.75	NO0SI03	10.97
CS0VN04	0.75	NO0PU03	9.16	NO0PG01	16.63
CS0PP01	32.36	NO0CL01	16.70	NO0PG02	2.19
CS0PP02	5.58	NO0CL02	2.19	NO0PG03	10.28
CS0PP03	18.62	NO0CL03	10.31	NO0IT01	18.65
CS0PP04	0.75	NO0SW01	17.04	NO0IT02	2.56
CS0HK01	32.32	NO0SW02	2.42	NO0IT03	11.25
CS0HK02	5.59	NO0SW03	10.10	NO0TK01	20.55
CS0HK03	18.61	NO0NW01	17.18	NO0TK02	2.93
CS0HK04	0.77	NO0NW02	2.45	NO0TK03	12.17
CS0JP01	27.52	NO0NW03	10.16	NO0MR01	18.55
CS0JP02	4.85	NO0FN01	18.26	NO0MR02	2.38
CS0JP03	15.92	NO0FN02	2.65	NO0MR03	11.58
CS0JP04	0.77	NO0FN03	10.68	NO0TU01	19.62
CS0CN01	13.47	NO0DN01	17.57	NO0TU02	2.03
CS0CN02	3.65	NO0DN02	2.52	NO0UA01	20.55
CS0CN03	9.59	NO0DN03	10.35	NO0UA02	2.93
CS0CN04	2.34	NO0UK01	15.91	NO0UA03	12.17
CS0AG01	19.34	NO0UK02	2.41	NO0IS01	20.69
CS0AG02	1.28	NO0UK03	9.66	NO0IS02	2.95
CS0AU01	25.65	NO0UK04	0.24	NO0IS03	12.24
CS0AU02	4.52	NO0IR01	15.49	NO0SN01	18.15
CS0AU03	14.55	NO0IR02	2.35	NO0SN02	2.31
CS0AU04	0.60	NO0IR03	9.49	NO0SN03	11.40
NO0MX01	9.80	NO0IR04	0.26	NO0NG01	19.40
NO0MX02	0.91	NO0NH01	15.12	NO0NG02	1.26
NO0MX03	7.00	NO0NH02	2.31	NO0SA01	22.27
NO0PA01	10.98	NO0NH03	8.85	NO0SA02	3.25
NO0PA02	1.14	NO0NH04	0.12	NO0SA03	13.00

Table 31. (Continued)

Coded route	Oppor. Cost	Coded route	Oppor. Cost	Coded route	Oppor. Cost
NOOKN01	28.77	GVOTR04	0.19	GVONH03	9.14
NOOKN02	4.30	GVOVZ01	10.99	GVONH04	0.30
NOOKN03	16.50	GVOVZ02	1.13	GVOBL01	14.76
NOOID01	32.78	GVOVZ03	8.04	GVOBL02	2.26
NOOID02	5.05	GVOVZ04	0.17	GVOBL03	9.15
NOOID03	18.42	GVOBZ01	17.97	GVOBL04	0.30
NOOPK01	32.90	GVOBZ02	2.47	GVOFR01	16.50
NOOPK02	5.07	GVOBZ03	11.42	GVOFR02	2.38
NOOPK03	18.49	GVOBZ04	0.21	GVOFR03	10.34
NOOVN01	32.89	GVOUR01	20.22	GVOFR04	0.24
NOOVN02	5.07	GVOUR02	2.95	GVOWG01	15.18
NOOVN03	18.48	GVOUR03	12.53	GVOWG02	2.28
NOOPP01	31.29	GVOUR04	0.28	GVOWG03	9.33
NOOPP02	4.78	GVOPU01	13.83	GVOWG04	0.23
NOOPP03	17.71	GVOPU02	1.66	GVOEG01	16.87
NOOHK01	31.21	GVOPU03	9.39	GVOEG02	2.26
NOOHK02	4.76	GVOPU04	0.16	GVOPO01	19.16
NOOHK03	17.67	GVOCL01	16.24	GVOPO02	2.69
NOOJP01	26.42	GVOCL02	2.10	GVOPO03	11.98
NOOJP02	4.02	GVOCL03	10.54	GVOPO04	0.21
NOOJP03	14.99	GVOCL04	0.14	GVOSI01	17.82
NOOCN01	15.57	GVOSW01	16.38	GVOSI02	2.44
NOOCN02	4.03	GVOSW02	2.25	GVOSI03	11.34
NOOCN03	10.59	GVOSW03	10.21	GVOSI04	0.20
NOOCN04	2.31	GVOSW04	0.11	GVOPG01	16.39
NOOAG01	20.38	GVONW01	16.16	GVOPG02	2.18
NOOAG02	1.26	GVONW02	2.15	GVOPG03	10.65
NOOAU01	25.97	GVONW03	10.07	GVOPG04	0.21
NOOAU02	4.22	GVONW04	0.02	GVOIT01	18.50
NOOAU03	14.47	GVOFN01	17.19	GVOIT02	2.58
NOOAU04	0.16	GVOFN02	2.33	GVOIT03	11.68
GVOMX01	8.69	GVOFN03	10.56	GVOIT04	0.22
GVOMX02	0.57	GVOFN04	0.01	GVOTK01	20.26
GVOMX03	6.85	GVODN01	16.48	GVOTK02	2.89
GVOMX04	0.01	GVODN02	2.19	GVOTK03	12.51
GVOPA01	10.50	GVODN03	10.21	GVOTK04	0.20
GVOPA02	1.03	GVOUK01	15.51	GVOMR01	18.37
GVOPA03	7.79	GVOUK02	2.33	GVOMR02	2.39
GVOPA04	0.16	GVOUK03	9.94	GVOMR03	11.99
GVOJM01	10.06	GVOUK04	0.40	GVOMR04	0.21
GVOJM02	0.97	GVOIR01	15.26	GVOTU01	19.37
GVOJM03	7.58	GVOIR02	2.34	GVOTU02	2.00
GVOJM04	0.17	GVOIR03	9.86	GVOUA01	20.30
GVOTR01	11.94	GVOIR04	0.47	GVOUA02	2.90
GVOTR02	1.33	GVONH01	14.74	GVOUA03	12.53
GVOTR03	8.50	GVONH02	2.25	GVOUA04	0.21

Table 31. (Continued)

Coded route	Oppor. Cost	Coded route	Oppor. Cost	Coded route	Oppor. Cost
GV0IS01	20.51	GV0AG01	20.64	LA0CL06	17.30
GV0IS02	2.96	GV0AG02	1.43	LA0SW01	44.45
GV0IS03	12.65	GV0AU01	24.14	LA0SW02	24.00
GV0IS04	0.22	GV0AU02	3.62	LA0SW03	34.26
GV0SN01	17.91	GV0AU03	13.90	LA0SW04	20.42
GV0SN02	2.30	LA0MX01	39.18	LA0NW01	43.82
GV0SN03	11.76	LA0MX02	23.22	LA0NW02	23.74
GV0SN04	0.21	LA0MX03	32.34	LA0NW03	33.86
GV0NG01	19.66	LA0MX04	20.88	LA0NW04	20.24
GV0NG02	1.43	LA0PA01	35.44	LA0FN01	45.20
GV0SA01	22.00	LA0PA02	21.61	LA0FN02	24.05
GV0SA02	3.22	LA0PA03	29.95	LA0FN03	34.56
GV0SA03	13.35	LA0PA04	19.75	LA0FN04	20.31
GV0SA04	0.20	LA0JM01	36.96	LA0DN01	44.54
GV0KN01	28.49	LA0JM02	22.28	LA0DN02	23.93
GV0KN02	4.28	LA0JM03	30.93	LA0DN03	34.24
GV0KN03	16.85	LA0JM04	20.22	LA0DN04	20.32
GV0KN04	0.20	LA0TR01	37.93	LA0UK01	43.62
GV0ID01	32.51	LA0TR02	22.31	LA0UK02	24.09
GV0ID02	5.02	LA0TR03	31.30	LA0UK03	34.02
GV0ID03	18.78	LA0TR04	20.03	LA0UK04	20.72
GV0ID04	0.19	LA0VZ01	37.39	LA0UK05	28.04
GV0PK01	32.63	LA0VZ02	22.25	LA0UK06	18.61
GV0PK02	5.05	LA0VZ03	31.07	LA0IR01	43.54
GV0PK03	18.84	LA0VZ04	20.09	LA0IR02	24.16
GV0PK04	0.20	LA0VZ05	26.85	LA0IR03	34.04
GV0VN01	32.43	LA0VZ06	18.67	LA0IR04	20.83
GV0VN02	4.98	LA0BZ01	44.16	LA0NH01	42.70
GV0VN03	18.72	LA0BZ02	23.52	LA0NH02	23.96
GV0VN04	0.15	LA0BZ03	34.33	LA0NH03	33.12
GV0PP01	30.82	LA0BZ04	20.09	LA0NH04	20.58
GV0PP02	4.67	LA0BZ05	28.10	LA0NH05	27.00
GV0PP03	17.95	LA0BZ06	17.90	LA0NH06	18.39
GV0PP04	0.15	LA0UR01	44.92	LA0BL01	42.44
GV0HK01	30.48	LA0UR02	23.45	LA0BL02	23.86
GV0HK02	4.57	LA0UR03	34.55	LA0BL03	32.97
GV0HK03	17.75	LA0UR04	19.82	LA0BL04	20.52
GV0HK04	0.09	LA0PU01	35.31	LA0BL05	26.90
GV0JP01	26.01	LA0PU02	20.94	LA0BL06	18.34
GV0JP02	3.95	LA0PU03	29.48	LA0FR01	44.10
GV0JP03	15.26	LA0PU04	18.96	LA0FR02	23.94
GV0JP04	0.17	LA0CL01	37.45	LA0FR03	34.10
GV0CN01	15.34	LA0CL02	21.28	LA0FR04	20.44
GV0CN02	4.02	LA0CL03	30.47	LA0WG01	43.14
GV0CN03	10.97	LA0CL04	18.88	LA0WG02	23.99
GV0CN04	2.52	LA0CL05	25.87	LA0WG03	33.30

Table 31. (Continued)

Coded route	Oppor. Cost	Coded route	Oppor. Cost	Coded route	Oppor. Cost
LA0WG04	20.52	LA0IS04	20.40	LA0CN02	25.16
LA0WG05	27.03	LA0IS05	29.06	LA0CN03	34.03
LA0WG06	18.26	LA0IS06	17.82	LA0CN04	22.46
LA0EG01	44.82	LA0SN01	44.62	LA0AG01	46.45
LA0EG02	23.97	LA0SN02	23.54	LA0AG02	22.33
LA0PO01	47.60	LA0SN03	34.99	LA0AU01	36.77
LA0PO02	24.58	LA0SN04	20.20	LA0AU02	19.59
LA0PO03	36.25	LA0NG01	45.47	LA0AU03	28.67
LA0PO04	20.60	LA0NG02	22.34	LA0AU04	16.76
LA0SI01	45.42	LA0SA01	43.06	LA0AU05	23.54
LA0SI02	24.00	LA0SA02	22.34	LA0AU06	14.96
LA0SI03	35.09	LA0SA03	33.18	SL0MX01	40.35
LA0SI04	20.40	LA0SA04	18.89	SL0MX02	23.69
LA0PG01	44.21	LA0SA05	26.92	SL0MX03	32.58
LA0PG02	23.84	LA0SA06	16.70	SL0MX04	20.99
LA0PG03	34.55	LA0KN01	53.14	SL0PA01	36.57
LA0PG04	20.47	LA0KN02	24.74	SL0PA02	22.06
LA0PG05	28.42	LA0KN03	38.84	SL0PA03	30.18
LA0PG06	18.32	LA0KN04	19.72	SL0PA04	19.86
LA0IT01	46.09	LA0ID01	48.51	SL0JM01	38.11
LA0IT02	24.15	LA0ID02	22.25	SL0JM02	22.73
LA0IT03	35.43	LA0ID03	35.58	SL0JM03	31.16
LA0IT04	20.42	LA0ID04	17.72	SL0JM04	20.33
LA0IT05	28.72	LA0PK01	49.58	SL0TR01	39.07
LA0IT06	18.06	LA0PK02	22.63	SL0TR02	22.76
LA0TK01	47.90	LA0PK03	36.20	SL0TR03	31.53
LA0TK02	24.48	LA0PK04	17.95	SL0TR04	20.14
LA0TK03	36.29	LA0VN01	39.95	SL0VZ01	38.54
LA0TK04	20.41	LA0VN02	19.02	SL0VZ02	22.71
LA0TK05	29.05	LA0VN03	30.42	SL0VZ03	31.30
LA0TK06	17.83	LA0VN04	15.73	SL0VZ04	20.21
LA0MR01	45.84	LA0PP01	39.57	SL0VZ05	26.40
LA0MR02	23.91	LA0PP02	19.18	SL0VZ06	18.49
LA0MR03	35.67	LA0PP03	30.38	SL0BZ01	45.30
LA0MR04	20.39	LA0PP04	16.00	SL0BZ02	23.97
LA0MR05	29.13	LA0HK01	38.39	SL0BZ03	34.55
LA0MR06	18.11	LA0HK02	18.76	SL0BZ04	20.20
LA0TU01	46.95	LA0HK03	29.69	SL0BZ05	27.63
LA0TU02	23.58	LA0HK04	15.77	SL0BZ06	17.72
LA0UA01	47.80	LA0JP01	35.67	SL0UR01	45.14
LA0UA02	24.44	LA0JP02	18.80	SL0UR02	23.55
LA0UA03	36.24	LA0JP03	28.24	SL0UR03	34.23
LA0UA04	20.39	LA0JP04	16.24	SL0UR04	19.72
LA0IS01	47.99	LA0JP05	23.40	SL0PU01	36.49
LA0IS02	24.49	LA0JP06	14.57	SL0PU02	21.41
LA0IS03	36.34	LA0CN01	41.77	SL0PU03	29.73

Table 31. (Continued)

Coded route	Oppor. Cost	Coded route	Oppor. Cost	Coded route	Oppor. Cost
SLOPU04	19.07	SLOFR02	24.40	SLOUA02	24.81
SLOCL01	38.62	SLOFR03	34.33	SLOUA03	36.32
SLOCL02	21.74	SLOFR04	20.54	SLOUA04	20.44
SLOCL03	30.72	SLOWG01	44.28	SLOIS01	49.16
SLOCL04	18.99	SLOWG02	24.45	SLOIS02	24.96
SLOCL05	25.42	SLOWG03	33.53	SLOIS03	36.58
SLOCL06	17.14	SLOWG04	20.62	SLOIS04	20.52
SLOSW01	45.60	SLOWG05	26.56	SLOIS05	28.61
SLOSW02	24.46	SLOWG06	18.09	SLOIS06	17.65
SLOSW03	34.48	SLOEG01	46.96	SLOSN01	45.77
SLOSW04	20.53	SLOEG02	24.80	SLOSN02	24.00
SLONW01	45.09	SLOPO01	48.30	SLOSN03	35.22
SLONW02	24.24	SLOPO02	24.87	SLOSN04	20.32
SLONW03	34.17	SLOPO03	36.21	SLONG01	46.57
SLONW04	20.38	SLOPO04	20.61	SLONG02	22.77
SLOFN01	46.34	SLOSI01	46.58	SLOSA01	49.22
SLOFN02	24.51	SLOSI02	24.48	SLOSA02	24.68
SLOFN03	34.79	SLOSI03	35.34	SLOSA03	36.42
SLOFN04	20.42	SLOSI04	20.52	SLOSA04	20.16
SLODN01	45.71	SLOPG01	45.35	SLOSA05	28.33
SLODN02	24.40	SLOPG02	24.29	SLOSA06	17.24
SLODN03	34.48	SLOPG03	34.77	SLOKN01	50.83
SLODN04	20.43	SLOPG04	20.58	SLOKN02	23.90
SLOUK01	44.76	SLOPG05	27.95	SLOKN03	36.99
SLOUK02	24.54	SLOPG06	18.15	SLOKN04	19.03
SLOUK03	34.24	SLOIT01	47.23	SLOID01	44.96
SLOUK04	20.84	SLOIT02	24.61	SLOID02	20.95
SLOUK05	27.58	SLOIT03	35.65	SLOID03	32.98
SLOUK06	18.43	SLOIT04	20.54	SLOID04	16.75
SLOIR01	44.69	SLOIT05	28.27	SLOPK01	46.00
SLOIR02	24.62	SLOIT06	17.89	SLOPK02	21.32
SLOIR03	34.26	SLOTK01	49.08	SLOPK03	33.60
SLOIR04	20.95	SLOTK02	24.95	SLOPK04	16.97
SLONH01	43.84	SLOTK03	36.54	SLOVN01	38.25
SLONH02	24.42	SLOTK04	20.53	SLOVN02	18.42
SLONH03	33.35	SLOTK05	28.60	SLOVN03	28.94
SLONH04	20.69	SLOTK06	17.67	SLOVN04	15.19
SLONH05	26.54	SLOMR01	46.98	SLOPP01	36.58
SLONH06	18.21	SLOMR02	24.37	SLOPP02	18.09
SLOBL01	43.61	SLOMR03	35.90	SLOPP03	28.12
SLOBL02	24.33	SLOMR04	20.49	SLOPP04	15.17
SLOBL03	33.21	SLOMR05	28.66	SLOHK01	36.11
SLOBL04	20.64	SLOMR06	17.93	SLOHK02	17.94
SLOBL05	26.45	SLOTU01	48.10	SLOHK03	27.86
SLOBL06	18.17	SLOTU02	24.03	SLOHK04	15.08
SLOFR01	45.24	SLOUA01	48.70	SLOJP01	31.57

Table 31. (Continued)

Coded route	Oppor. Cost
SL0JP02	17.29
SL0JP03	25.32
SL0JP04	15.14
SL0JP05	20.98
SL0JP06	13.65
SL0CN01	43.26
SL0CN02	25.74
SL0CN03	34.46
SL0CN04	22.65
SL0AG01	47.55
SL0AG02	22.77
SL0AU01	35.89
SL0AU02	19.28
SL0AU03	27.68
SL0AU04	16.40
SL0AU05	22.33
SL0AU06	14.50

Table 32. Opportunity Cost: model V, objective function 2

Coded route	Oppor. Cost	Coded route	Oppor. Cost	Coded route	Oppor. Cost
SE0CS0	0.85	MC7IA5	6.29	OH4IL3	5.78
SE0NO0	3.47	MC7IA6	4.85	OH4IL4	3.77
SE0GV0	6.49	MC8PH0	0.57	OH4IL5	3.34
SE0NE0	4.36	MC8CH0	1.24	OH5PH0	0.10
DL0GV0	0.45	MC8TO0	0.57	OH5CS0	3.93
DL0AP0	2.35	MC8OH3	0.43	OH5NO0	4.68
DL0MO1	6.31	MC8IN3	0.21	OH5CH0	3.72
DL0KA8	6.20	MC8IN4	2.27	OH5TO0	1.40
SP0NO0	2.35	MC8IN5	2.36	OH5NE0	0.36
SP0KA8	6.77	MC8IL2	2.63	OH5AP0	0.20
MC5PH0	0.86	MC8IL3	5.53	OH5OH3	1.13
MC5CH0	1.75	MC8IL4	3.66	OH5IN3	1.83
MC5TO0	0.74	MC8IL5	3.38	OH5IN4	3.31
MC5OH2	0.63	MC8IA6	5.95	OH5IN5	2.94
MC5OH3	0.94	MC9PH0	1.17	OH5IL2	4.97
MC5IN3	1.63	MC9CH0	3.24	OH5IL4	5.37
MC5IN4	3.08	MC9NE0	0.72	OH5IL5	4.94
MC5IN5	3.23	MC9OH2	0.96	OH7PH0	0.77
MC5IL2	3.10	MC9OH3	1.02	OH7NO0	1.47
MC5IL3	6.03	MC9IN3	2.50	OH7CH0	3.05
MC5IL4	4.28	MC9IN4	3.85	OH7TO0	1.70
MC5IL5	4.07	MC9IN5	3.78	OH7OH2	0.89
MC5IA6	6.19	MC9IL2	4.62	OH7OH3	1.16
MC6PH0	0.92	MC9IL3	7.45	OH7IN3	1.83
MC6CH0	3.24	MC9IL4	5.51	OH7IN4	2.18
MC6TO0	0.96	MC9IL5	5.16	OH7IN5	2.25
MC6OH2	1.05	OH1PH0	0.76	OH7IL2	4.16
MC6OH3	1.20	OH1CH0	2.27	OH7IL3	6.24
MC6IN3	2.38	OH1NE0	0.58	OH7IL4	4.26
MC6IN4	4.30	OH1AP0	1.32	OH7IL5	3.86
MC6IN5	4.33	OH1OH3	0.55	OH8PH0	0.82
MC6IL2	4.62	OH1IN4	2.47	OH8CH0	4.85
MC6IL4	5.71	OH1IN5	2.34	OH8TO0	2.85
MC6IL5	5.44	OH1IL2	3.60	OH8OH2	2.08
MC7PH0	0.66	OH1IL3	6.28	OH8OH3	1.74
MC7CH0	0.80	OH1IL4	4.29	OH8IN3	3.08
MC7TO0	0.05	OH1IL5	3.90	OH8IN4	4.08
MC7NE0	0.14	OH1IA6	7.06	OH8IN5	3.66
MC7OH3	0.48	OH4CH0	2.13	OH8IL2	6.01
MC7IN3	0.24	OH4TO0	0.44	OH8IL4	6.16
MC7IN4	1.47	OH4NE0	0.12	OH8IL5	5.76
MC7IN5	1.70	OH4OH2	0.27	IN1PH0	1.77
MC7IL2	1.55	OH4IN3	0.38	IN1NO0	2.89
MC7IL3	4.47	OH4IN4	1.73	IN1GV0	8.19
MC7IL4	2.66	OH4IN5	1.93	IN1TO0	1.28
MC7IL5	2.43	OH4IL2	3.36	IN1NE0	1.63

Table 32. (Continued)

Coded route	Oppor. Cost	Coded route	Oppor. Cost	Coded route	Oppor. Cost
IN1OH2	1.06	IN7TO0	1.66	WI4NO0	1.60
IN1OH3	1.59	IN7NE0	1.61	WI4GV0	8.72
IN1IN3	0.66	IN7OH2	1.13	WI4CH0	1.23
IN1IN4	0.02	IN7OH3	1.52	WI4NE0	2.52
IN1IN5	1.42	IN7IN3	0.94	WI4IN3	2.61
IN1IL2	1.61	IN7IN5	0.79	WI4IN4	3.07
IN1IL3	3.81	IN7IL2	2.21	WI4IL2	1.90
IN1IL4	2.38	IN7IL3	3.52	WI4IL3	3.63
IN1IL5	1.46	IN7IL4	1.75	WI4IL4	2.89
IN1IA5	6.15	IN7IL5	2.17	WI4IL5	3.28
IN1IA6	4.72	IN7IA5	6.33	WI4MN8	2.82
IN1MO1	8.01	IN7IA6	5.04	WI4IA5	3.43
IN2PH0	1.82	IN8PH0	1.31	WI4IA6	2.57
IN2NO0	4.55	IN8CS0	2.88	WI4MO1	6.16
IN2GV0	9.20	IN8NO0	1.77	WI6NO0	2.66
IN2CH0	1.66	IN8GV0	6.49	WI6GV0	8.68
IN2TO0	1.33	IN8CH0	2.06	WI6DU0	1.25
IN2NE0	1.67	IN8TO0	1.93	WI6TO0	0.85
IN2OH2	1.11	IN8NE0	1.72	WI6NE0	0.47
IN2OH3	1.63	IN8OH2	1.32	WI6OH2	0.80
IN2IN4	1.45	IN8OH3	1.67	WI6OH3	1.24
IN2IN5	1.02	IN8IN3	1.29	WI6IN3	0.78
IN2IL2	3.27	IN8IN4	0.84	WI6IN4	1.70
IN2IL3	5.03	IN8IN5	0.57	WI6IN5	2.14
IN2IL4	3.04	IN8IL2	2.93	WI6IL2	1.02
IN2IL5	3.38	IN8IL3	4.40	WI6IL3	3.39
IN2IA5	7.33	IN8IL4	2.58	WI6IL4	2.07
IN2IA6	5.89	IN8IL5	2.33	WI6IL5	2.18
IN6PH0	1.17	IN8IA6	5.88	WI6MN8	4.54
IN6CH0	1.94	IN9PH0	2.12	WI6IA5	4.30
IN6TO0	1.17	IN9GV0	5.43	WI6IA6	3.01
IN6NE0	1.27	IN9CH0	2.23	WI8NO0	2.70
IN6AP0	0.87	IN9TO0	2.66	WI8GV0	8.18
IN6OH2	0.69	IN9NE0	2.55	WI8DU0	2.00
IN6OH3	1.14	IN9AP0	0.55	WI8TO0	1.84
IN6IN4	1.18	IN9OH2	2.11	WI8NE0	1.87
IN6IN5	0.64	IN9IN3	1.93	WI8OH2	1.78
IN6IL2	3.09	IN9IN4	1.24	WI8IN3	1.43
IN6IL3	5.39	IN9IN5	1.42	WI8IN4	1.83
IN6IL4	3.37	IN9IL2	2.93	WI8IN5	2.40
IN6IL5	2.94	IN9IL3	3.83	WI8IL2	1.16
IN6IA6	6.48	IN9IL4	2.30	WI8IL3	2.87
IN7PH0	1.26	IN9IL5	2.40	WI8IL4	1.78
IN7NO0	0.65	IN9IA5	6.66	WI8IL5	2.08
IN7GV0	5.86	IN9IA6	5.45	WI8MN8	4.44
IN7CH0	1.41	IN9MO1	7.47	WI8IA5	3.76

Table 32. (Continued)

Coded route	Oppor. Cost	Coded route	Oppor. Cost	Coded route	Oppor. Cost
WI8IA6	2.42	IL6IN3	0.95	IL9IN4	0.34
WI8MO1	6.31	IL6IN4	0.20	IL9IN5	0.63
WI9NO0	2.65	IL6IN5	0.77	IL9IL2	1.80
WI9GV0	9.04	IL6IL2	0.75	IL9IL3	2.49
WI9DU0	3.08	IL6IL3	1.12	IL9IL4	1.43
WI9TO0	1.70	IL6IL5	1.18	IL9IL5	1.41
WI9NE0	1.72	IL6MN8	5.66	IL9IA5	5.30
WI9OH2	1.65	IL6IA5	3.82	IL9IA6	4.13
WI9OH3	2.14	IL6IA6	2.65	IL9MO1	6.04
WI9IN3	1.38	IL6MO1	4.81	MN1NE0	5.01
WI9IN4	2.06	IL7CS0	2.83	MN1MN8	3.71
WI9IN5	2.55	IL7NO0	1.02	MN4NO0	3.94
WI9IL2	0.78	IL7GV0	4.79	MN4GV0	8.78
WI9IL3	3.82	IL7CH0	0.18	MN4NE0	4.72
WI9IL4	2.40	IL7TO0	1.17	MN4MN8	2.25
WI9IL5	2.42	IL7NE0	1.36	MN4IA5	3.99
WI9MN8	5.83	IL7AP0	0.06	MN4IA6	3.77
WI9IA5	5.12	IL7OH2	0.77	MN4MO1	6.01
WI9IA6	3.73	IL7IN3	0.34	MN5NO0	2.46
WI9MO1	7.57	IL7IN4	0.23	MN5GV0	9.55
IL1PH0	2.71	IL7IL2	0.72	MN5NE0	4.52
IL1NO0	1.60	IL7IL3	1.68	MN5AP0	6.20
IL1GV0	7.63	IL7IA5	4.50	MN5IL2	3.88
IL1DU0	3.34	IL7IA6	3.26	MN5IL3	5.16
IL1TO0	2.09	IL7MO1	5.57	MN5MN8	2.13
IL1NE0	2.37	IL8GV0	3.93	MN5IA5	4.35
IL1AP0	2.68	IL8CH0	1.24	MN5IA6	3.96
IL1OH2	1.97	IL8TO0	2.22	MN5MO1	6.71
IL1IN3	1.46	IL8NE0	2.31	MN6NO0	1.42
IL1IN4	1.45	IL8AP0	0.47	MN6GV0	9.60
IL1IN5	2.07	IL8IN3	1.41	MN6CH0	2.85
IL1IL3	2.98	IL8IN4	0.60	MN6NE0	3.93
IL1IL4	1.06	IL8IN5	0.99	MN6AP0	5.75
IL1IL5	2.33	IL8IL2	1.78	MN6IL2	3.49
IL1MN8	5.34	IL8IL3	2.14	MN6IL3	4.94
IL1IA5	4.04	IL8IL4	1.21	MN6MN8	2.99
IL1IA6	2.98	IL8IL5	1.25	MN6IA5	4.27
IL1MO1	6.22	IL8IA5	4.89	MN6IA6	3.76
IL6PH0	1.98	IL8IA6	3.80	MN6MO1	6.80
IL6CS0	3.71	IL8MO1	5.46	MN7NO0	3.55
IL6GV0	4.77	IL9GV0	4.29	MN7GV0	6.72
IL6CH0	0.31	IL9CH0	1.17	MN7NE0	3.92
IL6TO0	1.78	IL9TO0	1.88	MN7IL3	3.21
IL6NE0	2.07	IL9NE0	1.89	MN7MN8	1.12
IL6AP0	0.98	IL9OH2	1.39	MN7IA5	2.20
IL6OH2	1.47	IL9IN3	1.11	MN7IA6	2.14

Table 32. (Continued)

Coded route	Oppor. Cost	Coded route	Oppor. Cost	Coded route	Oppor. Cost
MN7MO1	3.97	IA3CH0	0.16	IA8IN5	1.61
MN9CS0	7.22	IA3NE0	2.23	IA8IL2	0.36
MN9NO0	0.98	IA3AP0	2.95	IA8IL3	0.30
MN9GV0	7.73	IA3IN3	1.64	IA8IL4	0.31
MN9CH0	1.11	IA3IN4	1.71	IA8IL5	0.99
MN9NE0	2.82	IA3IN5	2.35	IA8MN8	2.13
MN9AP0	4.00	IA3IL2	0.62	IA8IA6	0.82
MN9IN4	2.81	IA3IL3	1.76	IA8MO1	1.81
MN9IL2	1.66	IA3IL4	1.27	IA8KA8	4.44
MN9IL3	2.94	IA3IL5	1.79	IA9NO0	0.21
MN9IL4	2.43	IA3MN8	2.14	IA9GV0	4.92
MN9IL5	2.92	IA3IA5	1.77	IA9DU0	2.09
MN9MN8	1.56	IA3MO1	4.21	IA9CH0	0.04
MN9IA5	2.48	IA4NO0	1.55	IA9NE0	2.39
MN9IA6	2.37	IA4GV0	4.05	IA9AP0	2.09
MN9MO1	5.02	IA4CH0	0.16	IA9IN3	1.33
IA1NO0	3.35	IA4NE0	2.44	IA9IN4	0.93
IA1GV0	5.75	IA4AP0	2.53	IA9IN5	1.58
IA1CH0	1.18	IA4IL2	0.52	IA9IL2	0.35
IA1NE0	3.24	IA4IL3	0.76	IA9IL3	0.50
IA1AP0	3.82	IA4IL4	0.70	IA9IL4	0.28
IA1IL2	1.60	IA4IL5	1.36	IA9IL5	0.96
IA1IL3	2.16	IA4MN8	0.59	IA9MN8	3.22
IA1IL4	1.99	IA4IA6	0.02	IA9IA5	1.51
IA1MN8	0.92	IA4MO1	1.28	IA9MO1	2.90
IA1IA5	1.15	IA4KA8	3.73	MO2GV0	2.89
IA1IA6	1.15	IA7NO0	0.28	MO2CH0	0.08
IA1MO1	2.95	IA7GV0	2.78	MO2IN4	0.57
IA2CS0	6.26	IA7CH0	0.07	MO2IN5	1.19
IA2NO0	1.50	IA7NE0	2.42	MO2IL2	0.40
IA2GV0	6.16	IA7AP0	2.05	MO2IL4	0.0
IA2CH0	0.44	IA7IL2	0.40	MO2IL5	0.67
IA2NE0	2.49	IA7IL3	0.32	MO2MN8	3.11
IA2AP0	3.18	IA7IL4	0.35	MO2IA5	0.99
IA2IN4	1.93	IA7IL5	1.03	MO2IA6	0.69
IA2IL2	0.88	IA7MN8	1.09	MO2MO1	1.33
IA2IL3	1.72	IA7MO1	0.02	MO2KA8	3.96
IA2IL4	1.41	IA7KA8	2.47	MO3CS0	4.83
IA2IL5	1.98	IA8CS0	4.83	MO3GV0	4.54
IA2MN8	0.98	IA8NO0	1.12	MO3CH0	1.04
IA2IA5	0.46	IA8GV0	4.00	MO3IN3	2.03
IA2IA6	1.37	IA8DU0	1.31	MO3IN4	1.37
IA2MO1	3.40	IA8CH0	0.04	MO3IN5	1.98
IA3NO0	1.23	IA8NE0	2.39	MO3IL2	1.38
IA3GV0	6.70	IA8AP0	2.07	MO3IL3	1.09
IA3DU0	0.64	IA8IN4	0.95	MO3IL4	0.85

Table 32. (Continued)

Coded route	Oppor. Cost	Coded route	Oppor. Cost	Coded route	Oppor. Cost
MO3IL5	1.51	MO7IA6	3.16	NB3CH0	0.23
MO3MN8	4.97	MO7MO1	2.74	NB3NE0	2.49
MO3IA5	3.03	MO7KA8	2.54	NB3AP0	2.50
MO3IA6	1.99	MO9CS0	3.40	NB3IL3	0.73
MO3MO1	3.59	MO9GV0	3.78	NB3IA6	0.09
MO3KA8	6.22	MO9CH0	3.12	NB3MO1	0.49
MO4GV0	0.90	MO9IN3	3.13	NB3KA8	1.67
MO4IN4	0.61	MO9IN4	2.37	NB4NO0	2.39
MO4IL2	0.77	MO9IN5	2.65	NB4GV0	1.19
MO4IL3	0.34	MO9IL2	3.68	NB4CH0	0.98
MO4IL4	0.21	MO9IL3	3.94	NB4NE0	3.29
MO4IL5	0.83	MO9IL4	2.90	NB4AP0	2.95
MO4MN8	3.44	MO9IL5	3.13	NB4MO1	0.71
MO4IA5	1.68	MO9IA5	6.57	NB5CS0	4.75
MO4IA6	1.21	MO9IA6	5.57	NB5NO0	2.13
MO4MO1	1.20	MO9MO1	6.76	NB5GV0	1.25
MO4KA8	2.28	ND6NE0	5.03	NB5LA0	1.50
MO5GV0	3.46	ND6MN8	2.92	NB5SL0	1.36
MO5CH0	1.77	ND9NE0	4.97	NB5CH0	0.21
MO5IN4	1.81	ND9MN8	2.56	NB5NE0	2.53
MO5IN5	2.36	ND9IA5	4.20	NB5AP0	2.22
MO5IL2	2.13	SD3NE0	4.68	NB5MT0	1.51
MO5IL3	1.75	SD3MN8	1.95	NB5MN8	0.12
MO5IL4	1.49	SD3IA5	3.52	NB5IA6	0.08
MO5IL5	2.07	SD3IA6	3.40	NB5KA8	0.05
MO5MN8	5.62	SD3MO1	5.28	NB8NO0	0.27
MO5IA5	3.70	SD6NO0	3.55	NB8GV0	1.20
MO5IA6	2.98	SD6GV0	6.26	NB8LA0	3.58
MO5MO1	3.56	SD6NE0	4.12	NB8SL0	3.94
MO5KA8	5.54	SD6MN8	1.15	NB8CH0	0.07
MO6GV0	4.40	SD6IA5	2.26	NB8NE0	2.42
MO6CH0	1.91	SD6IA6	2.25	NB8AP0	1.75
MO6IN3	2.48	SD6MO1	3.70	NB8IL3	0.20
MO6IN4	1.69	SD9NO0	2.33	NB8MN8	0.90
MO6IN5	2.19	SD9GV0	4.75	NB8IA5	0.04
MO6IL2	2.34	SD9NE0	3.75	NB8IA6	0.04
MO6IL3	1.97	SD9AP0	4.16	NB8KA8	0.39
MO6IL4	1.58	SD9MN8	0.91	KA2NO0	0.71
MO6IL5	2.06	SD9IA5	1.49	KA2GV0	0.86
MO6IA5	4.74	SD9IA6	1.55	KA2NE0	2.99
MO6IA6	3.78	SD9MO1	2.44	KA2AP0	2.15
MO6MO1	5.08	SD9KA8	3.73	KA2MT0	3.11
MO7NO0	0.27	NB3NO0	0.73	KA2IL3	0.71
MO7IL3	2.14	NB3GV0	2.66	KA2MN8	1.43
MO7IL4	1.87	NB3LA0	3.61	KA2IA5	0.64
MO7IA5	3.64	NB3SL0	2.91	KA2IA6	0.63

Table 32. (Continued)

Coded route	Oppor. Cost	Coded route	Oppor. Cost	Coded route	Oppor. Cost
KA2KA8	0.03	DU0UR01	22.11	DU0ID01	33.85
KA3GV0	1.97	DU0UR02	2.21	DU0ID02	4.07
KA3NE0	3.56	DU0PU01	19.59	DU0PK01	33.98
KA3AP0	2.54	DU0PU02	2.37	DU0PK02	4.11
KA3IL3	1.23	DU0CL01	21.16	DU0VN01	37.99
KA3IL4	1.25	DU0CL02	2.49	DU0VN02	5.61
KA3MN8	2.87	DU0SW01	14.36	DU0PP01	36.59
KA3IA5	1.57	DU0SW02	0.04	DU0PP02	5.38
KA3IA6	1.43	DU0NW01	14.40	DU0HK01	36.24
KA3MO1	0.74	DU0NW02	0.03	DU0HK02	5.27
KA3KA8	1.71	DU0FN01	15.95	DU0JP01	31.69
KA5NO0	2.88	DU0FN02	0.42	DU0JP02	4.62
KA5GV0	1.80	DU0DN01	14.49	DU0CN01	8.45
KA5NE0	5.37	DU0DN02	0.01	DU0AG01	20.66
KA5AP0	4.14	DU0UK01	13.15	DU0AU01	29.87
KA5MT0	4.59	DU0IR01	12.88	DU0AU02	4.32
KA5IA5	3.23	DU0NH01	12.56	CH0MX01	17.94
KA5MO1	2.36	DU0BL01	12.56	CH0MX02	2.64
KA6PH0	3.65	DU0FR01	14.97	CH0PA01	16.98
KA6CS0	4.54	DU0FR02	0.36	CH0PA02	2.05
KA6GV0	1.42	DU0WG01	12.97	CH0JM01	15.90
KA6NE0	3.70	DU0EG01	14.67	CH0JM02	1.75
KA6AP0	2.32	DU0PO01	17.06	CH0TR01	15.81
KA6IL3	1.41	DU0PO02	0.45	CH0TR02	1.38
KA6IL4	1.38	DU0SI01	16.29	CH0VZ01	16.13
KA6MN8	3.71	DU0SI02	0.40	CH0VZ02	1.65
KA6IA5	2.20	DU0PG01	14.68	CH0BZ01	20.10
KA6IA6	1.94	DU0PG02	0.09	CH0BZ02	1.86
KA6MO1	1.43	DU0IT01	16.97	CH0UR01	21.98
KA6KA8	1.75	DU0IT02	0.56	CH0UR02	2.21
KA9IL3	0.10	DU0TK01	18.81	CH0PU01	19.46
KA9IA5	1.09	DU0TK02	0.90	CH0PU02	2.37
KA9IA6	0.78	DU0MR01	16.97	CH0CL01	21.88
KA9MO1	0.03	DU0MR02	0.41	CH0CL02	2.80
DU0MX01	18.06	DU0TU01	17.85	CH0SW01	14.24
DU0MX02	2.64	DU0UA01	18.75	CH0SW02	0.05
DU0PA01	17.11	DU0UA02	0.88	CH0NW01	14.27
DU0PA02	2.05	DU0IS01	19.05	CH0NW02	0.03
DU0JM01	16.02	DU0IS02	0.96	CH0FN01	15.83
DU0JM02	1.75	DU0SN01	18.07	CH0FN02	0.42
DU0TR01	15.93	DU0SN02	0.91	CH0DN01	14.37
DU0TR02	1.38	DU0NG01	19.68	CH0UK01	13.02
DU0VZ01	16.25	DU0SA01	23.34	CH0UK02	0.01
DU0VZ02	1.66	DU0SA02	2.27	CH0IR01	12.75
DU0BZ01	20.21	DU0KN01	29.84	CH0IR02	0.01
DU0BZ02	1.86	DU0KN02	3.33	CH0NH01	12.44

Table 32. (Continued)

Coded route	Oppor. Cost	Coded route	Oppor. Cost	Coded route	Oppor. Cost
CHOBL01	12.44	CHOCN01	8.34	TOOPO02	0.46
CHOBL02	0.0	CHOCN02	0.01	TOOSI01	15.30
CHOFR01	14.85	CHOAG01	20.54	TOOSI02	0.41
CHOFR02	0.36	CHOAG02	0.0	TOOPG01	13.70
CHOWG01	12.85	CHOAU01	29.74	TOOPG02	0.09
CHOWG02	0.01	CHOAU02	4.33	TOOIT01	15.98
CHOEG01	14.56	TOOMX01	17.08	TOOIT02	0.56
CHOEG02	0.01	TOOMX02	2.65	TOOTK01	17.82
CHOPO01	16.94	TOOPA01	16.12	TOOTK02	0.90
CHOPO02	0.46	TOOPA02	2.05	TOOMR01	15.98
CHOSI01	16.16	TOOJM01	15.04	TOOMR02	0.42
CHOSI02	0.41	TOOJM02	1.75	TOOTU01	16.87
CHOPG01	14.56	TOOTR01	14.94	TOOTU02	0.0
CHOPG02	0.09	TOOTR02	1.38	TOOUA01	17.77
CHOIT01	16.84	TOOVZ01	15.26	TOOUA02	0.88
CHOIT02	0.56	TOOVZ02	1.66	TOOIS01	18.06
CHOTK01	18.68	TOOBZ01	19.23	TOOIS02	0.97
CHOTK02	0.90	TOOBZ02	1.87	TOOSN01	17.08
CHOMR01	16.84	TOOUR01	21.12	TOOSN02	0.91
CHOMR02	0.41	TOOUR02	2.22	TOONG01	18.70
CHOTU01	17.73	TOOPU01	18.60	TOONG02	0.0
CHOTU02	0.0	TOOPU02	2.37	TOOSA01	22.36
CHOUA01	18.64	TOOCL01	21.01	TOOSA02	2.27
CHOUA02	0.88	TOOCL02	2.81	TOOKN01	28.85
CHOIS01	18.93	TOOSW01	13.38	TOOKN02	3.33
CHOIS02	0.96	TOOSW02	0.05	TOOID01	32.86
CHOSN01	17.94	TOONW01	13.41	TOOID02	4.07
CHOSN02	0.91	TOONW02	0.04	TOOPK01	32.99
CHONG01	19.56	TOOFN01	14.96	TOOPK02	4.11
CHONG02	0.0	TOOFN02	0.42	TOOVN01	37.01
CHOSA01	23.23	TOODN01	13.51	TOOVN02	5.61
CHOSA02	2.27	TOODN02	0.01	TOOPP01	35.61
CHOKN01	29.71	TOOUK01	12.16	TOOPP02	5.39
CHOKN02	3.33	TOOUK02	0.01	TOOHK01	35.23
CHOID01	33.72	TOOIR01	11.89	TOOHK02	5.27
CHOID02	4.08	TOOIR02	0.01	TOOJP01	30.70
CHOPK01	33.86	TOONH01	11.58	TOOJP02	4.63
CHOPK02	4.11	TOOBL01	11.57	TOOCN01	7.47
CHOVN01	37.87	TOOBL02	0.0	TOOCN02	0.01
CHOVN02	5.61	TOOFR01	13.98	TOOAG01	19.68
CHOPP01	36.47	TOOFR02	0.36	TOOAG02	0.0
CHOPP02	5.39	TOOWG01	11.98	TOOAU01	28.88
CHOHK01	36.12	TOOWG02	0.01	TOOAU02	4.33
CHOHK02	5.28	TOOEG01	13.69	PHOMX01	15.55
CHOJP01	31.57	TOOEG02	0.01	PHOMX02	5.03
CHOJP02	4.63	TOOPO01	16.08	PHOMX03	11.70

Table 32. (Continued)

Coded route	Oppor. Cost	Coded route	Oppor. Cost	Coded route	Oppor. Cost
PHOMX04	3.73	PHODN02	4.49	PHOTK02	4.87
PHOPA01	15.45	PHODN03	11.61	PHOTK03	13.40
PHOPA02	4.76	PHODN04	2.41	PHOTK04	2.40
PHOPA03	11.49	PHOUK01	15.17	PHOMR01	18.59
PHOPA04	3.44	PHOUK02	4.09	PHOMR02	4.35
PHOJM01	14.36	PHOUK03	10.48	PHOMR03	12.85
PHOJM02	4.45	PHOUK04	2.48	PHOMR04	2.40
PHOJM03	10.91	PHOIR01	15.60	PHOTU01	19.68
PHOJM04	3.31	PHOIR02	4.35	PHOTU02	4.01
PHOTR01	15.05	PHOIR03	10.80	PHOUA01	20.49
PHOTR02	4.37	PHOIR04	2.71	PHOUA02	4.85
PHOTR03	11.10	PHONH01	15.00	PHOUA03	13.37
PHOTR04	3.05	PHONH02	4.24	PHOUA04	2.39
PHOVZ01	15.06	PHONH03	10.03	PHOIS01	20.83
PHOVZ02	4.53	PHONH04	2.51	PHOIS02	4.95
PHOVZ03	11.21	PHOBL01	14.53	PHOIS03	13.56
PHOVZ04	3.24	PHOBL02	4.06	PHOIS04	2.44
PHOBZ01	20.43	PHOBL03	9.76	PHOSN01	19.11
PHOBZ02	5.27	PHOBL04	2.41	PHOSN02	4.62
PHOBZ03	13.61	PHOFR01	16.74	PHOSN03	13.21
PHOBZ04	2.92	PHOFR02	4.35	PHOSN04	2.62
PHOUR01	22.32	PHOFR03	11.21	PHONG01	20.64
PHOUR02	5.62	PHOFR04	2.43	PHONG02	3.68
PHOUR03	14.53	PHOWG01	14.96	PHOSA01	24.30
PHOUR04	2.91	PHOWG02	4.07	PHOSA02	5.96
PHOPU01	18.77	PHOWG03	9.92	PHOSA03	15.46
PHOPU02	5.38	PHOWG04	2.32	PHOSA04	2.87
PHOPU03	13.09	PHOEG01	16.66	PHOKN01	30.79
PHOPU04	3.44	PHOEG02	4.07	PHOKN02	7.01
PHOCL01	21.18	PHOPO01	19.67	PHOKN03	18.96
PHOCL02	5.82	PHOPO02	4.75	PHOKN04	2.87
PHOCL03	14.24	PHOPO03	13.02	PHOID01	34.80
PHOCL04	3.43	PHOPO04	2.46	PHOID02	7.76
PHOSW01	16.97	PHOSI01	18.05	PHOID03	20.89
PHOSW02	4.35	PHOSI02	4.39	PHOID04	2.87
PHOSW03	11.30	PHOSI03	12.20	PHOPK01	34.93
PHOSW04	2.38	PHOSI04	2.38	PHOPK02	7.78
PHONW01	17.01	PHOPG01	16.77	PHOPK03	20.95
PHONW02	4.34	PHOPG02	4.20	PHOPK04	2.87
PHONW03	11.30	PHOPG03	11.61	PHOVN01	37.36
PHONW04	2.35	PHOPG04	2.44	PHOVN02	8.69
PHOFN01	18.55	PHOIT01	18.74	PHOVN03	22.42
PHOFN02	4.72	PHOIT02	4.55	PHOVN04	3.43
PHOFN03	12.11	PHOIT03	12.55	PHOPP01	35.77
PHOFN04	2.47	PHOIT04	2.42	PHOPP02	8.40
PHODN01	17.58	PHOTK01	20.53	PHOPP03	21.65

Table 32. (Continued)

Coded route	Oppor. Cost	Coded route	Oppor. Cost	Coded route	Oppor. Cost
PHOPP04	3.43	CSOUR04	0.38	CSOWG03	7.98
PHOHK01	35.71	CSOPU01	15.33	CSOWG04	0.04
PHOHK02	8.40	CSOPU02	2.55	CSOEG01	15.09
PHOHK03	21.63	CSOPU03	10.04	CSOEG02	1.93
PHOHK04	3.44	CSOPU04	0.74	CSOPO01	17.93
PHOJP01	30.89	CSOCL01	17.74	CSOPO02	2.56
PHOJP02	7.64	CSOCL02	2.98	CSOPO03	10.99
PHOJP03	18.92	CSOCL03	11.19	CSOPO04	0.15
PHOJP04	3.43	CSOCL04	0.73	CSOSI01	16.25
PHOCN01	15.13	CSOSW01	15.24	CSOSI02	2.17
PHOCN02	5.83	CSOSW02	2.15	CSOSI03	10.13
PHOCN03	11.58	CSOSW03	9.26	CSOSI04	0.07
PHOCN04	4.62	CSOSW04	0.07	CSOPG01	14.85
PHOAG01	21.62	CSONW01	15.33	CSOPG02	1.93
PHOAG02	3.68	CSONW02	2.15	CSOPG03	9.46
PHOAU01	29.06	CSONW03	9.30	CSOPG04	0.09
PHOAU02	7.35	CSONW04	0.06	CSOIT01	16.95
PHOAU03	17.59	CSOFN01	16.56	CSOIT02	2.32
PHOAU04	3.29	CSOFN02	2.42	CSOIT03	10.48
CSOMX01	11.95	CSOFN03	9.92	CSOIT04	0.09
CSOMX02	2.13	CSOFN04	0.11	CSOTK01	18.74
CSOMX03	8.55	CSODN01	15.36	CSOTK02	2.65
CSOMX04	0.99	CSODN02	2.10	CSOTK03	11.34
CSOPA01	12.02	CSODN03	9.28	CSOTK04	0.08
CSOPA02	1.92	CSOUK01	13.61	CSOMR01	16.93
CSOPA03	8.44	CSOUK02	1.96	CSOMR02	2.17
CSOPA04	0.73	CSOUK03	8.56	CSOMR03	10.86
CSOJM01	10.94	CSOUK04	0.21	CSOMR04	0.11
CSOJM02	1.62	CSOIR01	13.76	CSOTU01	17.84
CSOJM03	7.86	CSOIR02	2.11	CSOTU02	1.77
CSOJM04	0.61	CSOIR03	8.71	CSOUA01	18.59
CSOTR01	11.93	CSOIR04	0.37	CSOUA02	2.59
CSOTR02	1.66	CSONH01	12.99	CSOUA03	11.25
CSOTR03	8.24	CSONH02	1.94	CSOUA04	0.04
CSOTR04	0.42	CSONH03	7.84	CSOIS01	19.03
CSOVZ01	12.14	CSONH04	0.14	CSOIS02	2.73
CSOVZ02	1.89	CSOBL01	12.96	CSOIS03	11.49
CSOVZ03	8.46	CSOBL02	1.93	CSOIS04	0.12
CSOVZ04	0.66	CSOBL03	7.82	CSOSN01	16.79
CSOBZ01	17.66	CSOBL04	0.13	CSOSN02	2.20
CSOBZ02	2.68	CSOFR01	14.95	CSOSN03	10.82
CSOBZ03	10.96	CSOFR02	2.12	CSOSN04	0.18
CSOBZ04	0.37	CSOFR03	9.14	CSONG01	18.36
CSOUR01	19.60	CSOFR04	0.11	CSONG02	1.28
CSOUR02	3.05	CSOWG01	13.38	CSOSA01	21.74
CSOUR03	11.90	CSOWG02	1.93	CSOSA02	3.44

Table 32. (Continued)

Coded route	Oppor. Cost	Coded route	Oppor. Cost	Coded route	Oppor. Cost
CS0SA03	12.93	NO0PA03	7.56	NO0NH03	8.87
CS0SA04	0.37	NO0JM01	10.45	NO0NH04	0.14
CS0KN01	28.23	NO0JM02	1.04	NO0BL01	15.00
CS0KN02	4.50	NO0JM03	7.31	NO0BL02	2.29
CS0KN03	16.44	NO0TR01	12.20	NO0BL03	8.79
CS0KN04	0.37	NO0TR02	1.36	NO0BL04	0.11
CS0ID01	32.24	NO0TR03	8.14	NO0FR01	16.64
CS0ID02	5.24	NO0VZ01	11.39	NO0FR02	2.36
CS0ID03	18.36	NO0VZ02	1.20	NO0FR03	9.91
CS0ID04	0.36	NO0VZ03	7.76	NO0WG01	15.33
CS0PK01	32.37	NO0BZ01	18.23	NO0WG02	2.26
CS0PK02	5.28	NO0BZ02	2.49	NO0WG03	8.90
CS0PK03	18.43	NO0BZ03	11.05	NO0EG01	17.03
CS0PK04	0.37	NO0UR01	20.11	NO0EG02	2.26
CS0VN01	33.93	NO0UR02	2.84	NO0PO01	19.39
CS0VN02	5.87	NO0UR03	11.96	NO0PO02	2.71
CS0VN03	19.37	NO0PU01	14.29	NO0PO03	11.61
CS0VN04	0.73	NO0PU02	1.75	NO0SI01	18.08
CS0PP01	32.34	NO0PU03	9.16	NO0SI02	2.45
CS0PP02	5.56	NO0CL01	16.70	NO0SI03	10.97
CS0PP03	18.60	NO0CL02	2.19	NO0PG01	16.63
CS0PP04	0.73	NO0CL03	10.31	NO0PG02	2.19
CS0HK01	32.30	NO0SW01	17.04	NO0PG03	10.28
CS0HK02	5.57	NO0SW02	2.42	NO0IT01	18.65
CS0HK03	18.59	NO0SW03	10.10	NO0IT02	2.56
CS0HK04	0.75	NO0NW01	17.18	NO0IT03	11.25
CS0JP01	27.50	NO0NW02	2.45	NO0TK01	20.55
CS0JP02	4.83	NO0NW03	10.16	NO0TK02	2.93
CS0JP03	15.90	NO0FN01	18.27	NO0TK03	12.17
CS0JP04	0.75	NO0FN02	2.66	NO0MR01	18.55
CS0CN01	13.47	NO0FN03	10.69	NO0MR02	2.38
CS0CN02	3.65	NO0FN04	0.01	NO0MR03	11.58
CS0CN03	9.59	NO0DN01	17.59	NO0TU01	19.64
CS0CN04	2.34	NO0DN02	2.54	NO0TU02	2.05
CS0AG01	19.34	NO0DN03	10.37	NO0UA01	20.55
CS0AG02	1.28	NO0DN04	0.02	NO0UA02	2.93
CS0AU01	25.65	NO0UK01	15.93	NO0UA03	12.17
CS0AU02	4.52	NO0UK02	2.43	NO0IS01	20.69
CS0AU03	14.55	NO0UK03	9.68	NO0IS02	2.95
CS0AU04	0.60	NO0UK04	0.26	NO0IS03	12.24
NO0MX01	9.81	NO0IR01	15.51	NO0SN01	18.15
NO0MX02	0.92	NO0IR02	2.37	NO0SN02	2.31
NO0MX03	7.01	NO0IR03	9.51	NO0SN03	11.40
NO0MX04	0.01	NO0IR04	0.28	NO0NG01	19.42
NO0PA01	10.98	NO0NH01	15.14	NO0NG02	1.28
NO0PA02	1.14	NO0NH02	2.33	NO0SA01	22.27

Table 32. (Continued)

Coded route	Oppor. Cost	Coded route	Oppor. Cost	Coded route	Oppor. Cost
NOOSA02	3.25	GVOTR03	8.48	GVONH03	9.14
NOOSA03	13.00	GVOTR04	0.17	GVONH04	0.30
NOOKN01	28.77	GVOVZ01	10.97	GVOBL01	14.76
NOOKN02	4.30	GVOVZ02	1.11	GVOBL02	2.26
NOOKN03	16.50	GVOVZ03	8.02	GVOBL03	9.15
NOOID01	32.78	GVOVZ04	0.15	GVOBL04	0.30
NOOID02	5.05	GVOBZ01	17.95	GVOFR01	16.48
NOOID03	18.42	GVOBZ02	2.45	GVOFR02	2.36
NOOPK01	32.90	GVOBZ03	11.40	GVOFR03	10.32
NOOPK02	5.07	GVOBZ04	0.19	GVOFR04	0.22
NOOPK03	18.49	GVOUR01	20.20	GVOWG01	15.16
NOOVN01	32.89	GVOUR02	2.93	GVOWG02	2.26
NOOVN02	5.07	GVOUR03	12.51	GVOWG03	9.31
NOOVN03	18.48	GVOUR04	0.26	GVOWG04	0.21
NOOPP01	31.29	GVOPU01	13.81	GVOEG01	16.87
NOOPP02	4.78	GVOPU02	1.64	GVOEG02	2.26
NOOPP03	17.71	GVOPU03	9.37	GVOPO01	19.14
NOOHK01	31.21	GVOPU04	0.14	GVOPO02	2.67
NOOHK02	4.76	GVOCL01	16.22	GVOPO03	11.96
NOOHK03	17.67	GVOCL02	2.08	GVOPO04	0.19
NOOJP01	26.42	GVOCL03	10.52	GVOSI01	17.80
NOOJP02	4.02	GVOCL04	0.12	GVOSI02	2.42
NOOJP03	14.99	GVOSW01	16.36	GVOSI03	11.32
NOOCN01	15.59	GVOSW02	2.23	GVOSI04	0.18
NOOCN02	4.05	GVOSW03	10.19	GVOPG01	16.37
NOOCN03	10.61	GVOSW04	0.09	GVOPG02	2.16
NOOCN04	2.33	GVONW01	16.14	GVOPG03	10.63
NOOAG01	20.40	GVONW02	2.13	GVOPG04	0.19
NOOAG02	1.28	GVONW03	10.05	GVOIT01	18.48
NOOAU01	25.99	GVONW04	0.0	GVOIT02	2.56
NOOAU02	4.24	GVOFN01	17.18	GVOIT03	11.66
NOOAU03	14.49	GVOFN02	2.32	GVOIT04	0.20
NOOAU04	0.18	GVOFN03	10.55	GVOTK01	20.24
GVOMX01	8.68	GVODN01	16.48	GVOTK02	2.87
GVOMX02	0.56	GVODN02	2.19	GVOTK03	12.49
GVOMX03	6.84	GVODN03	10.21	GVOTK04	0.18
GVOPA01	10.48	GVOUK01	15.51	GVOMR01	18.35
GVOPA02	1.01	GVOUK02	2.33	GVOMR02	2.37
GVOPA03	7.77	GVOUK03	9.94	GVOMR03	11.97
GVOPA04	0.14	GVOUK04	0.40	GVOMR04	0.19
GVOJM01	10.04	GVOIR01	15.26	GVOTU01	19.37
GVOJM02	0.95	GVOIR02	2.34	GVOTU02	2.00
GVOJM03	7.56	GVOIR03	9.86	GVOUA01	20.28
GVOJM04	0.15	GVOIR04	0.47	GVOUA02	2.88
GVOTR01	11.92	GVONH01	14.74	GVOUA03	12.51
GVOTR02	1.31	GVONH02	2.25	GVOUA04	0.19

Table 32. (Continued)

Coded route	Oppor. Cost	Coded route	Oppor. Cost	Coded route	Oppor. Cost
GV0IS01	20.49	GV0AG01	20.64	LA0CL06	2.82
GV0IS02	2.94	GV0AG02	1.43	LA0SW01	29.97
GV0IS03	12.63	GV0AU01	24.14	LA0SW02	9.52
GV0IS04	0.20	GV0AU02	3.62	LA0SW03	19.78
GV0SN01	17.89	GV0AU03	13.90	LA0SW04	5.94
GV0SN02	2.28	LA0MX01	24.71	LA0NW01	29.34
GV0SN03	11.74	LA0MX02	8.75	LA0NW02	9.26
GV0SN04	0.19	LA0MX03	17.87	LA0NW03	19.38
GV0NG01	19.66	LA0MX04	6.41	LA0NW04	5.76
GV0NG02	1.43	LA0PA01	20.96	LA0FN01	30.73
GV0SA01	21.98	LA0PA02	7.13	LA0FN02	9.58
GV0SA02	3.20	LA0PA03	15.47	LA0FN03	20.09
GV0SA03	13.33	LA0PA04	5.27	LA0FN04	5.84
GV0SA04	0.18	LA0JM01	22.48	LA0DN01	30.08
GV0KN01	28.47	LA0JM02	7.80	LA0DN02	9.47
GV0KN02	4.26	LA0JM03	16.45	LA0DN03	19.78
GV0KN03	16.83	LA0JM04	5.74	LA0DN04	5.86
GV0KN04	0.18	LA0TR01	23.45	LA0UK01	29.16
GV0ID01	32.49	LA0TR02	7.83	LA0UK02	9.63
GV0ID02	5.00	LA0TR03	16.82	LA0UK03	19.56
GV0ID03	18.76	LA0TR04	5.55	LA0UK04	6.26
GV0ID04	0.17	LA0VZ01	22.91	LA0UK05	13.58
GV0PK01	32.61	LA0VZ02	7.77	LA0UK06	4.15
GV0PK02	5.03	LA0VZ03	16.59	LA0IR01	29.08
GV0PK03	18.82	LA0VZ04	5.61	LA0IR02	9.70
GV0PK04	0.18	LA0VZ05	12.37	LA0IR03	19.58
GV0VN01	32.41	LA0VZ06	4.19	LA0IR04	6.37
GV0VN02	4.96	LA0BZ01	29.68	LA0NH01	28.24
GV0VN03	18.70	LA0BZ02	9.04	LA0NH02	9.50
GV0VN04	0.13	LA0BZ03	19.85	LA0NH03	18.66
GV0PP01	30.80	LA0BZ04	5.61	LA0NH04	6.12
GV0PP02	4.65	LA0BZ05	13.62	LA0NH05	12.54
GV0PP03	17.93	LA0BZ06	3.42	LA0NH06	3.93
GV0PP04	0.13	LA0UR01	30.44	LA0BL01	27.98
GV0HK01	30.46	LA0UR02	8.97	LA0BL02	9.40
GV0HK02	4.55	LA0UR03	20.07	LA0BL03	18.51
GV0HK03	17.73	LA0UR04	5.34	LA0BL04	6.06
GV0HK04	0.07	LA0PU01	20.83	LA0BL05	12.44
GV0JP01	25.99	LA0PU02	6.46	LA0BL06	3.88
GV0JP02	3.93	LA0PU03	15.00	LA0FR01	29.62
GV0JP03	15.24	LA0PU04	4.48	LA0FR02	9.46
GV0JP04	0.15	LA0CL01	22.97	LA0FR03	19.62
GV0CN01	15.34	LA0CL02	6.80	LA0FR04	5.96
GV0CN02	4.02	LA0CL03	15.99	LA0WG01	28.66
GV0CN03	10.97	LA0CL04	4.40	LA0WG02	9.51
GV0CN04	2.52	LA0CL05	11.39	LA0WG03	18.82

Table 32. (Continued)

Coded route	Oppor. Cost	Coded route	Oppor. Cost	Coded route	Oppor. Cost
LAOWG04	6.04	LAOIS04	5.92	LAOCN02	10.70
LAOWG05	12.55	LAOIS05	14.58	LAOCN03	19.57
LAOWG06	3.78	LAOIS06	3.34	LAOCN04	8.00
LAOEG01	30.36	LAOSN01	30.14	LAOAG01	31.99
LAOEG02	9.51	LAOSN02	9.06	LAOAG02	7.87
LAOPO01	33.12	LAOSN03	20.51	LAOAU01	22.31
LAOPO02	10.10	LAOSN04	5.72	LAOAU02	5.13
LAOPO03	21.77	LAONG01	31.01	LAOAU03	14.21
LAOPO04	6.12	LAONG02	7.88	LAOAU04	2.30
LAOSI01	30.94	LAOSA01	28.58	LAOAU05	9.08
LAOSI02	9.52	LAOSA02	7.86	LAOAU06	0.50
LAOSI03	20.61	LAOSA03	18.70	SLOMX01	26.71
LAOSI04	5.92	LAOSA04	4.41	SLOMX02	10.05
LAOPG01	29.73	LAOSA05	12.44	SLOMX03	18.94
LAOPG02	9.36	LAOSA06	2.22	SLOMX04	7.35
LAOPG03	20.07	LAOKN01	38.66	SLOPA01	22.92
LAOPG04	5.99	LAOKN02	10.26	SLOPA02	8.41
LAOPG05	13.94	LAOKN03	24.36	SLOPA03	16.53
LAOPG06	3.84	LAOKN04	5.24	SLOPA04	6.21
LAOIT01	31.61	LAOID01	34.03	SLOJM01	24.46
LAOIT02	9.67	LAOID02	7.77	SLOJM02	9.08
LAOIT03	20.95	LAOID03	21.10	SLOJM03	17.51
LAOIT04	5.94	LAOID04	3.24	SLOJM04	6.68
LAOIT05	14.24	LAOPK01	35.10	SLOTR01	25.42
LAOIT06	3.58	LAOPK02	8.15	SLOTR02	9.11
LAOTK01	33.42	LAOPK03	21.72	SLOTR03	17.88
LAOTK02	10.00	LAOPK04	3.47	SLOTR04	6.49
LAOTK03	21.81	LAOVN01	25.47	SLOVZ01	24.89
LAOTK04	5.93	LAOVN02	4.54	SLOVZ02	9.06
LAOTK05	14.57	LAOVN03	15.94	SLOVZ03	17.65
LAOTK06	3.35	LAOVN04	1.25	SLOVZ04	6.56
LAOMR01	31.36	LAOPP01	25.09	SLOVZ05	12.75
LAOMR02	9.43	LAOPP02	4.70	SLOVZ06	4.84
LAOMR03	21.19	LAOPP03	15.90	SLOBZ01	31.65
LAOMR04	5.91	LAOPP04	1.52	SLOBZ02	10.32
LAOMR05	14.65	LAOHK01	23.91	SLOBZ03	20.90
LAOMR06	3.63	LAOHK02	4.28	SLOBZ04	6.55
LAOTU01	32.49	LAOHK03	15.21	SLOBZ05	13.98
LAOTU02	9.12	LAOHK04	1.29	SLOBZ06	4.07
LAOUA01	33.32	LAOJP01	21.19	SLOUR01	31.49
LAOUA02	9.96	LAOJP02	4.32	SLOUR02	9.90
LAOUA03	21.76	LAOJP03	13.76	SLOUR03	20.58
LAOUA04	5.91	LAOJP04	1.76	SLOUR04	6.07
LAOIS01	33.51	LAOJP05	8.92	SLOPU01	22.84
LAOIS02	10.01	LAOJP06	0.09	SLOPU02	7.76
LAOIS03	21.86	LAOCN01	27.31	SLOPU03	16.08

Table 32. (Continued)

Coded route	Oppor. Cost	Coded route	Oppor. Cost	Coded route	Oppor. Cost
SLOPU04	5.42	SLOFR02	10.75	SLOUA02	11.16
SLOCL01	24.97	SLOFR03	20.68	SLOUA03	22.67
SLOCL02	8.09	SLOFR04	6.89	SLOUA04	6.79
SLOCL03	17.07	SLOWG01	30.63	SLOIS01	35.51
SLOCL04	5.34	SLOWG02	10.80	SLOIS02	11.31
SLOCL05	11.77	SLOWG03	19.88	SLOIS03	22.93
SLOCL06	3.49	SLOWG04	6.97	SLOIS04	6.87
SLOSW01	31.95	SLOWG05	12.91	SLOIS05	14.96
SLOSW02	10.81	SLOWG06	4.44	SLOIS06	4.00
SLOSW03	20.83	SLOEG01	33.33	SLOSN01	32.12
SLOSW04	6.88	SLOEG02	11.17	SLOSN02	10.35
SLONW01	31.44	SLOPO01	34.65	SLOSN03	21.57
SLONW02	10.59	SLOPO02	11.22	SLOSN04	6.67
SLONW03	20.52	SLOPO03	22.56	SLONG01	32.94
SLONW04	6.73	SLOPO04	6.96	SLONG02	9.14
SLOFN01	32.70	SLOSI01	32.93	SLOSA01	35.57
SLOFN02	10.87	SLOSI02	10.83	SLOSA02	11.03
SLOFN03	21.15	SLOSI03	21.69	SLOSA03	22.77
SLOFN04	6.78	SLOSI04	6.87	SLOSA04	6.51
SLODN01	32.08	SLOPG01	31.70	SLOSA05	14.68
SLODN02	10.77	SLOPG02	10.64	SLOSA06	3.59
SLODN03	20.85	SLOPG03	21.12	SLOKN01	37.18
SLODN04	6.80	SLOPG04	6.93	SLOKN02	10.25
SLOUK01	31.13	SLOPG05	14.30	SLOKN03	23.34
SLOUK02	10.91	SLOPG06	4.50	SLOKN04	5.38
SLOUK03	20.61	SLOIT01	33.58	SLOID01	31.31
SLOUK04	7.21	SLOIT02	10.96	SLOID02	7.30
SLOUK05	13.95	SLOIT03	22.00	SLOID03	19.33
SLOUK06	4.80	SLOIT04	6.89	SLOID04	3.10
SLOIR01	31.06	SLOIT05	14.62	SLOPK01	32.35
SLOIR02	10.99	SLOIT06	4.24	SLOPK02	7.67
SLOIR03	20.63	SLOTK01	35.43	SLOPK03	19.95
SLOIR04	7.32	SLOTK02	11.30	SLOPK04	3.32
SLONH01	30.21	SLOTK03	22.89	SLOVN01	24.60
SLONH02	10.79	SLOTK04	6.88	SLOVN02	4.77
SLONH03	19.72	SLOTK05	14.95	SLOVN03	15.29
SLONH04	7.06	SLOTK06	4.02	SLOVN04	1.54
SLONH05	12.91	SLOMR01	33.33	SLOPP01	22.93
SLONH06	4.58	SLOMR02	10.72	SLOPP02	4.44
SLOBL01	29.98	SLOMR03	22.25	SLOPP03	14.47
SLOBL02	10.70	SLOMR04	6.84	SLOPP04	1.52
SLOBL03	19.58	SLOMR05	15.01	SLOHK01	22.46
SLOBL04	7.01	SLOMR06	4.28	SLOHK02	4.29
SLOBL05	12.82	SLOTU01	34.47	SLOHK03	14.21
SLOBL06	4.54	SLOTU02	10.40	SLOHK04	1.43
SLOFR01	31.59	SLOUA01	35.05	SLOJP01	17.92

Table 32. (Continued)

Coded route	Oppor. Cost
SL0JP02	3.64
SL0JP03	11.67
SL0JP04	1.49
SL0JP05	7.33
SL0JP06	0.0
SL0CN01	29.63
SL0CN02	12.11
SL0CN03	20.83
SL0CN04	9.02
SL0AG01	33.92
SL0AG02	9.14
SL0AU01	22.26
SL0AU02	5.65
SL0AU03	14.05
SL0AU04	2.77
SL0AU05	8.70
SL0AU06	0.87

Table 33. Opportunity Cost: model V, objective function 3

Coded route	Oppor. Cost	Coded route	Oppor. Cost	Coded route	Oppor. Cost
SE0CS0	1.63	MC7IA5	5.26	OH4IN5	1.49
SE0NO0	4.27	MC7IA6	3.82	OH4IL2	3.62
SE0GV0	7.27	MC8PH0	0.47	OH4IL3	4.88
SE0NE0	4.56	MC8CH0	1.70	OH4IL4	2.97
DL0GV0	0.43	MC8TO0	1.03	OH4IL5	2.54
DL0AP0	1.55	MC8OH3	0.23	OH5CS0	4.51
DL0MO1	4.68	MC8IN3	0.21	OH5NO0	3.46
DL0KA8	4.60	MC8IN4	2.71	OH5CH0	4.18
SP0NO0	2.37	MC8IN5	1.72	OH5TO0	1.86
SP0KA8	5.19	MC8IL2	2.69	OH5NE0	0.36
MC5PH0	0.76	MC8IL3	4.43	OH5OH3	0.93
MC5CH0	2.21	MC8IL4	2.66	OH5IN3	1.83
MC5TO0	1.20	MC8IL5	2.38	OH5IN4	3.75
MC5OH2	0.63	MC8IA6	4.92	OH5IN5	2.30
MC5OH3	0.74	MC9PH0	0.61	OH5IL2	5.03
MC5IN3	1.63	MC9CH0	3.24	OH5IL4	4.37
MC5IN4	3.52	MC9NE0	0.26	OH5IL5	3.94
MC5IN5	2.59	MC9OH2	0.50	OH7PH0	0.87
MC5IL2	3.16	MC9OH3	0.36	OH7NO0	0.45
MC5IL3	4.93	MC9IN3	2.04	OH7CH0	3.71
MC5IL4	3.28	MC9IN4	3.83	OH7TO0	2.36
MC5IL5	3.07	MC9IN5	2.68	OH7OH2	1.09
MC5IA6	5.16	MC9IL2	4.22	OH7OH3	1.16
MC6PH0	0.82	MC9IL3	5.89	OH7IN3	2.03
MC6CH0	3.70	MC9IL4	4.05	OH7IN4	2.82
MC6TO0	1.42	MC9IL5	3.70	OH7IN5	1.81
MC6OH2	1.05	OH1PH0	0.66	OH7IL2	4.42
MC6OH3	1.00	OH1CH0	2.73	OH7IL3	5.34
MC6IN3	2.38	OH1TO0	0.46	OH7IL4	3.46
MC6IN4	4.74	OH1NE0	0.58	OH7IL5	3.06
MC6IN5	3.69	OH1AP0	1.12	OH8PH0	0.92
MC6IL2	4.68	OH1OH3	0.35	OH8CH0	5.51
MC6IL4	4.71	OH1IN4	2.91	OH8TO0	3.51
MC6IL5	4.44	OH1IN5	1.70	OH8OH2	2.28
MC7PH0	0.56	OH1IL2	3.66	OH8OH3	1.74
MC7CH0	1.26	OH1IL3	5.18	OH8IN3	3.28
MC7TO0	0.51	OH1IL4	3.29	OH8IN4	4.72
MC7NE0	0.14	OH1IL5	2.90	OH8IN5	3.22
MC7OH3	0.28	OH1IA6	6.03	OH8IL2	6.27
MC7IN3	0.24	OH4PH0	0.10	OH8IL4	5.36
MC7IN4	1.91	OH4CH0	2.79	OH8IL5	4.96
MC7IN5	1.06	OH4TO0	1.10	IN1PH0	1.21
MC7IL2	1.61	OH4NE0	0.32	IN1NO0	1.08
MC7IL3	3.37	OH4OH2	0.47	IN1GV0	8.31
MC7IL4	1.66	OH4IN3	0.58	IN1TO0	1.28
MC7IL5	1.43	OH4IN4	2.37	IN1NE0	1.17

Table 33. (Continued)

Coded route	Oppor. Cost	Coded route	Oppor. Cost	Coded route	Oppor. Cost
IN1OH2	0.60	IN7IN3	1.14	WI4NE0	2.64
IN1OH3	0.93	IN7IN4	0.64	WI4IN3	2.73
IN1IN3	0.20	IN7IN5	0.35	WI4IN4	3.63
IN1IN5	0.32	IN7IL2	2.47	WI4IL2	2.08
IN1IL2	1.21	IN7IL3	2.62	WI4IL3	2.65
IN1IL3	2.25	IN7IL4	0.95	WI4IL4	2.01
IN1IL4	0.92	IN7IL5	1.37	WI4IL5	2.40
IN1IA5	4.66	IN7IA5	5.50	WI4MN8	2.27
IN1IA6	3.23	IN7IA6	4.21	WI4IA5	2.52
IN1MO1	6.52	IN8PH0	1.41	WI4IA6	1.66
IN2PH0	1.72	IN8CS0	3.66	WI4MO1	5.25
IN2NO0	3.20	IN8NO0	1.10	WI6NO0	0.85
IN2GV0	9.78	IN8GV0	7.27	WI6GV0	8.80
IN2CH0	2.12	IN8CH0	2.72	WI6DU0	1.24
IN2TO0	1.79	IN8TO0	2.59	WI6TO0	0.85
IN2NE0	1.67	IN8NE0	1.92	WI6NE0	0.01
IN2OH2	1.11	IN8OH2	1.52	WI6OH2	0.34
IN2OH3	1.43	IN8OH3	1.67	WI6OH3	0.58
IN2IN4	1.89	IN8IN3	1.49	WI6IN3	0.32
IN2IN5	0.38	IN8IN4	1.48	WI6IN4	1.68
IN2IL2	3.33	IN8IN5	0.13	WI6IN5	1.04
IN2IL3	3.93	IN8IL2	3.19	WI6IL2	0.62
IN2IL4	2.04	IN8IL3	3.50	WI6IL3	1.83
IN2IL5	2.38	IN8IL4	1.78	WI6IL4	0.61
IN2IA5	6.30	IN8IL5	1.53	WI6IL5	0.72
IN2IA6	4.86	IN8IA6	5.05	WI6MN8	3.41
IN6PH0	1.07	IN9PH0	2.87	WI6IA5	2.81
IN6CH0	2.40	IN9GV0	6.86	WI6IA6	1.52
IN6TO0	1.63	IN9CH0	3.54	WI8NO0	0.63
IN6NE0	1.27	IN9TO0	3.97	WI8GV0	8.30
IN6AP0	0.67	IN9NE0	3.40	WI8DU0	1.99
IN6OH2	0.69	IN9AP0	1.20	WI8TO0	1.84
IN6OH3	0.94	IN9OH2	2.96	WI8NE0	1.41
IN6IN4	1.62	IN9IN3	2.78	WI8OH2	1.32
IN6IL2	3.15	IN9IN4	2.53	WI8IN3	0.97
IN6IL3	4.29	IN9IN5	1.63	WI8IN4	1.81
IN6IL4	2.37	IN9IL2	3.84	WI8IN5	1.30
IN6IL5	1.94	IN9IL3	3.58	WI8IL2	0.76
IN6IA6	5.45	IN9IL4	2.15	WI8IL3	1.31
IN7PH0	1.36	IN9IL5	2.25	WI8IL4	0.32
IN7GV0	6.64	IN9IA5	6.48	WI8IL5	0.62
IN7CH0	2.07	IN9IA6	5.27	WI8MN8	3.31
IN7TO0	2.32	IN9MO1	7.29	WI8IA5	2.27
IN7NE0	1.81	WI4GV0	9.42	WI8IA6	0.93
IN7OH2	1.33	WI4DU0	0.57	WI8MO1	4.82
IN7OH3	1.52	WI4CH0	1.81	WI9NO0	0.85

Table 33. (Continued)

Coded route	Oppor. Cost	Coded route	Oppor. Cost	Coded route	Oppor. Cost
WI9GV0	9.16	IL6IN5	1.13	IL9IN4	1.63
WI9DU0	3.07	IL6IL2	1.81	IL9IN5	0.84
WI9TO0	1.70	IL6IL3	1.02	IL9IL2	2.71
WI9NE0	1.26	IL6IL5	1.18	IL9IL3	2.24
WI9OH2	1.19	IL6MN8	5.99	IL9IL4	1.28
WI9OH3	1.48	IL6IA5	3.79	IL9IL5	1.26
WI9IN3	0.92	IL6IA6	2.62	IL9IA5	5.12
WI9IN4	2.04	IL6MO1	4.78	IL9IA6	3.95
WI9IN5	1.45	IL7CS0	4.41	IL9MO1	5.86
WI9IL2	0.38	IL7NO0	1.17	MN1NE0	4.56
WI9IL3	2.26	IL7GV0	6.37	MN1MN8	2.59
WI9IL4	0.94	IL7CH0	1.64	MN4NO0	1.77
WI9IL5	0.96	IL7TO0	2.63	MN4GV0	8.91
WI9MN8	4.70	IL7NE0	2.36	MN4NE0	4.27
WI9IA5	3.63	IL7AP0	0.86	MN4MN8	1.13
WI9IA6	2.24	IL7OH2	1.77	MN4IA5	2.51
WI9MO1	6.08	IL7IN3	1.34	MN4IA6	2.29
IL1PH0	2.55	IL7IN4	1.67	MN4MO1	4.53
IL1NO0	0.37	IL7IN5	0.36	MN5NO0	0.30
IL1GV0	8.15	IL7IL2	1.78	MN5GV0	9.68
IL1DU0	3.73	IL7IL3	1.58	MN5NE0	4.07
IL1CH0	0.40	IL7IA5	4.47	MN5AP0	5.55
IL1TO0	2.49	IL7IA6	3.23	MN5IL2	3.49
IL1NE0	2.31	IL7MO1	5.54	MN5IL3	3.61
IL1AP0	2.42	IL8GV0	5.29	MN5MN8	1.01
IL1OH2	1.91	IL8CH0	2.48	MN5IA5	2.87
IL1IN3	1.40	IL8TO0	3.46	MN5IA6	2.48
IL1IN4	1.83	IL8NE0	3.09	MN5MO1	5.23
IL1IN5	1.37	IL8AP0	1.05	MN6GV0	10.47
IL1IL3	1.82	IL8IN3	2.19	MN6DU0	0.74
IL1IL5	1.27	IL8IN4	1.82	MN6CH0	3.60
IL1MN8	4.61	IL8IN5	1.13	MN6NE0	4.22
IL1IA5	2.95	IL8IL2	2.62	MN6AP0	5.84
IL1IA6	1.89	IL8IL3	1.82	MN6IL2	3.84
IL1MO1	5.13	IL8IL4	0.99	MN6IL3	4.13
IL6PH0	2.88	IL8IL5	1.03	MN6MN8	2.61
IL6CS0	5.29	IL8IA5	4.64	MN6IA5	3.53
IL6NO0	0.15	IL8IA6	3.55	MN6IA6	3.02
IL6GV0	6.35	IL8MO1	5.21	MN6MO1	6.06
IL6CH0	1.77	IL9GV0	5.72	MN7NO0	0.65
IL6TO0	3.24	IL9CH0	2.48	MN7GV0	6.85
IL6NE0	3.07	IL9TO0	3.19	MN7NE0	3.47
IL6AP0	1.78	IL9NE0	2.74	MN7IL3	1.66
IL6OH2	2.47	IL9AP0	0.65	MN7IA5	0.72
IL6IN3	1.95	IL9OH2	2.24	MN7IA6	0.66
IL6IN4	1.64	IL9IN3	1.96	MN7MO1	2.49

Table 33. (Continued)

Coded route	Oppor. Cost	Coded route	Oppor. Cost	Coded route	Oppor. Cost
MN9CS0	8.54	IA3AP0	3.78	IA8IL2	1.64
MN9GV0	9.05	IA3IN3	2.67	IA8IL3	0.42
MN9DU0	1.19	IA3IN4	3.18	IA8IL4	0.53
MN9CH0	2.31	IA3IN5	2.74	IA8IL5	1.21
MN9NE0	3.56	IA3IL2	1.71	IA8MN8	2.68
MN9AP0	4.54	IA3IL3	1.69	IA8IA5	0.19
MN9IN4	3.99	IA3IL4	1.30	IA8IA6	1.01
MN9IL2	2.46	IA3IL5	1.82	IA8MO1	2.00
MN9IL3	2.58	IA3MN8	2.50	IA8KA8	4.66
MN9IL4	2.17	IA3IA5	1.77	IA9GV0	6.67
MN9IL5	2.66	IA3MO1	4.21	IA9DU0	3.71
MN9MN8	1.63	IA4NO0	0.18	IA9CH0	1.67
MN9IA5	2.19	IA4GV0	5.66	IA9NE0	3.56
MN9IA6	2.08	IA4DU0	1.48	IA9AP0	3.06
MN9MO1	4.73	IA4CH0	1.65	IA9IN3	2.50
IA1NO0	0.62	IA4NE0	3.47	IA9IN4	2.54
IA1GV0	6.21	IA4AP0	3.36	IA9IN5	2.11
IA1DU0	0.33	IA4IL2	1.61	IA9IL2	1.58
IA1CH0	1.52	IA4IL3	0.69	IA9IL3	0.57
IA1NE0	3.12	IA4IL4	0.73	IA9IL4	0.45
IA1AP0	3.50	IA4IL5	1.39	IA9IL5	1.13
IA1IL2	1.54	IA4MN8	0.95	IA9MN8	3.72
IA1IL3	0.94	IA4IA6	0.02	IA9IA5	1.65
IA1IL4	0.87	IA4MO1	1.28	IA9IA6	0.14
IA1MN8	0.13	IA4KA8	3.76	IA9MO1	3.04
IA1MO1	1.80	IA7GV0	5.17	MO2GV0	4.85
IA2CS0	7.41	IA7CH0	2.34	MO2CH0	1.92
IA2NO0	0.35	IA7NE0	4.23	MO2IN4	2.39
IA2GV0	7.31	IA7AP0	3.66	MO2IN5	1.93
IA2DU0	1.02	IA7IL2	2.27	MO2IL2	1.84
IA2CH0	1.47	IA7IL3	1.03	MO2IL3	0.28
IA2NE0	3.06	IA7IL4	1.16	MO2IL4	0.38
IA2AP0	3.55	IA7IL5	1.84	MO2IL5	1.05
IA2IN4	2.94	IA7MN8	2.23	MO2MN8	3.82
IA2IL2	1.51	IA7IA5	0.78	MO2IA5	1.34
IA2IL3	1.19	IA7IA6	0.78	MO2IA6	1.04
IA2IL4	0.98	IA7MO1	0.80	MO2MO1	1.68
IA2IL5	1.55	IA7KA8	3.28	MO2KA8	4.34
IA2MN8	0.88	IA8CS0	6.63	MO3CS0	6.78
IA2IA6	0.91	IA8GV0	5.80	MO3GV0	6.49
IA2MO1	2.94	IA8DU0	2.98	MO3CH0	2.87
IA3NO0	0.55	IA8CH0	1.72	MO3IN3	3.40
IA3GV0	8.31	IA8NE0	3.61	MO3IN4	3.18
IA3DU0	2.12	IA8AP0	3.09	MO3IN5	2.71
IA3CH0	1.65	IA8IN4	2.61	MO3IL2	2.81
IA3NE0	3.26	IA8IN5	2.19	MO3IL3	1.36

Table 33. (Continued)

Coded route	Oppor. Cost	Coded route	Oppor. Cost	Coded route	Oppor. Cost
MO3IL4	1.22	MO7IA5	2.29	NB3CH0	2.86
MO3IL5	1.88	MO7IA6	1.81	NB3NE0	4.66
MO3MN8	5.67	MO7MO1	1.39	NB3AP0	4.47
MO3IA5	3.37	MO7KA8	1.22	NB3IL3	1.80
MO3IA6	2.33	MO9CS0	4.76	NB3MN8	1.50
MO3MO1	3.93	MO9GV0	5.14	NB3IA5	1.14
MO3KA8	6.59	MO9CH0	4.36	NB3IA6	1.23
MO4GV0	3.14	MO9IN3	3.91	NB3MO1	1.63
MO4IN4	2.71	MO9IN4	3.59	NB3KA8	2.84
MO4IL2	2.49	MO9IN5	2.79	NB4NO0	2.72
MO4IL3	0.90	MO9IL2	4.52	NB4GV0	2.77
MO4IL4	0.87	MO9IL3	3.62	NB4CH0	2.44
MO4IL5	1.49	MO9IL4	2.68	NB4NE0	4.29
MO4MN8	4.43	MO9IL5	2.91	NB4AP0	3.75
MO4IA5	2.31	MO9IA5	6.32	NB4MO1	0.68
MO4IA6	1.84	MO9IA6	5.32	NB5CS0	6.36
MO4MO1	1.83	MO9MO1	6.51	NB5NO0	0.70
MO4KA8	2.94	ND6NE0	4.58	NB5GV0	2.86
MO5GV0	5.70	ND6MN8	1.80	NB5LA0	1.53
MO5CH0	3.89	ND9NE0	4.52	NB5SL0	1.39
MO5IN4	3.91	ND9MN8	1.44	NB5CH0	1.70
MO5IN5	3.38	ND9IA5	2.72	NB5NE0	3.56
MO5IL2	3.85	SD3NE0	4.23	NB5AP0	3.05
MO5IL3	2.31	SD3MN8	0.83	NB5MT0	1.54
MO5IL4	2.15	SD3IA5	2.04	NB5MN8	0.48
MO5IL5	2.73	SD3IA6	1.92	NB5IA6	0.08
MO5MN8	6.61	SD3MO1	3.80	NB5KA8	0.08
MO5IA5	4.33	SD6NO0	0.20	NB8GV0	3.61
MO5IA6	3.61	SD6GV0	6.39	NB8LA0	4.41
MO5MO1	4.19	SD6NE0	3.67	NB8SL0	4.77
MO5KA8	6.20	SD6MN8	0.03	NB8CH0	2.36
MO6GV0	5.83	SD6IA5	0.78	NB8NE0	4.25
MO6CH0	3.22	SD6IA6	0.77	NB8AP0	3.38
MO6IN3	3.33	SD6MO1	2.22	NB8IL3	0.93
MO6IN4	2.98	SD9GV0	5.90	NB8MN8	2.06
MO6IN5	2.40	SD9DU0	1.02	NB8IA5	0.84
MO6IL2	3.25	SD9NE0	4.32	NB8IA6	0.84
MO6IL3	1.72	SD9AP0	4.53	NB8MO1	0.80
MO6IL4	1.43	SD9MN8	0.81	NB8KA8	1.22
MO6IL5	1.91	SD9IA5	1.03	KA2GV0	2.83
MO6IA5	4.56	SD9IA6	1.09	KA2NE0	4.38
MO6IA6	3.60	SD9MO1	1.98	KA2AP0	3.34
MO6MO1	4.90	SD9KA8	3.30	KA2MT0	3.50
MO7GV0	0.26	NB3GV0	5.41	KA2IL3	1.00
MO7IL3	0.72	NB3LA0	4.78	KA2MN8	2.15
MO7IL4	0.55	NB3SL0	4.08	KA2IA5	1.00

Table 33. (Continued)

Coded route	Oppor. Cost	Coded route	Oppor. Cost	Coded route	Oppor. Cost
KA2IA6	0.99	DUOUR01	22.26	DUONG02	0.01
KA2MO1	0.36	DUOUR02	2.36	DUOSA01	23.49
KA2KA8	0.42	DUOPU01	19.74	DUOSA02	2.42
KA3GV0	4.37	DUOPU02	2.52	DUOKN01	29.99
KA3NE0	5.38	DUOCL01	21.31	DUOKN02	3.48
KA3AP0	4.16	DUOCL02	2.64	DUOID01	34.00
KA3IL3	1.95	DUOSW01	14.51	DUOID02	4.22
KA3IL4	2.07	DUOSW02	0.19	DUOPK01	34.13
KA3MN8	4.02	DUONW01	14.55	DUOPK02	4.26
KA3IA5	2.36	DUONW02	0.18	DUOVN01	38.14
KA3IA6	2.22	DUOFN01	16.09	DUOVN02	5.76
KA3MO1	1.53	DUOFN02	0.56	DUOPP01	36.74
KA3KA8	2.53	DUODN01	14.62	DUOPP02	5.53
KA5NO0	2.56	DUODN02	0.14	DUOHK01	36.39
KA5GV0	3.38	DUOUK01	13.15	DUOHK02	5.42
KA5NE0	6.37	DUOIR01	12.88	DUOJP01	31.84
KA5AP0	4.94	DUONH01	12.57	DUOJP02	4.77
KA5MT0	4.59	DUONH02	0.01	DUOCN01	8.45
KA5IA5	3.20	DUOBL01	12.60	DUOAG01	20.67
KA5MO1	2.33	DUOBL02	0.04	DUOAG02	0.01
KA6PH0	5.37	DUOFR01	15.12	DUOAU01	30.00
KA6CS0	6.94	DUOFR02	0.51	DUOAU02	4.45
KA6GV0	3.82	DUOWG01	13.12	CHOMX01	18.07
KA6NE0	5.52	DUOWG02	0.15	CHOMX02	2.77
KA6AP0	3.94	DUOEG01	14.67	CHOPA01	17.12
KA6IL3	2.13	DUOPO01	17.21	CHOPA02	2.19
KA6IL4	2.20	DUOPO02	0.60	CHOJM01	16.04
KA6MN8	4.86	DUOSI01	16.44	CHOJM02	1.89
KA6IA5	2.99	DUOSI02	0.55	CHOTR01	15.95
KA6IA6	2.73	DUOPG01	14.83	CHOTR02	1.52
KA6MO1	2.22	DUOPG02	0.24	CHOVZ01	16.27
KA6KA8	2.57	DUOIT01	17.12	CHOVZ02	1.79
KA9IA5	1.06	DUOIT02	0.71	CHOBZ01	20.24
KA9IA6	0.75	DUOTK01	18.96	CHOBZ02	2.00
DUOMX01	18.20	DUOTK02	1.05	CHOUR01	22.12
DUOMX02	2.78	DUOMR01	17.12	CHOUR02	2.35
DUOPA01	17.26	DUOMR02	0.56	CHOPU01	19.60
DUOPA02	2.20	DUOTU01	17.86	CHOPU02	2.51
DUOJM01	16.17	DUOTU02	0.01	CHOCL01	22.02
DUOJM02	1.90	DUOUA01	18.90	CHOCL02	2.94
DUOTR01	16.08	DUOUA02	1.03	CHOSW01	14.38
DUOTR02	1.53	DUOIS01	19.20	CHOSW02	0.19
DUOVZ01	16.40	DUOIS02	1.11	CHONW01	14.41
DUOVZ02	1.81	DUOSN01	18.22	CHONW02	0.17
DUOBZ01	20.36	DUOSN02	1.06	CHOFN01	15.96
DUOBZ02	2.01	DUONG01	19.69	CHOFN02	0.55

Table 33. (Continued)

Coded route	Oppor. Cost	Coded route	Oppor. Cost	Coded route	Oppor. Cost
CHODN01	14.49	CHOPP01	36.61	TOOWG02	0.15
CHODN02	0.12	CHOPP02	5.53	TOOEG01	13.68
CHOUK01	13.01	CHOHK01	36.26	TOOEG02	0.0
CHOUK02	0.0	CHOHK02	5.42	TOOPO01	16.22
CHOIR01	12.74	CHOJP01	31.71	TOOPO02	0.60
CHOIR02	0.0	CHOJP02	4.77	TOOSI01	15.44
CHONH01	12.44	CHOCN01	8.33	TOOSI02	0.55
CHOBL01	12.47	CHOAG01	20.54	TOOPG01	13.84
CHOBL02	0.03	CHOAU01	29.86	TOOPG02	0.23
CHOFR01	14.99	CHOAU02	4.45	TOOIT01	16.12
CHOFR02	0.50	TOOMX01	17.21	TOOIT02	0.70
CHOWG01	12.99	TOOMX02	2.78	TOOTK01	17.96
CHOWG02	0.15	TOOPA01	16.26	TOOTK02	1.04
CHOEG01	14.55	TOOPA02	2.19	TOOMR01	16.12
CHOEG02	0.0	TOOJM01	15.18	TOOMR02	0.56
CHOPO01	17.08	TOOJM02	1.89	TOOTU01	16.87
CHOPO02	0.60	TOOTR01	15.08	TOOUA01	17.91
CHOSI01	16.30	TOOTR02	1.52	TOOUA02	1.02
CHOSI02	0.55	TOOVZ01	15.40	TOOIS01	18.20
CHOPG01	14.70	TOOVZ02	1.80	TOOIS02	1.11
CHOPG02	0.23	TOOBZ01	19.37	TOOSN01	17.22
CHOIT01	16.98	TOOBZ02	2.01	TOOSN02	1.05
CHOIT02	0.70	TOOUR01	21.26	TOONG01	18.70
CHOTK01	18.82	TOOUR02	2.36	TOONG02	0.0
CHOTK02	1.04	TOOPU01	18.74	TOOSA01	22.50
CHOMR01	16.98	TOOPU02	2.51	TOOSA02	2.41
CHOMR02	0.55	TOOCL01	21.15	TOOKN01	28.99
CHOTU01	17.73	TOOCL02	2.95	TOOKN02	3.47
CHOTU02	0.0	TOOSW01	13.52	TOOID01	33.00
CHOUA01	18.78	TOOSW02	0.19	TOOID02	4.21
CHOUA02	1.02	TOONW01	13.55	TOOPK01	33.13
CHOIS01	19.07	TOONW02	0.18	TOOPK02	4.25
CHOIS02	1.10	TOOFN01	15.09	TOOVN01	37.15
CHOSN01	18.08	TOOFN02	0.55	TOOVN02	5.75
CHOSN02	1.05	TOODN01	13.63	TOOPP01	35.75
CHONG01	19.56	TOODN02	0.13	TOOPP02	5.53
CHOSA01	23.37	TOOUK01	12.15	TOOHK01	35.37
CHOSA02	2.41	TOOUK02	0.0	TOOHK02	5.41
CHOKN01	29.85	TOOIR01	11.88	TOOJP01	30.84
CHOKN02	3.47	TOOIR02	0.0	TOOJP02	4.77
CHOID01	33.86	TOONH01	11.58	TOOCN01	7.46
CHOID02	4.22	TOOBL01	11.60	TOOCN02	0.0
CHOPK01	34.00	TOOBL02	0.03	TOOAG01	19.68
CHOPK02	4.25	TOOFR01	14.12	TOOAG02	0.0
CHOVN01	38.01	TOOFR02	0.50	TOOAU01	29.00
CHOVN02	5.75	TOOWG01	12.12	TOOAU02	4.45

Table 33. (Continued)

Coded route	Oppor. Cost	Coded route	Oppor. Cost	Coded route	Oppor. Cost
PHOMX01	16.24	PHOFN03	12.80	PHOIT03	13.25
PHOMX02	5.72	PHOFN04	3.16	PHOIT04	3.12
PHOMX03	12.39	PHODN01	18.26	PHOTK01	21.23
PHOMX04	4.42	PHODN02	5.17	PHOTK02	5.57
PHOPA01	16.15	PHODN03	12.29	PHOTK03	14.10
PHOPA02	5.46	PHODN04	3.09	PHOTK04	3.10
PHOPA03	12.19	PHOUK01	15.72	PHOMR01	19.29
PHOPA04	4.14	PHOUK02	4.64	PHOMR02	5.05
PHOJM01	15.06	PHOUK03	11.03	PHOMR03	13.55
PHOJM02	5.15	PHOUK04	3.03	PHOMR04	3.10
PHOJM03	11.61	PHOIR01	16.15	PHOTU01	20.24
PHOJM04	4.01	PHOIR02	4.90	PHOTU02	4.57
PHOTR01	15.75	PHOIR03	11.35	PHOUA01	21.19
PHOTR02	5.07	PHOIR04	3.26	PHOUA02	5.55
PHOTR03	11.80	PHONH01	15.56	PHOUA03	14.07
PHOTR04	3.75	PHONH02	4.80	PHOUA04	3.09
PHOVZ01	15.76	PHONH03	10.59	PHOIS01	21.53
PHOVZ02	5.23	PHONH04	3.07	PHOIS02	5.65
PHOVZ03	11.91	PHOBL01	15.12	PHOIS03	14.26
PHOVZ04	3.94	PHOBL02	4.65	PHOIS04	3.14
PHOBZ01	21.13	PHOBL03	10.35	PHOSN01	19.81
PHOBZ02	5.97	PHOBL04	3.00	PHOSN02	5.32
PHOBZ03	14.31	PHOFR01	17.44	PHOSN03	13.91
PHOBZ04	3.62	PHOFR02	5.05	PHOSN04	3.32
PHOUR01	23.02	PHOFR03	11.91	PHONG01	21.20
PHOUR02	6.32	PHOFR04	3.13	PHONG02	4.24
PHOUR03	15.23	PHOWG01	15.66	PHOSA01	25.00
PHOUR04	3.61	PHOWG02	4.77	PHOSA02	6.66
PHOPU01	19.47	PHOWG03	10.62	PHOSA03	16.16
PHOPU02	6.08	PHOWG04	3.02	PHOSA04	3.57
PHOPU03	13.79	PHOEG01	17.21	PHOKN01	31.49
PHOPU04	4.14	PHOEG02	4.62	PHOKN02	7.71
PHOCL01	21.88	PHOPO01	20.37	PHOKN03	19.66
PHOCL02	6.52	PHOPO02	5.45	PHOKN04	3.57
PHOCL03	14.94	PHOPO03	13.72	PHOID01	35.50
PHOCL04	4.13	PHOPO04	3.16	PHOID02	8.46
PHOSW01	17.67	PHOSI01	18.75	PHOID03	21.59
PHOSW02	5.05	PHOSI02	5.09	PHOID04	3.57
PHOSW03	12.00	PHOSI03	12.90	PHOPK01	35.63
PHOSW04	3.08	PHOSI04	3.08	PHOPK02	8.48
PHONW01	17.71	PHOPG01	17.47	PHOPK03	21.65
PHONW02	5.04	PHOPG02	4.90	PHOPK04	3.57
PHONW03	12.00	PHOPG03	12.31	PHOVN01	38.06
PHONW04	3.05	PHOPG04	3.14	PHOVN02	9.39
PHOFN01	19.24	PHOIT01	19.44	PHOVN03	23.12
PHOFN02	5.41	PHOIT02	5.25	PHOVN04	4.13

Table 33. (Continued)

Coded route	Oppor. Cost	Coded route	Oppor. Cost	Coded route	Oppor. Cost
PHOPP01	36.47	CSOUR01	19.62	CSOFR04	0.13
PHOPP02	9.10	CSOUR02	3.07	CSOWG01	13.40
PHOPP03	22.35	CSOUR03	11.92	CSOWG02	1.95
PHOPP04	4.13	CSOUR04	0.40	CSOWG03	8.00
PHOHK01	36.41	CSOPU01	15.35	CSOWG04	0.06
PHOHK02	9.10	CSOPU02	2.57	CSOEG01	14.96
PHOHK03	22.33	CSOPU03	10.06	CSOEG02	1.80
PHOHK04	4.14	CSOPU04	0.76	CSOPO01	17.95
PHOJP01	31.59	CSOCL01	17.76	CSOPO02	2.58
PHOJP02	8.34	CSOCL02	3.00	CSOPO03	11.01
PHOJP03	19.62	CSOCL03	11.21	CSOPO04	0.17
PHOJP04	4.13	CSOCL04	0.75	CSOSI01	16.27
PHOCN01	15.68	CSOSW01	15.26	CSOSI02	2.19
PHOCN02	6.38	CSOSW02	2.17	CSOSI03	10.15
PHOCN03	12.13	CSOSW03	9.28	CSOSI04	0.09
PHOCN04	5.17	CSOSW04	0.09	CSOPG01	14.87
PHOAG01	22.18	CSONW01	15.35	CSOPG02	1.95
PHOAG02	4.24	CSONW02	2.17	CSOPG03	9.48
PHOAU01	29.74	CSONW03	9.32	CSOPG04	0.11
PHOAU02	8.03	CSONW04	0.08	CSOIT01	16.97
PHOAU03	18.27	CSOFN01	16.57	CSOIT02	2.34
PHOAU04	3.97	CSOFN02	2.43	CSOIT03	10.50
CSOMX01	11.96	CSOFN03	9.93	CSOIT04	0.11
CSOMX02	2.14	CSOFN04	0.12	CSOTK01	18.76
CSOMX03	8.56	CSODN01	15.36	CSOTK02	2.67
CSOMX04	1.00	CSODN02	2.10	CSOTK03	11.36
CSOPA01	12.04	CSODN03	9.28	CSOTK04	0.10
CSOPA02	1.94	CSOUK01	13.48	CSOMR01	16.95
CSOPA03	8.46	CSOUK02	1.83	CSOMR02	2.19
CSOPA04	0.75	CSOUK03	8.43	CSOMR03	10.88
CSOJM01	10.96	CSOUK04	0.08	CSOMR04	0.13
CSOJM02	1.64	CSOIR01	13.63	CSOTU01	17.72
CSOJM03	7.88	CSOIR02	1.98	CSOTU02	1.65
CSOJM04	0.63	CSOIR03	8.58	CSOUA01	18.61
CSOTR01	11.95	CSOIR04	0.24	CSOUA02	2.61
CSOTR02	1.68	CSONH01	12.87	CSOUA03	11.27
CSOTR03	8.26	CSONH02	1.82	CSOUA04	0.06
CSOTR04	0.44	CSONH03	7.72	CSOIS01	19.05
CSOVZ01	12.16	CSONH04	0.02	CSOIS02	2.75
CSOVZ02	1.91	CSOBL01	12.87	CSOIS03	11.51
CSOVZ03	8.48	CSOBL02	1.84	CSOIS04	0.14
CSOVZ04	0.68	CSOBL03	7.73	CSOSN01	16.81
CSOBZ01	17.68	CSOBL04	0.04	CSOSN02	2.22
CSOBZ02	2.70	CSOFR01	14.97	CSOSN03	10.84
CSOBZ03	10.98	CSOFR02	2.14	CSOSN04	0.20
CSOBZ04	0.39	CSOFR03	9.16	CSONG01	18.24

Table 33. (Continued)

Coded route	Oppor. Cost	Coded route	Oppor. Cost	Coded route	Oppor. Cost
CS0NG02	1.16	NO0PA01	10.98	NO0NH03	8.73
CS0SA01	21.76	NO0PA02	1.14	NO0BL01	14.89
CS0SA02	3.46	NO0PA03	7.56	NO0BL02	2.18
CS0SA03	12.95	NO0JM01	10.45	NO0BL03	8.68
CS0SA04	0.39	NO0JM02	1.04	NO0FR01	16.64
CS0KN01	28.25	NO0JM03	7.31	NO0FR02	2.36
CS0KN02	4.52	NO0TR01	12.20	NO0FR03	9.91
CS0KN03	16.46	NO0TR02	1.36	NO0WG01	15.33
CS0KN04	0.39	NO0TR03	8.14	NO0WG02	2.26
CS0ID01	32.26	NO0VZ01	11.39	NO0WG03	8.90
CS0ID02	5.26	NO0VZ02	1.20	NO0EG01	16.88
CS0ID03	18.38	NO0VZ03	7.76	NO0EG02	2.11
CS0ID04	0.38	NO0BZ01	18.23	NO0PO01	19.39
CS0PK01	32.39	NO0BZ02	2.49	NO0PO02	2.71
CS0PK02	5.30	NO0BZ03	11.05	NO0PO03	11.61
CS0PK03	18.45	NO0UR01	20.11	NO0SI01	18.08
CS0PK04	0.39	NO0UR02	2.84	NO0SI02	2.45
CS0VN01	33.95	NO0UR03	11.96	NO0SI03	10.97
CS0VN02	5.89	NO0PU01	14.29	NO0PG01	16.63
CS0VN03	19.39	NO0PU02	1.75	NO0PG02	2.19
CS0VN04	0.75	NO0PU03	9.16	NO0PG03	10.28
CS0PP01	32.36	NO0CL01	16.70	NO0IT01	18.65
CS0PP02	5.58	NO0CL02	2.19	NO0IT02	2.56
CS0PP03	18.62	NO0CL03	10.31	NO0IT03	11.25
CS0PP04	0.75	NO0SW01	17.04	NO0TK01	20.55
CS0HK01	32.32	NO0SW02	2.42	NO0TK02	2.93
CS0HK02	5.59	NO0SW03	10.10	NO0TK03	12.17
CS0HK03	18.61	NO0NW01	17.18	NO0MR01	18.55
CS0HK04	0.77	NO0NW02	2.45	NO0MR02	2.38
CS0JP01	27.52	NO0NW03	10.16	NO0MR03	11.58
CS0JP02	4.85	NO0FN01	18.26	NO0TU01	19.50
CS0JP03	15.92	NO0FN02	2.65	NO0TU02	1.91
CS0JP04	0.77	NO0FN03	10.68	NO0UA01	20.55
CS0CN01	13.34	NO0DN01	17.57	NO0UA02	2.93
CS0CN02	3.52	NO0DN02	2.52	NO0UA03	12.17
CS0CN03	9.46	NO0DN03	10.35	NO0IS01	20.69
CS0CN04	2.21	NO0UK01	15.78	NO0IS02	2.95
CS0AG01	19.22	NO0UK02	2.28	NO0IS03	12.24
CS0AG02	1.16	NO0UK03	9.53	NO0SN01	18.15
CS0AU01	25.65	NO0UK04	0.11	NO0SN02	2.31
CS0AU02	4.52	NO0IR01	15.36	NO0SN03	11.40
CS0AU03	14.55	NO0IR02	2.22	NO0NG01	19.28
CS0AU04	0.60	NO0IR03	9.36	NO0NG02	1.14
NO0MX01	9.80	NO0IR04	0.13	NO0SA01	22.27
NO0MX02	0.91	NO0NH01	15.00	NO0SA02	3.25
NO0MX03	7.00	NO0NH02	2.19	NO0SA03	13.00

Table 33. (Continued)

Coded route	Oppor. Cost	Coded route	Oppor. Cost	Coded route	Oppor. Cost
NOOKN01	28.77	GVOTR04	0.19	GVONH03	9.02
NOOKN02	4.30	GVOVZ01	10.99	GVONH04	0.18
NOOKN03	16.50	GVOVZ02	1.13	GVOBL01	14.67
NOOID01	32.78	GVOVZ03	8.04	GVOBL02	2.17
NOOID02	5.05	GVOVZ04	0.17	GVOBL03	9.06
NOOID03	18.42	GVOBZ01	17.97	GVOBL04	0.21
NOOPK01	32.90	GVOBZ02	2.47	GVOFR01	16.50
NOOPK02	5.07	GVOBZ03	11.42	GVOFR02	2.38
NOOPK03	18.49	GVOBZ04	0.21	GVOFR03	10.34
NOOVN01	32.89	GVOUR01	20.22	GVOFR04	0.24
NOOVN02	5.07	GVOUR02	2.95	GVOWG01	15.18
NOOVN03	18.48	GVOUR03	12.53	GVOWG02	2.28
NOOPP01	31.29	GVOUR04	0.28	GVOWG03	9.33
NOOPP02	4.78	GVOPU01	13.83	GVOWG04	0.23
NOOPP03	17.71	GVOPU02	1.66	GVOEG01	16.74
NOOHK01	31.21	GVOPU03	9.39	GVOEG02	2.13
NOOHK02	4.76	GVOPU04	0.16	GVOPO01	19.16
NOOHK03	17.67	GVOCL01	16.24	GVOPO02	2.69
NOOJP01	26.42	GVOCL02	2.10	GVOPO03	11.98
NOOJP02	4.02	GVOCL03	10.54	GVOPO04	0.21
NOOJP03	14.99	GVOCL04	0.14	GVOSI01	17.82
NOOCN01	15.44	GVOSW01	16.38	GVOSI02	2.44
NOOCN02	3.90	GVOSW02	2.25	GVOSI03	11.34
NOOCN03	10.46	GVOSW03	10.21	GVOSI04	0.20
NOOCN04	2.18	GVOSW04	0.11	GVOPG01	16.39
NOOAG01	20.26	GVONW01	16.16	GVOPG02	2.18
NOOAG02	1.14	GVONW02	2.15	GVOPG03	10.65
NOOAU01	25.97	GVONW03	10.07	GVOPG04	0.21
NOOAU02	4.22	GVONW04	0.02	GVOIT01	18.50
NOOAU03	14.47	GVOFN01	17.19	GVOIT02	2.58
NOOAU04	0.16	GVOFN02	2.33	GVOIT03	11.68
GVOMX01	8.69	GVOFN03	10.56	GVOIT04	0.22
GVOMX02	0.57	GVOFN04	0.01	GVOTK01	20.26
GVOMX03	6.85	GVODN01	16.48	GVOTK02	2.89
GVOMX04	0.01	GVODN02	2.19	GVOTK03	12.51
GVOPA01	10.50	GVODN03	10.21	GVOTK04	0.20
GVOPA02	1.03	GVOUK01	15.38	GVOMR01	18.37
GVOPA03	7.79	GVOUK02	2.20	GVOMR02	2.39
GVOPA04	0.16	GVOUK03	9.81	GVOMR03	11.99
GVOJM01	10.06	GVOUK04	0.27	GVOMR04	0.21
GVOJM02	0.97	GVOIR01	15.13	GVOTU01	19.25
GVOJM03	7.58	GVOIR02	2.21	GVOTU02	1.88
GVOJM04	0.17	GVOIR03	9.73	GVOUA01	20.30
GVOTR01	11.94	GVOIR04	0.34	GVOUA02	2.90
GVOTR02	1.33	GVONH01	14.62	GVOUA03	12.53
GVOTR03	8.50	GVONH02	2.13	GVOUA04	0.21

Table 33. (Continued)

Coded route	Oppor. Cost	Coded route	Oppor. Cost	Coded route	Oppor. Cost
GV0IS01	20.51	GV0AG01	20.52	LA0CL06	4.42
GV0IS02	2.96	GV0AG02	1.31	LA0SW01	31.57
GV0IS03	12.65	GV0AU01	24.14	LA0SW02	11.12
GV0IS04	0.22	GV0AU02	3.62	LA0SW03	21.38
GV0SN01	17.91	GV0AU03	13.90	LA0SW04	7.54
GV0SN02	2.30	LA0MX01	26.30	LA0NW01	30.94
GV0SN03	11.76	LA0MX02	10.34	LA0NW02	10.86
GV0SN04	0.21	LA0MX03	19.46	LA0NW03	20.98
GV0NG01	19.54	LA0MX04	8.00	LA0NW04	7.36
GV0NG02	1.31	LA0PA01	22.56	LA0FN01	32.32
GV0SA01	22.00	LA0PA02	8.73	LA0FN02	11.17
GV0SA02	3.22	LA0PA03	17.07	LA0FN03	21.68
GV0SA03	13.35	LA0PA04	6.87	LA0FN04	7.43
GV0SA04	0.20	LA0JM01	24.08	LA0DN01	31.66
GV0KN01	28.49	LA0JM02	9.40	LA0DN02	11.05
GV0KN02	4.28	LA0JM03	18.05	LA0DN03	21.36
GV0KN03	16.85	LA0JM04	7.34	LA0DN04	7.44
GV0KN04	0.20	LA0TR01	25.05	LA0UK01	30.61
GV0ID01	32.51	LA0TR02	9.43	LA0UK02	11.08
GV0ID02	5.02	LA0TR03	18.42	LA0UK03	21.01
GV0ID03	18.78	LA0TR04	7.15	LA0UK04	7.71
GV0ID04	0.19	LA0VZ01	24.51	LA0UK05	15.03
GV0PK01	32.63	LA0VZ02	9.37	LA0UK06	5.60
GV0PK02	5.05	LA0VZ03	18.19	LA0IR01	30.53
GV0PK03	18.84	LA0VZ04	7.21	LA0IR02	11.15
GV0PK04	0.20	LA0VZ05	13.97	LA0IR03	21.03
GV0VN01	32.43	LA0VZ06	5.79	LA0IR04	7.82
GV0VN02	4.98	LA0BZ01	31.28	LA0NH01	29.70
GV0VN03	18.72	LA0BZ02	10.64	LA0NH02	10.96
GV0VN04	0.15	LA0BZ03	21.45	LA0NH03	20.12
GV0PP01	30.82	LA0BZ04	7.21	LA0NH04	7.58
GV0PP02	4.67	LA0BZ05	15.22	LA0NH05	14.00
GV0PP03	17.95	LA0BZ06	5.02	LA0NH06	5.39
GV0PP04	0.15	LA0UR01	32.04	LA0BL01	29.47
GV0HK01	30.48	LA0UR02	10.57	LA0BL02	10.89
GV0HK02	4.57	LA0UR03	21.67	LA0BL03	20.00
GV0HK03	17.75	LA0UR04	6.94	LA0BL04	7.55
GV0HK04	0.09	LA0PU01	22.43	LA0BL05	13.93
GV0JP01	26.01	LA0PU02	8.06	LA0BL06	5.37
GV0JP02	3.95	LA0PU03	16.60	LA0FR01	31.22
GV0JP03	15.26	LA0PU04	6.08	LA0FR02	11.06
GV0JP04	0.17	LA0CL01	24.57	LA0FR03	21.22
GV0CN01	15.21	LA0CL02	8.40	LA0FR04	7.56
GV0CN02	3.89	LA0CL03	17.59	LA0WG01	30.26
GV0CN03	10.84	LA0CL04	6.00	LA0WG02	11.11
GV0CN04	2.39	LA0CL05	12.99	LA0WG03	20.42

Table 33. (Continued)

Coded route	Oppor. Cost	Coded route	Oppor. Cost	Coded route	Oppor. Cost
LAOWG04	7.64	LAOIS04	7.52	LAOCN02	12.15
LAOWG05	14.15	LAOIS05	16.18	LAOCN03	21.02
LAOWG06	5.38	LAOIS06	4.94	LAOCN04	9.45
LAOEG01	31.81	LAOSN01	31.74	LAOAG01	33.45
LAOEG02	10.96	LAOSN02	10.66	LAOAG02	9.33
LAOPO01	34.72	LAOSN03	22.11	LAOAU01	23.89
LAOPO02	11.70	LAOSN04	7.32	LAOAU02	6.71
LAOPO03	23.37	LAONG01	32.47	LAOAU03	15.79
LAOPO04	7.72	LAONG02	9.34	LAOAU04	3.88
LAOSI01	32.54	LAOSA01	30.18	LAOAU05	10.66
LAOSI02	11.12	LAOSA02	9.46	LAOAU06	2.08
LAOSI03	22.21	LAOSA03	20.30	SLOMX01	28.30
LAOSI04	7.52	LAOSA04	6.01	SLOMX02	11.64
LAOPG01	31.33	LAOSA05	14.04	SLOMX03	20.53
LAOPG02	10.96	LAOSA06	3.82	SLOMX04	8.94
LAOPG03	21.67	LAOKN01	40.26	SLOPA01	24.52
LAOPG04	7.59	LAOKN02	11.86	SLOPA02	10.01
LAOPG05	15.54	LAOKN03	25.96	SLOPA03	18.13
LAOPG06	5.44	LAOKN04	6.84	SLOPA04	7.81
LAOIT01	33.21	LAOID01	35.63	SLOJM01	26.06
LAOIT02	11.27	LAOID02	9.37	SLOJM02	10.68
LAOIT03	22.55	LAOID03	22.70	SLOJM03	19.11
LAOIT04	7.54	LAOID04	4.84	SLOJM04	8.28
LAOIT05	15.84	LAOPK01	36.70	SLOTR01	27.02
LAOIT06	5.18	LAOPK02	9.75	SLOTR02	10.71
LAOTK01	35.02	LAOPK03	23.32	SLOTR03	19.48
LAOTK02	11.60	LAOPK04	5.07	SLOTR04	8.09
LAOTK03	23.41	LAOVN01	27.07	SLOVZ01	26.49
LAOTK04	7.53	LAOVN02	6.14	SLOVZ02	10.66
LAOTK05	16.17	LAOVN03	17.54	SLOVZ03	19.25
LAOTK06	4.95	LAOVN04	2.85	SLOVZ04	8.16
LAOMR01	32.96	LAOPP01	26.69	SLOVZ05	14.35
LAOMR02	11.03	LAOPP02	6.30	SLOVZ06	6.44
LAOMR03	22.79	LAOPP03	17.50	SLOBZ01	33.25
LAOMR04	7.51	LAOPP04	3.12	SLOBZ02	11.92
LAOMR05	16.25	LAOHK01	25.51	SLOBZ03	22.50
LAOMR06	5.23	LAOHK02	5.88	SLOBZ04	8.15
LAOTU01	33.95	LAOHK03	16.81	SLOBZ05	15.58
LAOTU02	10.58	LAOHK04	2.89	SLOBZ06	5.67
LAOUA01	34.92	LAOJP01	22.79	SLOUR01	33.09
LAOUA02	11.56	LAOJP02	5.92	SLOUR02	11.50
LAOUA03	23.36	LAOJP03	15.36	SLOUR03	22.18
LAOUA04	7.51	LAOJP04	3.36	SLOUR04	7.67
LAOIS01	35.11	LAOJP05	10.52	SLOPU01	24.44
LAOIS02	11.61	LAOJP06	1.69	SLOPU02	9.36
LAOIS03	23.46	LAOCN01	28.76	SLOPU03	17.68

Table 33. (Continued)

Coded route	Oppor. Cost	Coded route	Oppor. Cost	Coded route	Oppor. Cost
SLOPU04	7.02	SLOFR02	12.35	SLOUA02	12.76
SLOCL01	26.57	SLOFR03	22.28	SLOUA03	24.27
SLOCL02	9.69	SLOFR04	8.49	SLOUA04	8.39
SLOCL03	18.67	SLOWG01	32.23	SLOIS01	37.11
SLOCL04	6.94	SLOWG02	12.40	SLOIS02	12.91
SLOCL05	13.37	SLOWG03	21.48	SLOIS03	24.53
SLOCL06	5.09	SLOWG04	8.57	SLOIS04	8.47
SLOSW01	33.55	SLOWG05	14.51	SLOIS05	16.56
SLOSW02	12.41	SLOWG06	6.04	SLOIS06	5.60
SLOSW03	22.43	SLOEG01	34.78	SLOSN01	33.72
SLOSW04	8.48	SLOEG02	12.62	SLOSN02	11.95
SLONW01	33.04	SLOPO01	36.25	SLOSN03	23.17
SLONW02	12.19	SLOPO02	12.82	SLOSN04	8.27
SLONW03	22.12	SLOPO03	24.16	SLONG01	34.40
SLONW04	8.33	SLOPO04	8.56	SLONG02	10.60
SLOFN01	34.29	SLOSI01	34.53	SLOSA01	37.17
SLOFN02	12.46	SLOSI02	12.43	SLOSA02	12.63
SLOFN03	22.74	SLOSI03	23.29	SLOSA03	24.37
SLOFN04	8.37	SLOSI04	8.47	SLOSA04	8.11
SLODN01	33.66	SLOPG01	33.30	SLOSA05	16.28
SLODN02	12.35	SLOPG02	12.24	SLOSA06	5.19
SLODN03	22.43	SLOPG03	22.72	SLOKN01	38.78
SLODN04	8.38	SLOPG04	8.53	SLOKN02	11.85
SLOUK01	32.58	SLOPG05	15.90	SLOKN03	24.94
SLOUK02	12.36	SLOPG06	6.10	SLOKN04	6.98
SLOUK03	22.06	SLOIT01	35.18	SLOID01	32.91
SLOUK04	8.66	SLOIT02	12.56	SLOID02	8.90
SLOUK05	15.40	SLOIT03	23.60	SLOID03	20.93
SLOUK06	6.25	SLOIT04	8.49	SLOID04	4.70
SLOIR01	32.51	SLOIT05	16.22	SLOPK01	33.95
SLOIR02	12.44	SLOIT06	5.84	SLOPK02	9.27
SLOIR03	22.08	SLOTK01	37.03	SLOPK03	21.55
SLOIR04	8.77	SLOTK02	12.90	SLOPK04	4.92
SLONH01	31.67	SLOTK03	24.49	SLOVN01	26.20
SLONH02	12.25	SLOTK04	8.48	SLOVN02	6.37
SLONH03	21.18	SLOTK05	16.55	SLOVN03	16.89
SLONH04	8.52	SLOTK06	5.62	SLOVN04	3.14
SLONH05	14.37	SLOMR01	34.93	SLOPP01	24.53
SLONH06	6.04	SLOMR02	12.32	SLOPP02	6.04
SLOBL01	31.47	SLOMR03	23.85	SLOPP03	16.07
SLOBL02	12.19	SLOMR04	8.44	SLOPP04	3.12
SLOBL03	21.07	SLOMR05	16.61	SLOHK01	24.06
SLOBL04	8.50	SLOMR06	5.88	SLOHK02	5.89
SLOBL05	14.31	SLOTU01	35.93	SLOHK03	15.81
SLOBL06	6.03	SLOTU02	11.86	SLOHK04	3.03
SLOFR01	33.19	SLOUA01	36.65	SLOJP01	19.52

Table 33. (Continued)

Coded route	Oppor. Cost
SL0JP02	5.24
SL0JP03	13.27
SL0JP04	3.09
SL0JP05	8.93
SL0JP06	1.60
SL0CN01	31.08
SL0CN02	13.56
SL0CN03	22.28
SL0CN04	10.47
SL0AG01	35.38
SL0AG02	10.60
SL0AU01	23.84
SL0AU02	7.23
SL0AU03	15.63
SL0AU04	4.35
SL0AU05	10.28
SL0AU06	2.45