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16. Abstract

This report presents a bridge management system module for the selection of rehabilitation and replacement projects. The process starts with a budget to be allocated to the Texas districts and is finalized with the selection of projects to be submitted for bidding and contracting within the alloted funds. The ranking process included in both the allocation and selection processes is based on multiobjective decision theory. The developed system is composed by six computer modules, five at the state level and one at the district level. The one at the district level captures the expertise of the district engineers and includes it in the selection process. The system automates the process that recently was used to determine the district allocations and project selections in the last on and off systems Texas Highway Bridge Replacement and Rehabilitation Program. The ranking processes utilized by a selection of other states are reviewed and compared to the Texas procedures. A forecast of the funding needs for rehabilitating and replacing the Texas bridge network in the next decades is also presented.

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by

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Research Project 3-5-86-439

Strategies for Bridge Replacement

conducted for

Texas State Department of Highways and Public Transportation

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CENTER FOR TRANSPORTATION RESEARCH

Bureau of Engineering Research

THE UNIVERSITY OF TEXAS AT AUSTIN

January 1989

The contents of this report reflect the views of the authors, who are responsible for the facts and the accuracy of the data presented herein. The contents do not necessarily reflect the official views or policies of the Federal Highway Administration or the State Department of Highways and Public Transportation. This report does not constitute a standard, specification, or regulation.

There was no invention or discovery conceived or first actually reduced to practice in the course of or under this contract, including any art, method, process, machine, manufacture, design or composition of matter, or any new and useful improvement thereof, or any variety of plant which is or may be patentable under the patent laws of the United States of America or any foreign country.

PREFACE

This final report describes the work performed on Research Project 3-5-86-439, "Strategies for Bridge Replacement." It presents a two-level closed-loop bridge selection system that is based on computer modules for both the State and District levels. The system may be processed on both micro- and mainframe computers and is programmed in Statistical Analysis System (SAS) language. It is the result of close contact between project staff and the Texas State Department of Highways and Public Transportation (SDHPT) Bridge Division personnel; the results were applied in the determination of the last Highway Bridge Replacement and Rehabilitation Program (HBRRP) fund allocations and project selections.

The authors are particularly grateful to Ralph Banks of the SDHPT Bridge Division (D-5) for his assistance, contributions, and comments in the development of the research. The authors would also like to acknowledge the assistance of the staff of the Center for Transportation Research during the course of the study.

LIST OF REPORTS

Research Report 439-1, "Improvements in the On-System Bridge Prioritization," by Chris Boyce, W. R. Hudson, and Ned H. Burns, presents a computerized procedure for prioritizing bridge replacements and rehabilitations. Background information and directions for further research are included. January 1987.

Research Report 439-2, "Improved Safety Indices for Prioritizing Bridge Projects," by Chris Boyce, W. R. Hudson, and Ned H. Burns, presents two indices useful in bridge project prioritization procedures. A Structural Safety Index and a Geometric Safety Index are documented. Background information on the nature of bridge project prioritization procedures is presented, as is a chronological history of federal legislation concerning federal funding of bridge projects. A discussion of the current prioritization procedures, including the federal Sufficiency Rating, is included. January 1987.

Research Report 439-3, "Bridge Project Selection for Texas," by W. R. Hudson, Ned H. Burns, and Robert Harrison, presents a two-level closed-loop process for the selection of bridge rehabilitation and replacement projects. The process uses a computerized statistical evaluation to prioritize projects at the network level. Three indices which quantify the service projects provided are also developed to complement the safety indices previously defined. November 1987.

Research Report 439-4F, "A Bridge Management System Module for the Selection of Rehabilitation and Replacement Projects," by Jose Weissmann, W. R. Hudson, Ned H. Burns, and Robert Harrison, describes a computerized system for the allocation of funds on a district basis and also the selection of rehabilitation and replacement bridge projects. It is composed of several computer programs that exchange information and are designed to be utilized by the Texas SDHPT staff at both the state and district levels. January 1989.

ABSTRACT

This report presents a bridge management system module for the selection of rehabilitation and replacement projects. The process starts with a budget to be allocated to the Texas districts and is finalized with the selection of projects to be submitted for bidding and contracting within the alloted funds. The ranking process included in both the allocation and selection processes is based on multiobjective decision theory. The developed system is composed by six computer modules, five at the state level and one at the district level. The one at the district level captures the expertise of the district engineers and includes it in the selection process. The system automates the process that recently was used to determine the district allocations and project selections in the last on and off systems Texas Highway Bridge Replacement and Rehabilitation Program. The ranking processes utilized by a selection of other states are reviewed and compared to the Texas procedures. A forecast of the funding needs for rehabilitating and replacing the Texas bridge network in the next decades is also presented.

KEY WORDS: Bridge management, bridge rehabilitation, bridge replacement, bridge inventory, ranking, life cycle costs, multi-attribute criteria, prioritization.

SUMMARY

A system, developed for the state of Texas, is reported which determines an allocation budget for bridge replacement and rehabilitation projects, using multi-attribute criteria and user-friendly computer programs. The system is a two level closed loop procedure based on national bridge inventory data (NBI) and addresses both state and district level concerns. One state level program determines those bridge projects meeting FHWA financing criteria while two other programs take this subset and apply specific state criteria for project ranking and prioritization. The user of these programs can rank the candidate projects using a multi-attribute technique and can complement this with an automatic qualification process based on user defined threshold values. The multi-attribute approach uses statistical techniques applied to the entire state bridge population. Therefore, as the database is regularly updated in accordance with FHWA requirements, it captures both recent bridge deterioration and improvements. A district reporting program incorporates regional knowledge of structures and their condition into the decision-making process. Advanced reporting and data manipulation procedures are available at the state level of the system, in order to assemble the final project selection list.

The proposed system should interest all state officials engaged in ranking bridge projects. Incorporating managerial experience and using statistics based on current national bridge survey data means that the findings are relevant throughout the United States.

IMPLEMENTATION STATEMENT

It is recommended that the proposed system be implemented in the SDHPT administrative structure. The proposed system is a contribution to the rationalization of the bridge management activities currently used by the Texas SDHPT, such as the determination of district budget allocations and bridge rehabilitation and replacement selections. The proposed procedure is a significant step towards the implementation of integrated bridge management system techniques in the State of Texas.

TABLE OF CONTENTS

CHAPTER 1. INTRODUCTION

HISTORICAL BACKGROUND

Highways are one of the main modes of transportation and bridges are vital links for the adequate performance of the roadway system. In the United States the heavy use of this transportation system represented 1.92 trillion vehicle miles of travel (VMT) in 1987, with an expected increase of two to three percent a year (Ref 28). Unfortunately, the bridge network, as well as the roadway network, is not built to last forever and is in constant need of maintenance, rehabilitation and replacement. The solution for maintaining an acceptable level of service from this system, involves allocating funds that are generated nationwide by all units of government and which amounted to US $66 billion per year in 1987 dollars (Ref 28).

The need for maintaining an acceptable level of service for the bridge and roadway network, with limited funds, stimulated the development of management techniques in the field of Pavement Management Systems (PMS) (Ref 8), and more recently in the field of Bridge Management Systems (BMS) (Refs 10 and 30). The first concepts and also the term Pavement Management Systems began to be used in the early 1970's to describe the range of activities involved in providing pavements.

The firsts concerns related to BMS were triggered by the Ohio river Silver Bridge collapse, that killed 46 people in 1967. Congressional hearings responding to that collapse revealed a lack of uniform reporting standards and the need for an inventory of the nation's bridges.

In recognition of the declining condition of the nation's bridges the bridge program was established in 1970 (Ref 21) under the Special Bridge Replacement Program, making Federal funds available for training bridge inspectors, making bridge inspections and replacing the most critical bridges. This program was replaced in 1978 by the Highway Bridge Replacement and Rehabilitation Program (HBRRP) (Ref 23) and the early efforts culminated in establishing the National Bridge Inventory (NBI) data set as described by the Structural Inventory and Appraisal (SI&A) guide (Refs 20 and 27). This data base is certainly one of the few comprehensive inventories of a major segment of infrastructure available on a national basis.

The National Bridge Inspection Standards requires that inspection findings be published on a standard format by the states. This includes space for 90 data items and each state is required to inspect each structure with a frequency of two years plus or minus six months. The results are forwarded to the Federal Highway Administration (FHWA) in the form of computer tapes and these are used to determine eligibility of the projects for federal funding. These bridge inspection reports are also used in the allocation of the available funds to the states. The State of Texas data gathering procedure is known as BRINSAP (Bridge Inventory, Inspection and Appraisal Program). The BRINSAP data file contains the federally required data for each bridge, together with additional information that the State officials find useful. In Texas a total of 140 items are recorded for each bridge, making it a fairly extensive and frequently updated database.

objectives

The overall objective of this research is to establish a consistent computerized system for the selection of rehabilitation and replacement bridge projects for a major State. This overall objective can be itemized as follows:

(1) Development of a theoretically sound statewide criteria for the allocation of HBRRP budgets on a district by district basis based on existing inspection data.

(2) Application of the same process to the selection of initially considered projects to be submitted to the districts appreciation.

(3) Establish an alternate data base for preventing the projects already selected in previous HBRRP funding programs from being considered in the selection process.

(4) Integrate the statewide allocation and project selection procedures with a district level reporting program that allows district engineers to add regional criteria to the project selections.

(5) Establish a link between the districts and the State level administration through a State level reporting program that integrates the information relayed by the districts statewide.

(6) Design the computerized selection system in a modular way that allows for user inputs at any step of the selection process.

(7) Design the computerized component modules to be user friendly with a computer terminal screen driven interface.

(8) Allow flexibility on modification of existing report format and additional information retrieval.

ELIGIBILITY FOR FEDERAL FUNDS

The FHWA determines a bridge project's eligibility for rehabilitation or replacement federal funds based on two criteria:

(1) whether or not the bridge is deficient and

(2) whether or not its Sufficiency Rating is within a proper range.

The FHWA will fund up to 80 percent of a project if it is considered eligible. The state or local authorities must provide the remaining 20 percent of the funds.

Sufficiency Ratings (SR) are scores from 0 to 100 designed to quantify each bridge's sufficiency to remain in service in its present condition. A rating of 100 indicates an entirely sufficient bridge, that requires absolutely no work. A rating of zero indicates an entirely insufficient bridge, with severe safety problems and a large average daily traffic (ADT). The FHWA developed the original formula for SR in 1972, which was subsequently revised by the American Association of State Highway Officials (AASHTO) Committee on Bridge Replacement Surveys and Inspection Standards in 1976. The revised formula was finally adopted by the FHWA in 1977 (Ref 22).

To be considered deficient by FHWA standards, a bridge has to be classified as either structurally deficient or functionally obsolete. Many structurally deficient bridges are also functionally obsolete, but they are counted only as structurally deficient because the FHWA considers structural deficiency to be the more critical condition (Ref 26). A structure is defined as functionally obsolete if the appraisal rating for its roadway geometry, under-clearances, approach roadway alignment, structural condition, or waterway adequacy is three or less. Appraisal Ratings, a number assigned during the inspections on a 0 to 9 scale, measure the degree to which the design and configuration of a bridge meet current standards for the route of the bridge (Ref 19).

A bridge is defined as structurally deficient if the condition rating for its deck, superstructure, or substructure is 4 or less, or if either its structural condition appraisal rating, or its waterway capacity appraisal rating are two or less. Condition ratings measure the degree of deterioration of several bridge elements.

If the sufficiency rating for the bridge is less than or equal to 80, and if it is also classified as either structurally deficient or functionally obsolete, the bridge is eligible for FHWA funds for rehabilitation. If the sufficiency rating for the bridge is less than or equal to 50, and it is also determined as either structurally deficient or functionally obsolete, the bridge is eligible for FHWA funds for replacement. Two categories of funds are available within the HBRRP

(1) apportioned funds that are distributed according to relative State needs and
(2) discretionary funds that are set aside to replace or rehabilitate deficient, critically needed, high cost bridges on the Federal-aid system.

For the apportioned funds, the FHWA revises the distribution of bridge funds to the states annually to reflect changing needs and actual construction costs. To establish the apportionment factor, the FHWA applies construction costs to the four categories of eligible deficient bridge projects in each State. These categories are:

(1) replacement of Federal-aid system bridges,
(2) replacement of off-system bridges,
(3) rehabilitation of Federal-aid system bridges, and
(4) rehabilitation of off-system bridges.

The apportionment factor is the ratio of each State needs compared with the national need. By law each State must receive at least 0.25 percent, but not more than 10 percent, of total funds available.

The Federal-Aid system, referred from now on as the on-system, is described as follows. The national system of interstate and defense highways consists of routes of highest importance to the nation. They connect the main metropolitan areas, cities and industrial centers, including important routes into, through and around urban areas, serve national defense, and connect at suitable border points with routes of continental importance in Canada and Mexico. The Federal-Aid urban highway system is designated within urban areas of population over 5,000. The Federal-Aid primary system consists of interconnecting main roads important to interstate, statewide, and regional travel, consisting of rural arterial routes and their extensions into or through urban areas. The Federal-Aid secondary system consists of rural major collector routes. The off-system bridges are the ones that are excluded from the on-system classification, and the States must use at least 15 percent of the apportioned HBRRP funds to improve the off-system bridges.

CONDITION AND FUND OBLIGATIONS FOR THE NATION'S BRIDGES

Table 1.1 shows the changes in the number of deficient bridges since December 1982 as reported in bridge program reports (Ref 28). The total number of deficient bridges for both on and off systems is declining slowly. The rate of decline is of course related to the level of funding and the good distribution of funds to proper projects. A deficient bridge does not necessarily imply that it is likely to collapse or that it is unsafe; however, it implies increased user costs due to:

(1) posting, which causes detouring and
(2) geometric deficiencies, which may lead to traffic congestions or accidents.

From Fiscal Years 1979 through 1987, the States obligated a total of $11.3 billion of HBRRP funds. This amount was approximately 90.9 percent of the total discretionary and apportioned funds available. Table 1.2 (Ref 28) shows the HBRRP discretionary and apportioned fund obligations. In addition to the $11.3 billion of HBRRP funds the States spent $6.5 billion of

TABLE 1.1. CHANGES IN THE NUMBER OF DEFICIENT BRIDGES

	On System			Off System			
Date	Structurally Deficient	Functionaly Obsolete	Total	Structurally Deficient	Functionaly Obsolete	Total	Total on + off
Dec-82	28,070	41,575	69,645	104,084	79,467	183,551	253,196
Dec-83	30,996	43,253	74,249	105,351	80,706	186,057	260,306
Dec-84	33,389	41,809	75,198	107,419	77,558	184,997	260,175
Dec-85	35,433	40,499	75,932	100,303	67,682	167,985	243,917
Dec-86	36,321	40,542	76,863	95,241	71,542	166,783	243,646
Jun-88	37,300	39,892	77,192	98,526	62,639	161,165	238,357

Source FHWA/1989

TABLE 1.2. HBRRP PLUS OTHER FEDERAL-AID FUNDS OBLIGATED BY FISCAL YEAR

	HBRRP Funds				
Fiscal Year	Discretionary Funds (Million)	Apportioned Funds (Million)	Total HBRRP (Million)	Other Federal-aid Funds (Million)	Total HBRRP + Other
1979	178.9	423.4	602.3	318.0	920.3
1980	140.6	619.4	760.0	406.0	1,166.0
1981	164.4	730.8	895.2	371.0	1,266.2
1982	233.4	744.9	978.3	569.0	1,547.3
1983	216.2	1,196.0	1,412.2	570.0	1,982.2
1984	238.1	1,512.2	1,750.3	754.0	2,504.3
1985	206.3	1,382.1	1,588.4	1,073.0	2,661.4
1986	215.2	1,442.5	1,657.7	1,172.0	2,829.7
1987	188.9	1,427.4	1,616.3	1,237.0	2,853.3

Source FHWA/1989

other Federal-aid funds for bridge rehabilitation or replacement projects during the same period. This gives an average of $2 billion per year in the last nine fiscal years.

CONDITION OF TEXAS BRIDGES

The Texas highway infrastructure includes 44,314 inventoried bridge structures, which represent 7.7 percent of the nation's total of approximately 577,000 inventoried bridges, which represent 411 millions of square feet of bridge deck area. From these 44,314 bridges, 4,758 are classified as deficient for the on-system and 10,395 for the off-system, the condition of the Texas bridge system is summarized in Table 1.3 (Ref 28).

FUTURE FUNDING NEEDS FOR TEXAS

Texas has traditionally received an average of 3.8 percent of the Federal funds available nationwide for rehabilitation and replacement, which means about $90 million per year, from calculations based on data from (Ref 28). In order to estimate future funding needs for the Texas bridge

TABLE 1.3. CONDITION OF TEXAS BRIDGES

	On-System	Off-System	Total
Total Bridges in Inventory	26,076	18,238	44,314
Non-Deficient	21,318	7,843	29,161
Percent of Total	81.8	43.0	65.8
Structurally Deficient	1,315	5,257	6,572
Percent of Total	5.0	28.8	14.8
Functionally Obsolete	3,443	5,138	8,581
Percent of Total	13.2	28.2	19.4
Deficient Bridges	4,758	10,395	15,153
Percent of Total	18.2	57.0	34.2

Source FHWA/1989

network, and to illustrate the magnitude of the problem that faces the Texas State Department of Highways and Public Transportation (SDHPT) decision makers, life cycle analysis techniques are used (Refs 11 and 30) to calculate the size of the annual budget needed for rehabilitation and replacement activities over a specified time frame.

A network approach employing uniform and simplified life cycle cost analysis profiles is used to determine the annual budgets for this exercise. A complete life cycle cost analysis approach would determine actual expenditures through deterioration curves and predicted cost consequences for each bridge, resulting in a fairly complicated analysis. It is assumed, for this analysis, that the useful life of a bridge is sixty years, after which the structure needs to be replaced, and that the average bridge will need a rehabilitation activity at mid-life, about 30 years. The estimated cost for these activities is twenty dollars per square foot for rehabilitation and thirty five dollars per square foot for replacement, in 1989 dollar values. A schematic chart of the life cycle cost profile adopted is presented in Fig 1.1.

When a bridge structure is replaced, functional obsolescence is most often the determining factor. One key factor that characterizes functional obsolescence is the inadequacy of the bridge deck width for current daily traffic levels. To accommodate these concepts into the proposed life cycle cost analysis, an expansion factor needs to be used which estimates the larger bridge deck area for the replaced structure. Based on summary statistics calculated from the Texas BRINSAP data base this expansion factor is approximately 50 percent, which indicates that, on average, when structures are replaced, they have a deck area fifty percent larger than the original bridge specifications.

A computer program, included in Appendix B, was used to forecast bridge funding needs for Texas over a forty year time period starting in 1988, using the life cycle cost profile depicted in Fig 1.1. For each bridge structure in the BRINSAP data base, a rehabilitation activity is scheduled for the thirtieth year and a replacement is scheduled for the last year of useful life, based on the

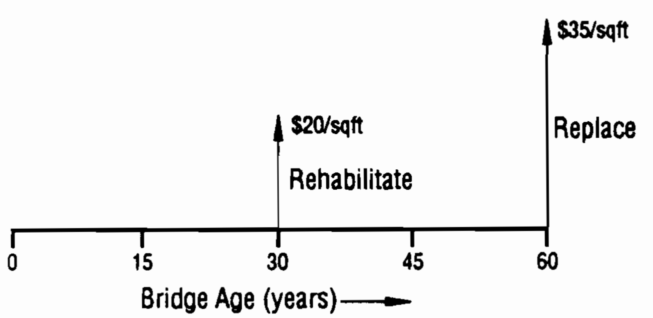


Fig 1.1. Life cycle activity profile for an average bridge for rehabilitation and replacement activities.

year of construction. For each year of the planning horizon, the total dollar amount of work required on bridges that have reached rehabilitation and replacement age is calculated, and this represents the budget level required to ensure that there is no backlog of scheduled rehabilitation and replacement activities. This approach also assumes that the backlog as off the date that the forecast is made is zero. The simplified life cycle cost analysis assumes that all structures in the bridge population have the same life cycle activity profile regardless of traffic, building material and other conditions. This assumption makes it possible to use the distribution of deck area built by year for the calculations, which simplifies the computations. Deck areas constructed in Texas are depicted in Fig 1.2 for both on- and off-systems. Tables C.1 and C.2, in Appendix C, present the numerical data used for generating the histogram shown in Fig 1.2, Table C.1 for the on-system, Table C.2 for the off-system. This deck area data was retrieved from the BRINSAP data base. To determine budget levels for the existing network using simplified life cycle profiles, the following sequential steps are followed:

(1) for every year in the forty year planning exercise, the age of each structure is calculated,
(2) this allows each structure to be categorized for rehabilitation and replacement activities,
(3) next the figures for annual deck area constructed are retrieved from the distribution of deck area built, and finally
(4) using constructed deck areas, the expansion factor, and current unit costs, annual budgets for accommodating the full rehabilitation and replacement needs can be derived.

The annual budgets represent the investment levels which will prevent the build-up of a backlog of rehabilitation and replacement activities on the existing network. They can be compared with actual and proposed agency expenditures. As an example, the annual budget for 1991 is calculated for the Texas on-system bridges In that year, bridges built in 1961 (total deck area 55,560,533 square feet) will be 30 years old, and the established life cycle profile indicates that they will need rehabilitation. Similarly, in 1991 bridges built in 1931 (deck area 2,254,936 square feet) will be 60 years old and will probably need replacement. The cost of rehabilitating and replacing these structures in 1991 is estimated by the following formula:

$$\text{Budget}_{1991} = (\text{Area built}_{1931}) * (\text{Expansion Factor}) * (\text{Cost per Square Foot for Replacement}) + (\text{Area built}_{1961}) * (\text{Cost per Square Foot for Rehabilitation})$$

$$\text{Budget}_{1991} = 2{,}254{,}936 * 1.5 * 35 + 55{,}560{,}533 * 20 = \$1{,}229{,}594{,}800$$

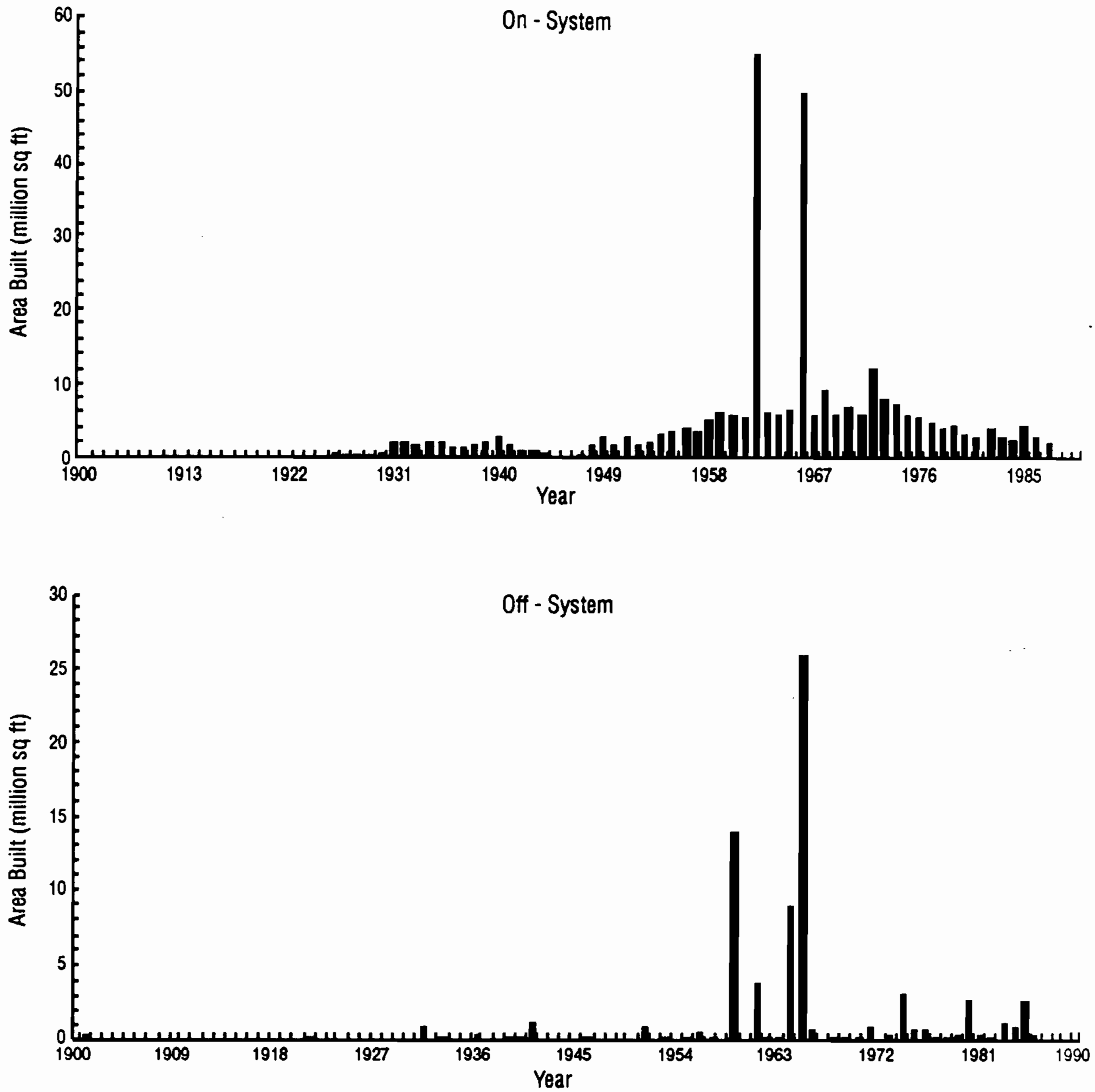


Fig 1.2. Distribution of deck area built in the state of Texas for On and Off systems.

The calculations are repeated for each year of the planning horizon giving the results depicted in Tables 1.4 and 1.5 for the on- and off-systems, respectively. A Statistical Analysis System (SAS) program is included in Appendix B which automates the calculations. It is designed to be interactive and the user provides the inputs through screen prompts for such variables as planning horizon, year to start the forecast, costs for rehabilitation and replacement, years to rehabilitate, years to replace, and expansion factor. The distribution of deck area built is needed for use in the model and can be retrieved and updated from the BRINSAP data base.

The results of the model, when run with these inputs and a forty year planning horizon, predict that a total budget of $18.7 billion will be needed for the on system (Table 1.4) and $5 billion will be needed for the off system (Table 1.5), at 1989 prices, for the planning period covered. A smooth funding level is desirable for state planning purposes and the results, in Fig 1.3, show that while such a characteristic is prevalent over a substantial part of the horizon, there are significant peaks which will pose a big challenge for bridge managers in the state of Texas, particularly in the early 1990's. Another critical point highlighted by the analysis is the second decade of the next century, when the substantial amount of deck area built in the early sixties will need costly replacement.

This forecast application demonstrates the contribution that life cycle analysis, even in a simplified form, can make to planning future funding needs. It is concluded that a significant backlog of work is building up in Texas, as demonstrated when current and forecasted funding levels are compared, which may cause massive funding requirements in the next decade. These funding needs reflect the bridge building boom of the 1960's, in which most of the decks were built with minimum cover for reinforcing steel and without corrosion protection systems. The development of a network level ranking module for determining rehabilitation and reconstruction programs, such as the one described in this publication, will help to manage the problem of selecting which bridges to select for improvement within a given budget.

SCOPE AND ORGANIZATION

This report is organized in five Chapters, with contents as follows.

Chapter 1 presents background information about the source and funding levels available for rehabilitation and replacement of the nation's bridges. It also includes a forecast of the future funding needs for the Texas bridge network.

Chapter 2 summarizes bridge project prioritization procedures used by other States and presents a summary of the ongoing research efforts at the University of Texas at Austin.

Chapter 3 includes the theoretical background for a bridge selection module and proposes procedures based on multiobjective decision theory for the solution of the problem. The different steps in solving a multiobjective decision problem are discussed and related to the bridge selection problem.

Chapter 4 presents a computerized budget allocation and bridge project selection system with the description of the component computer programs. Detailed manuals for the operation of the computer programs are included in Appendix A. Appendix A also contains an example of continuous flow of use of the system with a set of data. This example is used for illustration of the operating procedures for the system as a complement for the manual and also for the illustration of the capabilities of the system.

Finally, Chapter 5 presents the major conclusions, suggests implementation procedures and presents recommendations for further research.

TABLE 1.4. INVESTMENTS NEEDED IN THE FUTURE BY THE ON SYSTEM BRIDGES

Year	Needed Budget	Year	Needed Budget
1988	$159,948,558	2010	$228,291,565
1989	$175,103,218	2011	$185,014,920
1990	$242,767,438	2012	$176,492,100
1991	$1,229,594,800	2013	$239,579,108
1992	$239,637,073	2014	$277,391,023
1993	$232,728,123	2015	$275,855,828
1994	$255,170,633	2016	$237,465,080
1995	$1,093,253,128	2017	$285,106,040
1996	$202,907,380	2018	$365,962,703
1997	$302,313,655	2019	$359,737,073
1998	$238,135,543	2020	$368,682,563
1999	$300,134,038	2021	$2,984,576,063
2000	$210,547,523	2022	$416,513,408
2001	$322,833,093	2023	$373,866,458
2002	$232,483,438	2024	$434,514,690
2003	$196,944,993	2025	$2,704,441,418
2004	$135,952,308	2026	$375,900,960
2005	$122,158,233	2027	$569,080,335
2006	$123,253,305	2028	$384,443,610
2007	$193,099,568	2029	$470,899,163
2008	$239,845,243	2030	$360,386,295
2009	$175,564,933	TOTAL	$18,698,576,627

TABLE 1.5. INVESTMENTS NEEDED IN THE FUTURE BY THE OFF SYSTEM BRIDGES

Year	Needed Budget	Year	Needed Budget
1988	$297,540,378	2010	$60,678,135
1989	$8,687,670	2011	$7,206,218
1990	$134,206,910	2012	$35,647,140
1991	$7,520,555	2013	$24,646,918
1992	$16,328,865	2014	$66,126,393
1993	$190,656,110	2015	$45,517,300
1994	$534,277,345	2016	$13,525,588
1995	$41,639,558	2017	$5,692,093
1996	$10,135,653	2018	$764,439,180
1997	$10,286,918	2019	$11,169,578
1998	$18,363,650	2020	$242,694,833
1999	$18,234,013	2021	$11,382,323
2000	$93,012,785	2022	$22,036,268
2001	$7,350,693	2023	$494,516,295
2002	$13,751,003	2024	$1,390,360,553
2003	$68,706,313	2025	$59,539,853
2004	$19,528,973	2026	$12,036,630
2005	$27,241,978	2027	$13,555,598
2006	$12,403,490	2028	$22,957,050
2007	$9,582,453	2029	$22,718,850
2008	$15,794,543	2030	$94,876,845
2009	$58,778,720	TOTAL	$5,035,352,217

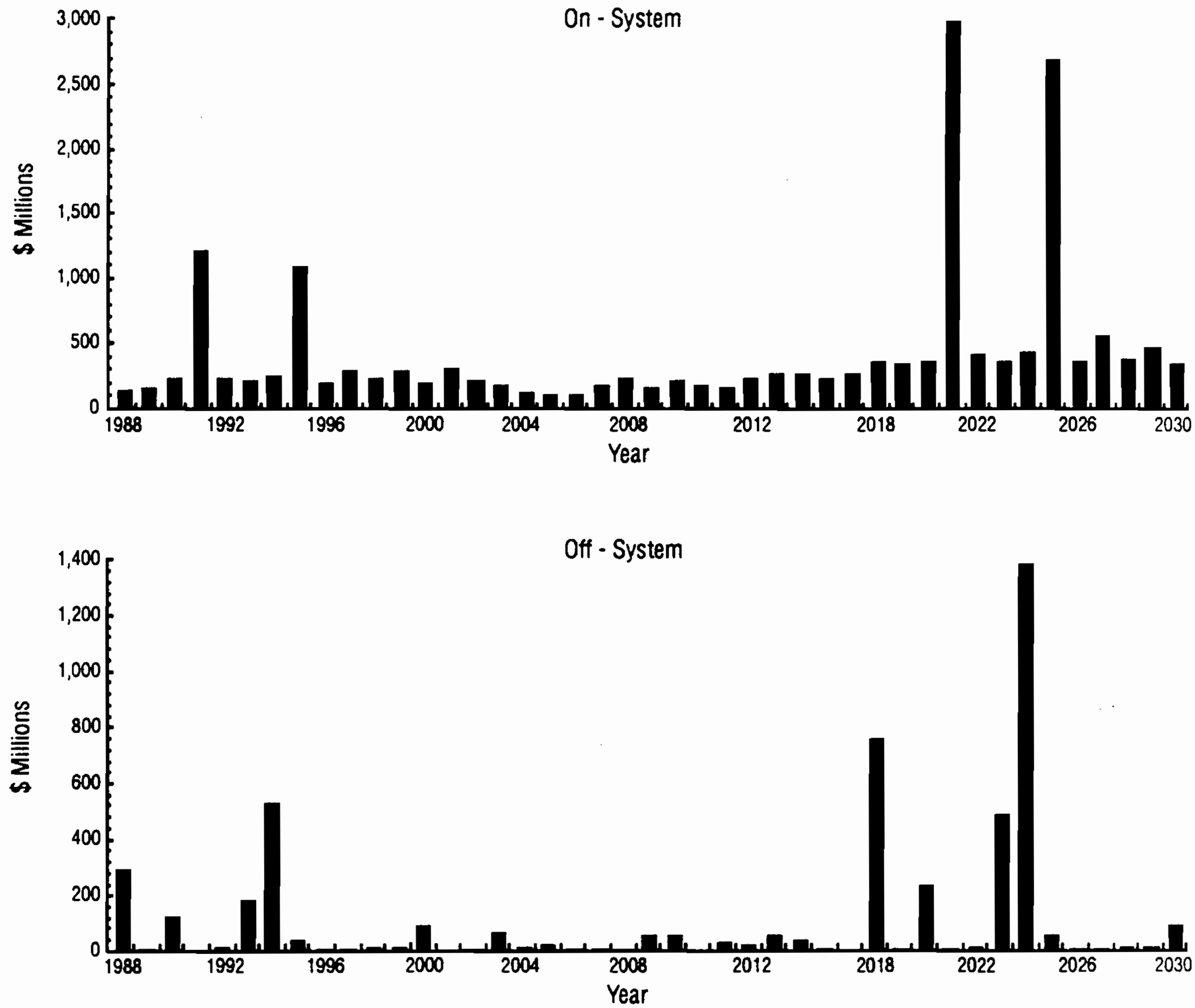


Fig 1.3. Funding levels needed by the On and the Off systems to avoid a backlog of rehabilitation and replacement projects.

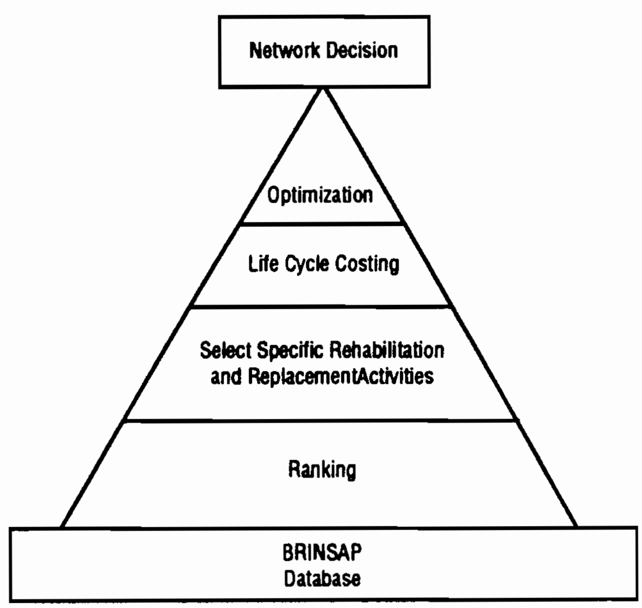


Fig 1.4.

CHAPTER 2. BRIDGE PROJECT PRIORITIZATION PROCEDURES

INTRODUCTION

For many years highway officials have selected bridges for construction, replacement, or rehabilitation basing the decision process on engineering judgment, intuition, political pressure, citizen complaints, and other subjective factors. The number of bridges involved in the decision process, and the need for a consistent approach to solve the problem stimulated the development of ranking techniques. This chapter presents an overview of some of the prioritization techniques used and developed by the States to eliminate some of the subjectivity involved in the process of making bridge funds allocations. Special emphasis is given to the evolution of the allocation methods employed by the State of Texas as developed under the research study "Strategies for Bridge Replacement" (Refs 1, 2, and 18), sponsored by the Texas State Department of Highways and Public Transportation in cooperation with the FHWA, which also sponsored the research efforts described in this publication.

Prioritization indices are used by the States as a guide for the selection of bridge projects. The first step of the usual procedure is to prepare a list of bridges ranked according to the state's established ranking procedure. This list is then submitted to personnel with close contact and knowledge of the selected bridges, for a more detailed evaluation of the selected bridges. In large States with decentralized bridge administrations (New York, California, and Texas), this task is typically accomplished by the district engineers.

THE FEDERAL SUFFICIENCY RATING

Federal funding is essential for the States, as demonstrated by the previous chapter. The funding programs sponsored by the FHWA are allocated to the States proportionally to the number of deficient bridges that meet a sufficiency rating (SR) of 80 or less for rehabilitation, and less than 50 for replacement and their associated costs. The original SR formula was developed by the FHWA in 1972, revised by a AASHTO committee and sent for the States approval in 1976. The 1976 formula is currently in effect and was the first effort in applying a consistent technique nationwide in order to provide non subjective fund allocations.

The SR formula is based on the general categories and relative percentages depicted in Fig 2.1. The complete SR formula is lengthy and it's complete description may be found in Ref 27.

Most States use the SR as part of their prioritization procedures, since the FHWA uses it as a criterion for eligibility for federal funds, but it is agreed upon by the FHWA and the States that it is not an adequate technique to rank bridges at the State level. The following FHWA comment illustrates this fact: "While the sufficiency rating has served well as a tool for ranking bridge priorities on a national basis, it has some significant shortcomings, including a relative lack of sensitivity to the functional class of highways that particular bridges carry..." (Ref 28, p 8). The States invested a considerable amount of research effort in the quest of an adequate technique for ranking bridge improvement projects. Selected bridge project prioritization procedures developed by the States are presented bellow. An excellent summary of the current procedures used by the States can be found in Ref 30.

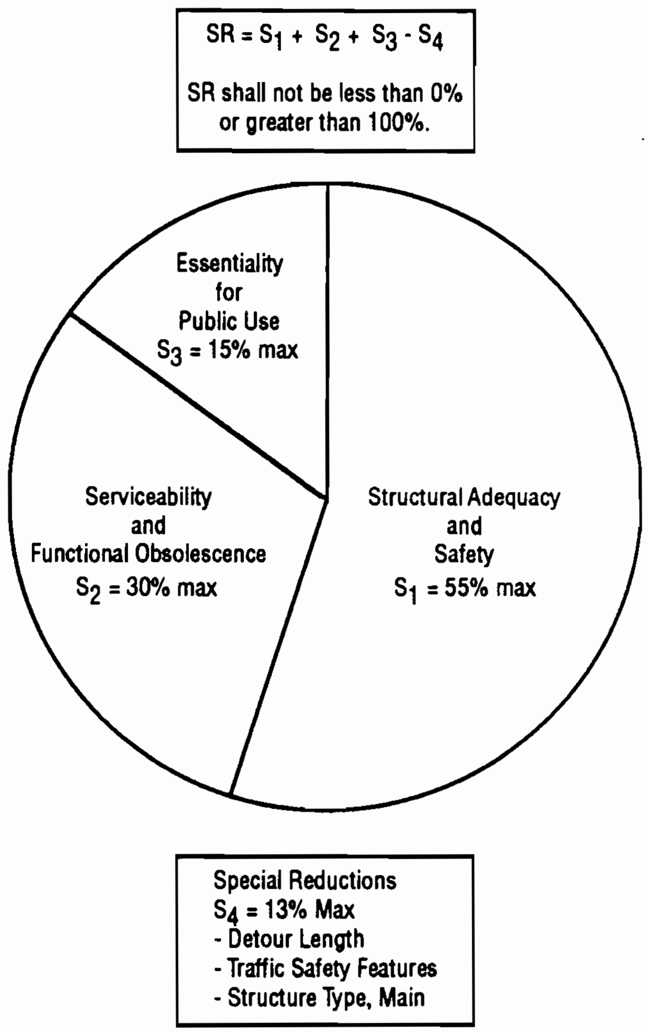


Fig 2.1. Sufficiency rating components.

SELECTED METHODS CURRENTLY USED BY THE STATES

NORTH CAROLINA

North Carolina developed and implemented a priority ranking system which considers essential bridge needs in accordance with highway functional classification (Ref 12). The system is based on level of service goals for load capacity, clear deck width and vertical roadway underclearance and overclearance. This system is presented in some detail, since it served as a basis for the ranking methods of other states.

In establishing level of service goals for load capacity, the objective was to provide load capacity to serve most of the vehicles expected to use the route. For this purpose, the weights of loaded essential service vehicles such as school buses, fire trucks, garbage trucks and heating oil home delivery trucks, were surveyed (Table 2.1), and were used to establish bridge capacity goals depicted in Table 2.2A. Major collectors, arterials, and Interstate highways needed a higher load capacity goal to serve commerce and industry. For major collectors, a goal of 25 tons was selected because it accommodates all three axle vehicles.

In establishing goals for level of service for clear bridge deck width the general policy followed was for existing bridges to remain in place when the approach roadway is reconstructed. Current year Average Daily Traffic (ADT) was used in establishing this year rather than design year ADT. Table 2.2B depicts the width goals established.

Acceptable goals for vertical roadway clearance are shown in Table 2.3. These clearances apply to both underclearance and overclearance and are the minimum vertical clearance not requiring posting. The 14 feet specified is slightly higher than the legal maximum height to allow for resurfacing.

The three level of service goals above defined are used to calculate deficiency points together with a fourth attribute, Remaining Life. The deficiency points for each function are summed to give total deficiency points in a scale of zero to 100, where zero means no deficiency and 100 means highly deficient, giving:

$$\text{Total Deficiency Points} = CP + WP + VP + LP \tag{2.1}$$

where CP, WP, VP, and LP are needed functions that determine deficiency points priorities for Load Capacity, Width, Vertical Clearance, and Remaining Life, respectively.

TABLE 2.1. NCDOT VEHICLE WEIGHT SURVEY

Vehicle Type	Weight, tons
Loaded School Buses	6 to 12
Fire Trucks	16
Residential Garbage Trucks (2 axle)	16
Commercial Trucks (3 axle or tandem)	22.5 to 33.6
Electrical Utility Trucks	13
Tandem Axle	18
Medical Emergency Vehicles	4 to 5
Passenger Cars	Less than 3

Source/NCDOT

TABLE 2.2A. NCDOT BRIDGE CAPACITY GOALS

Road Over Functional Classification	Single Vehicle Capacity Acceptable, tons	Single Vehicle Capacity Desirable, tons
Interstate and Arterial	NP	NP
Major Collector	25	NP
Minor Collector	16	NP
Local	16	NP

NP = Not Posted
(Capacity = 33.6 tons for single vehicles)
Source/NCDOT

TABLE 2.2B. NCDOT CLEAR BRIDGE DECK GOALS

Road Over Functional Classification	Current ADT	Acceptable Lane, ft	Acceptable Shoulder, ft	Desirable Lane, ft	Desirable Shoulder, ft
Interstate and Arterial	ADT ≤ 800	10	1	12	4
	801 - 2000	10	2	12	6
	2001 - 4000	11	2	12	8
	Over 4000	11	3	12	8
Major and Minor Collectors	ADT ≤ 800	9	1	10	2
	801 - 2000	9	2	11	3
	2001 - 4000	10	2	12	3
	Over 4000	10	3	12	3
Local	ADT ≤ 800	9	1	10	2
	801 - 2000	9	2	11	3
	2001 - 4000	10	2	12	3
	Over 4000	10	3	12	3

Width = (Number of Lanes) * (Lane Width) + 2 * (Shoulder Width)
Source/NCDOT

TABLE 2.3. NCDOT BRIDGE VERTICAL UNDERCLEARANCE GOALS

Road Over Functional Classification	Single Vehicle Capacity Acceptable, ft	Desirable, ft
Interstate and Arterial	14	16.5
Major and Minor Collectors	14	15
Local	14	15

Note: Bridge vertical overclearance goals for the road over functional classification shall be the same as the above values.
Source/NCDOT

The following weights were assigned to each need function:

Single Vehicle Load Capacity	70
Clear Bridge Deck Width	12
Vertical Roadway Under Overclearance	12
Estimated Remaining Life	6

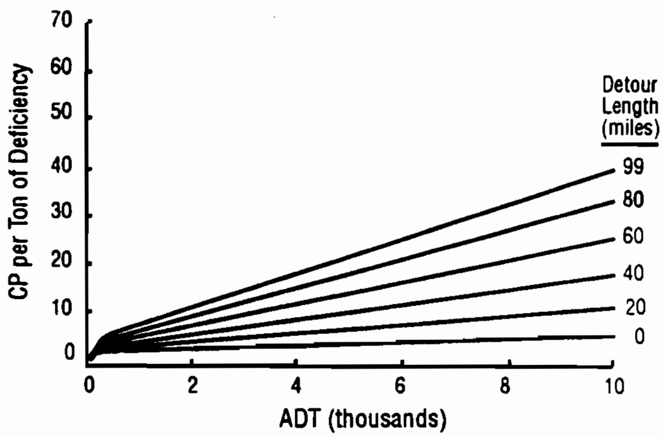
The value range for the need functions for CP, WP, VP, and LP, corresponds to the weighting factors.

CP is calculated as the product of the single vehicle load capacity per ton of deficiency and the capacity deficiency. The single vehicle load capacity per ton of deficiency is a function of ADT and the detour length. The capacity deficiency is defined as the difference between the level of service goal for capacity and the single vehicle posting, in tons. Figure 2.2 depicts the need function for CP, for an ADT of 5,000, a detour length of 20 miles and a capacity deficiency of 5 Tons, the CP per Ton of deficiency is 8, giving a CP of 5 times 8 or 40. A limitation of the established need function is that it is possible to get values for CP that are greater than the established maximum weight of 70. As an example, the same capacity deficiency of 5 Tons, a detour length of 99 miles and an ADT of 10 thousand, will lead to a CP of 5 times 40 or 200, which is considerably higher than the established limit of 70.

The need function for WP is based on both ADT and the difference between the actual deck width and the level of service goal. The derivation of this function assumes that the number of accidents and resulting costs increases linearly with ADT and Width Deficiency. Figure 2.3 depicts the WP need function. For an ADT of 10,000 and a difference between the actual deck width and the level of service goal of 0.5 ft, the value of WP would be 5 from a maximum of 12 established by the weights.

The need function for VP follows the same approach as that described previously for WP. VP is also a function of the ADT and the difference between the actual vertical clearance and the level of service goal. As in the case of WP it is assumed that the user costs associated with the vertical clearance deficiencies increase linearly with ADT.

The need function for LP assumes that a remaining life of 15 years or more is a good "proxy" attribute indicating that the overall condition of the bridge is good,



Source/NCDOT

Fig 2.2. Capacity Priority need function.

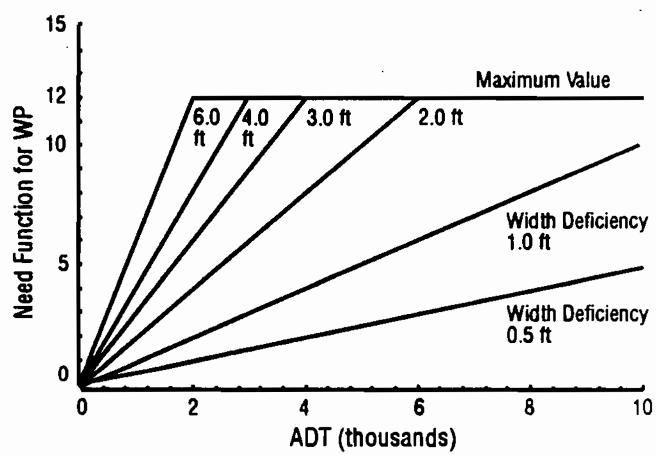


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Fig 2.3. Clear Deck Width need function.

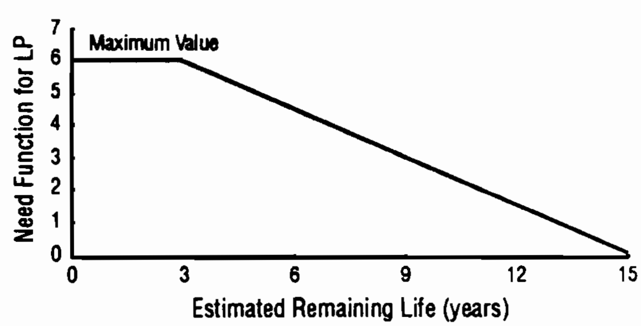

Fig 2.4. Need function for remaining life.

giving a weight of zero. The Maximum weight (six), is assigned when the remaining life is estimated to be 3 years or less, to allow time for planning and construction of a new facility. Values between the range of 3 and 15 years are interpolated linearly. Figure 2.4 depicts the need function for remaining life.

The whole ranking process is computerized and most of the data needed is available from the federally required data included in the Structure Inventory and Appraisal Sheet (SI&A). Bridges are ranked based on deficiency points and can be sorted either Statewide or by system.

The North Carolina approach was pioneer in basing the ranking of bridge needs on a desired level of service. This approach is interesting since, it is based mainly in indicators of the user costs associated with bridge deficiencies such as:

(1) user costs involved with traffic detouring posted bridges,
(2) user costs involved in accidents, and
(3) travel delays due to narrow or insufficient clearances.

The North Carolina ranking system based on desired levels of service for several bridge attributes inspired other States to develop similar bridge ranking approaches.

VIRGINIA

The State of Virginia combines the level of service concepts presented before with the FHWA Sufficiency Rating (Ref 17). It relies on desired levels of service goals for Load Capacity, Clear Deck Width, and Vertical Clearance. The ranking formula is very similar to North Carolina's, see Eq (2.1), but with slightly different attributes and weights as follows:

The need functions used to calculate deficiency points are similar to those derived by North Carolina. Special emphasis is placed on SR as observed from the assigned weights. The need function for SR is:

$$SP = WS\,(\,[100 - SR] / 100\,) \qquad (2.2)$$

where WS is the SR's weight, 46 in this case, and SP the number of deficiency points due to SR. For a bridge with SR of 100, completely sufficient by FHWA standards, the deficiency points assigned by SR would be zero, as expected.

PENNSYLVANIA

Pennsylvania's Department of Transportation is implementing a complete Bridge Management System (BMS). \$3.6 million were invested in the development phase (Ref 9). This system includes a Bridge Rehabilitation and Replacement Subsystem (BRRS). BRRS assigns priorities to bridge projects based on deficiencies in achieving a desired level of service and bridge condition. The ranking process incorporates features of both the Sufficiency Rating and the North Carolina's level of service approach. Deficiencies are measured by eight need functions which are combined to give a total deficiency rating (TDR) on a scale of zero to 100 according to the following formula:

$$TDR = \Phi[LCD + WD + VCOD + VCUD + BCD + RLD + AAD + WAD] \qquad (2.3)$$

where

TDR = Total Deficiency Rating,
LCD = Load Capacity Deficiency,
WD = Clear Deck Width Deficiency,
VCOD = Vertical Clearance Deficiency (over),
VCUD = Vertical Clearance Deficiency (under),
BCD = Bridge Condition Deficiency,
RCD = Remaining Life Deficiency,
AAD = Approach Roadway Alignment Deficiency,
WAD = Waterway Adequacy Deficiency, and
F = Weighting Factor for Functional Class.

NEBRASKA

Nebraska's formula is also based on level of service goals (Ref 30). It considers four bridge attributes, as does North Carolina's. The weights for the four attributes are:

Single Vehicle Load Capacity	50
Clear Bridge Deck Width	12
Vertical Roadway Under Overclearance	33
Estimated Remaining Life	10

Total deficiency points (DEFPT) are calculated as the sum of the individual need functions for each of the above attributes, i. e.,

$$DEFPT = CRAT + WIDPT + CLRPT + LIFEPT \qquad (2.4)$$

where, for each attribute, there is a defined need function for which the values range from zero (no deficiency) to the maximum weight assigned to each attribute, in a similar way as for the North Carolina model. No attempt is made to take into account the detour length for the Single Vehicle Load Capacity attribute need function, as does the North Carolina model.

KANSAS

Kansas structured the problem as a multi-attribute decision process for which the group decision making Delphi technique is utilized (Ref 30) The Delphi technique consists of a panel of experts, that are questioned to determine the need functions for the attributes and their relative weights (Ref 5). Broad objectives were identified, and were used to structure the problem together with attributes which would measure their level of achievement. The general objectives and their associated attributes are summarized in Fig 2.5. Operating Rating is measured in tons and gives an estimate of the posted load

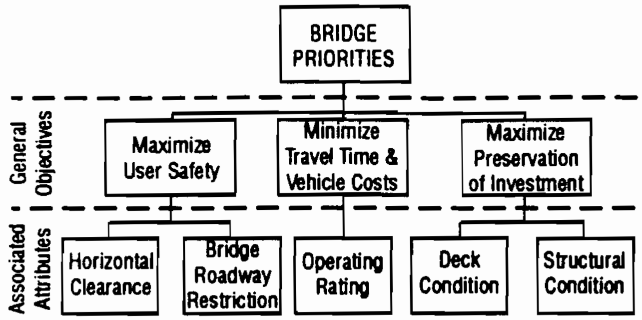

Fig 2.5. General objectives and associated attributes for Kansas.

and thus of user costs for having to detour or carry smaller loads. An interesting feature of this solution is the use of adjustment factors to account for Functional Classification, Traffic Volume and Accident Rate. The adjustment factors assign more weight to bridges that have a higher observed accident rate.

MINNESOTA

The Minnesota Department of Transportation uses an index called the "Minnesota Replacement Priority Index" (Ref 25). This priority index is similar to the federal Sufficiency Rating since it uses a mathematical formula to combine attributes that cover the following objectives: Structural Adequacy and Safety, weighted 50 percent, Serviceability and Functional Obsolescence, weighted 25 percent, and Essentiality for Public Use, weighted 25 percent. These points are added to produce a Priority Rating.

WISCONSIN

Wisconsin has not developed a priority ranking procedure. The emphasis was placed in the use of Life Cycle Cost Activity Profiles (LCCAP) in order to forecast future funding needs, at the network level, and determine whether to rehabilitate or replace a bridge, on a project level decision (Ref 11). In order to achieve these objectives, the model estimates the costs of performing different bridge improvements by forecasting bridge conditions. The model is currently used as a long-term forecasting tool with short-term decisions based on engineering judgement.

EVOLUTION OF THE TEXAS BRIDGE PROJECT PRIORITIZATION PROCEDURE

The Center for Transportation Research (UT/CTR) began work on a research contract, "Strategies for Bridge Replacement", in the fall of 1985 and three research reports have been published to date, (Refs 1, 2, and 18). The findings of these reports are summarized herein. The research results described in this publication are extensions of research developed in earlier phases of this research contract and included in these three research reports.

THE MANUAL PROCESS OF SELECTING PROJECTS

The first report of the project (Ref 2), described how the Texas SDHPT officials carried out their selections for the allocation of the HBRRP funds before some of the recommendations of the project were implemented. The process started by determining the bridges that were eligible for Federal funding. This process was based on information obtained from the BRINSAP database. With the eligible list and the calculations for the Sufficiency Rating (SR), the SDHPT prepared a list of the bridges eligible for Federal funding on a district by district basis. The districts were then asked to rank their bridges, indicating their priority for funding, and the results were forwarded to the SDHPT's main office. SDHPT goal was a statewide prioritization of the bridge projects selected by the districts based primarily on structural condition and secondarily on cost effectiveness. For this purpose a series of bridge attributes, that would capture these general objectives, were selected by the SDHPT officials. A screening procedure was developed by SDHPT officials, based on these bridge attributes and also on thresholds for each one of the attributes. This procedure was carried out manually for each one of the 772 district selected projects for the 1985-1986 funding program. The flowchart for the procedure, and the adopted thresholds for the five attributes, is depicted in Fig 2.6. Projects were selected until the available budget was exhausted and resulted on a set of 442 selected projects. This manual process served as a basis for the development of the automatic selection procedure described in (Ref 2).

THE FIRST AUTOMATIZED SYSTEM DEVELOPED

In a first step to automatize the selection process, Boyce et al. programmed the federal eligibility criteria using the Statistical Analysis System (SAS). This resulted in the first version of the program SURE (Sufficiency Rating Evaluator) which reads the BRINSAP database tape and creates a SAS data set of the federally eligible bridges.

A second program, TEBS1, (Texas Eligible Bridge Sorter) automatized the selection process and was based on the selection procedure depicted in Fig 2.6, using the eligible bridges generated by SURE as an input. The attributes included in the selection process were: Cost per Vehicle (CPV), the result of the division of the Cost of Proposed Improvements (COPRI) by the Average Daily Traffic (ADT), the ADT itself, the Sufficiency Rating (SR), the minimum condition rating given to the deck, substructure, or superstructure (DSS), and the Bridge Width Condition (BWC). BWC compares lane widths and traffic to minimum acceptable standards to determine

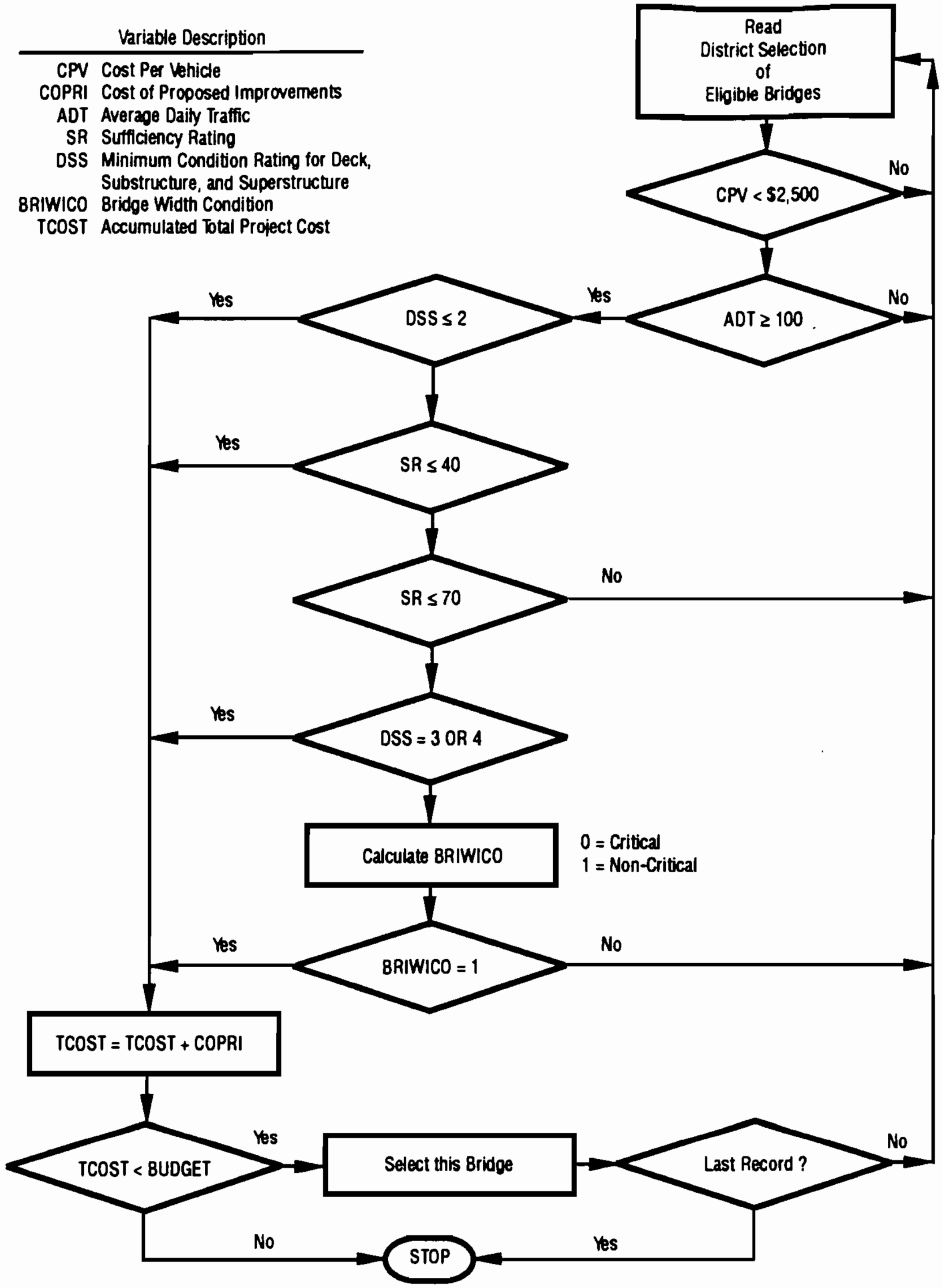

Fig 2.6. The Texas SDHPT manual selection process.

whether the bridge width condition is unsatisfactory or not. The bridges were sorted using a weighted scoring technique and an automatic qualification procedure.

The hypothetical example presented in Table 2.4 illustrates the features of this first automatized approach to the ranking problem, (Ref 2). It illustrates the scoring and the automatic qualification process applied to a hypothetical project. Some of the attributes considered in the decision process, capture a level of service concept such as those developed by other States and pioneered by North Carolina. The main difference is in the definition of the need function, where only two possible weight selections are available; either the bridge meets the passing level for the attribute and then gets full weight, or it does not meet the passing level and it is assigned zero for that weight. This leads to rather discrete scores for the projects, causing a high number of equal scores. Figure 2.7 depicts an example of how the need function for DSS

TABLE 2.4. FEATURES OF THE FIRST AUTOMATIZED APPROACH

Attributes	Weight	Passing Level	Automatic Qualifying Threshold	Attribute Value	Automatically Qualified ?	Points Gained
CPV	10	≤ $1,000	None	275	N/A	10
ADT	10	≥ 300	None	200	N/A	0
SR	35	≤ 60	None	47	N/A	35
DSS	25	≤ 5	≤ 3	3	Yes	25
BWC	20	Critical	None	1	N/A	20
					Total Score	90

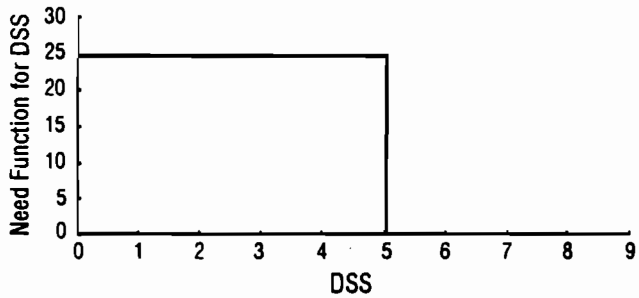

Fig 2.7. Need function for DSS.

looks like for a passing level of 5. The need function for DSS has 2 possible values for this passing level, zero, or the assigned weight for DSS, 25.

The hypothetical project presented above would receive a total score of 90 and it would automatically qualify for funding since it has a DSS of 3, which meets the threshold established. This scoring and automatic qualification procedure was fully automatized by the program TEBS1 for which the final results are three sets of bridges: Qualifying, Marginal and Non-Qualifying bridges, which were separated by thresholds for the calculated scores.

Some features of the system developed by Boyce et al. (Ref 2) are incorporated in the system presented in this report. These are the automatic qualification concept and parts of the coding of the program SURE.

The second report by Boyce et al. (Ref 1) proposed two new attributes to be considered in the project selection process, the Structural Safety Index (SSI) and the Geometric Safety Index (GSI).

A TWO-LEVEL BRIDGE PROJECT SELECTION PROGRAM

Tascione et al (Ref 18) developed a two level project selection system consisting of a State and a District levels, in which only the State level was automatized. The State level part consists of two programs, SURE2 which is an updated version of the program developed previously and TEBS3 an improved version of the original TEBS program developed in (Ref 2), that incorporates three new attributes, Cost Effective Service Index (CSI), Essential Service Index (ESI) and Functional Service Index (FSI). For the first time the research results were applied in supporting the project selections and budget allocations for the HBRRP funding program. The results of the TEBS3 based selections were forwarded to the districts appreciation and the districts returned comments about the selections to the State main office in an informal and manual procedure.

CHAPTER SUMMARY

North Carolina was the first State to rank bridges basing the decision on a level of service concept. The level of service approach is very interesting since it quantifies the degree to which a bridge is adequately serving the users, who ultimately pay for the service provided by these transportation system elements. The users are the ones that are affected by posted bridges which force them to detour leading to increased vehicle operating costs and travel time. They are the ones that are exposed to increasing number of accidents and travel time delays caused by insufficient deck clearances.

Many other States developed ranking procedures based on deficiency points associated to the inability of a bridge to meet desired levels of service. These generally lack a consistent technique for determining need functions for the attributes and capture the dynamic nature of the bridge selection process. This dynamic is caused by the ever changing situation of the bridge population, affected by the continued deterioration of the bridges and by the changes on the traffic distribution and intensity. Almost all the States lack a consistent technique to determine weights for the attributes. Kansas developed an interesting approach where weights and need functions for the attributes are determined with the help of a Delphi panel of experts.

Texas is investing resources to develop a ranking procedure that will adequately allocate available budgets on a statewide basis. It intends to solve some of the weak points of the existing approaches, such as the inability to capture changes in time for the bridge population decision attributes and the lack of a consistent attribute weight determination process. Since Texas is a large State, the development of a ranking module, emphasized the decentralization of the decision process, by delegating some of the project selection tasks to the districts. These concepts are reflected on the theoretical background presented in Chapter 3 and on the computerized bridge selection system presented in Chapter 4.

CHAPTER 3. THEORETICAL BACKGROUND FOR A RANKING MODULE

INTRODUCTION

BACKGROUND

The field of knowledge needed as a theoretical background by ranking methods is encompassed by the theory of Operations Research. This emerged as a scientific approach to decision making in the military scenarios of World War II. Since then a variety of techniques have been developed and applied to problems of decision making in engineering, business, government, social sciences and economics. These problems are usually characterized by the need to allocate limited resources to achieve an objective. The developed techniques share a common feature: the formulation of a single criterion or objective function and the optimization subject to a set of prescribed constraints. Goicoechea (Ref 6, p 2, 1982) states: "In the last two decades there has been an increased awareness of the need to identify and consider simultaneously several objectives in the analysis and solution of some problems, in particular those derived from the study of large-scale systems ... the inclusion of multiple objectives in the study of resource-allocation problems has motivated the development of Multi-objective Analysis." The decision maker concerned with the bridge project selection problem can find some useful analytical techniques in the field of Multi-objective Analysis. The several steps in solving a typical multi-objective decision-making process are depicted in Fig 3.1 (Ref 4). These consist of the following steps:

(1) initiation,
(2) problem formulation,
(3) system modeling,
(4) analysis, and
(5) implementation.

In the initiation step (Fig 3.1) the decision maker recognizes the need for a change as evidenced by a triggering signal.

In the problem formulation step (Fig 3.1),

(1) a statement of the general goals relating to the situation is made,
(2) the alternatives must be identified,
(3) a common set of evaluation criteria must be established, and
(4) the levels of the criteria for each alternative must be determined.

In the system modeling step, a model, based on a formal or informal evaluation procedure, is constructed. A formal evaluation procedure would treat the bridge project selection process as a choice among a finite number of discrete project alternatives which are evaluated using the common set of multiple criteria previously determined. Since alternatives need to be compared, a set of attributes or objective measures must be clearly specified. The levels of these attributes, measured on an appropriate scale for each alternative, serve as yardsticks by which the degree of attainment of the particular objectives specified in the preceding step can be assessed. The techniques for solving these type of problems are classified in the specialized literature as discrete methods with prior articulation of preferences (Ref 6).

In the analysis step, the model constructed in the previous phase is utilized to establish the ranking of the alternatives, the results are used to reach a decision and the decision is implemented in the implementation step. If the current result is found to be unsatisfactory, the output can be used to return to the problem formulation step in a closed-loop process.

THE APPROACH USED BY THE STATES

In the previous chapter, ranking methods utilized by the several States were summarized. The development of these ranking methods approximately follows the steps in Fig 3.1, but simplified procedures, which do not take full advantage of multi-objective decision theory techniques, are used in the modeling and analysis steps.

At the present stage, Texas State officials have recognized the need to adequately manage the bridge network under their responsibility, which corresponds to the Initiation step in Fig 3.1.

In the problem formulation step, work has already been performed for Texas, alternatives were identified and attributes for evaluation criteria established, see Chapter 2, Fig 2.6.

For the system modeling step, models were built that are not based on formal multi-attribute decision-theory selection procedures. Models were used in the analysis step to aid project selections (Refs 1, 2, and 18).

This chapter concentrates on the discussion of the problem formulation and system modeling steps applying formal multi-attribute decision procedures. These are discussed in the Texas context. The next chapter discusses the analysis and implementation steps and presents a project selection module for Texas.

PROBLEM FORMULATION STEP

A broad overall objective corresponding to the area of concern of providing adequate bridges to the public in Texas could be stated as follows: "provide bridge facilities that serve the public adequately in terms of safety and cost effectiveness." Such a broad objective provides little, if any, insight into which of a number of alternative

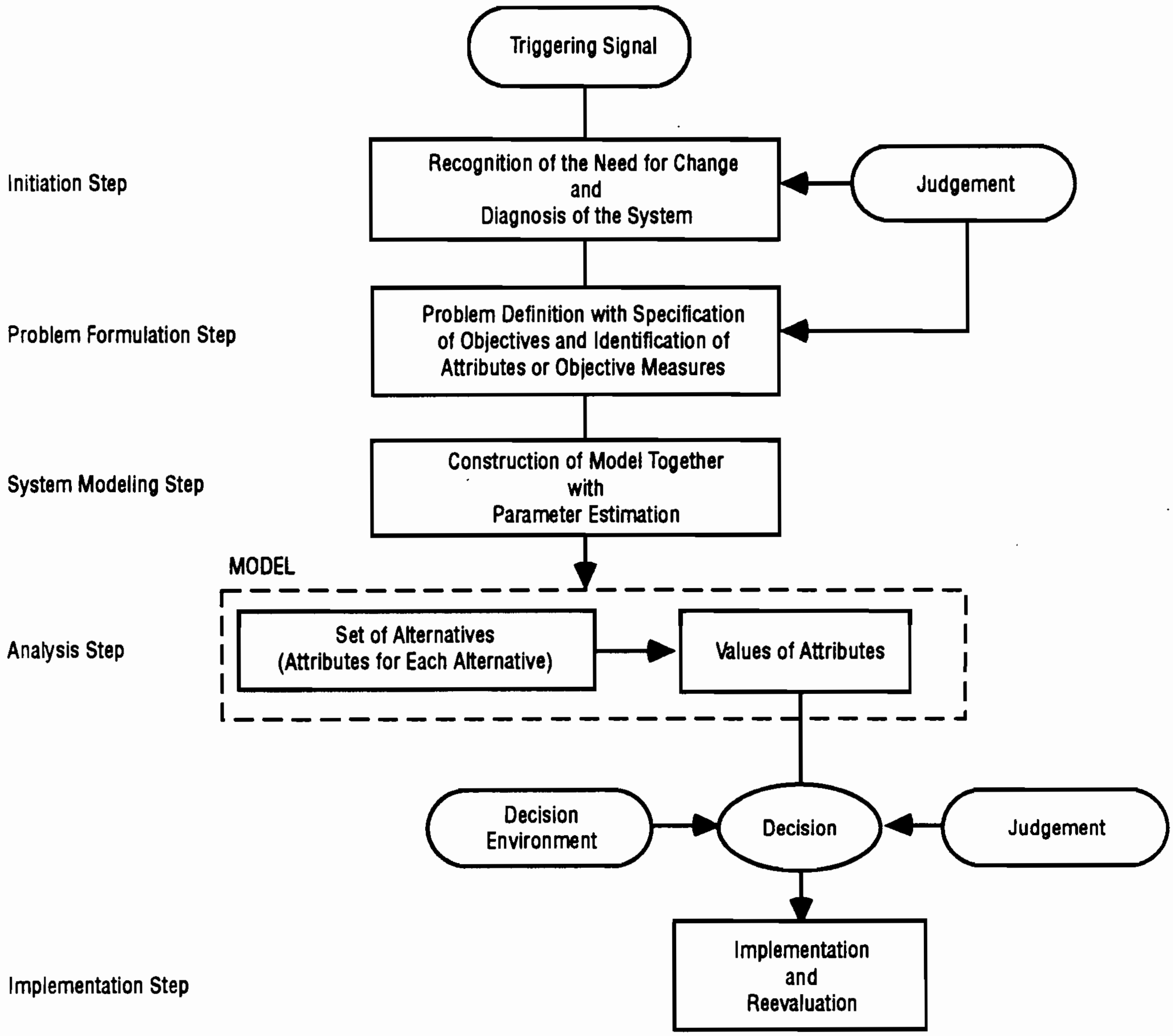

Fig 3.1. Typical multiobjective decision-making process.

projects,within a planned budget, may be the best or worthwhile to pursue. It does, however, provide a useful starting point for specifying detailed objectives in more operational terms.

For example, a set of more detailed objectives might be to: "serve the highest number of users", "rehabilitate or replace structurally unsafe bridges and preserve investment", "implement cost effective projects" and "maximize user safety". For each of these more detailed objectives it is possible to associate an attribute that will indicate the degree to which alternative bridge projects meet this objective. The objective "serve the highest number of users", may be measured by the attribute average daily traffic over the candidate bridge project (ADT), in the same manner the objective "repair or replace structurally unsafe bridges" may be measured by the attribute minimum of the deck substructure and superstructure condition ratings (DSS).

The association of more detailed objectives with the attributes is depicted in Fig 3.2. In each of these cases the attribute provides a scale for measuring the degree to which its respective objective is met. A more detailed objective indicates the direction in which the search for the best solution should be oriented to better meet the broad objective. The Texas SDHPT officials already implyed this decision structure when the manual system, presented in Fig 2.6, was created. At that time the attributes utilized in the manual system were: Average Daily Traffic (ADT), Cost per Vehicle (CPV), Sufficiency Rating (SR), Minimum of the Deck Substructure Superstructure condition ratings (DSS) and the Bridge Width Condition (BWC). Most of these attributes are still used in the ranking module presented in Chapter 4.

ATTRIBUTE CHARACTERISTICS

The relevant attributes chosen by the SDHPT officials involved in the bridge replacement rehabilitation decision process are now presented, together with an explanation of their relevance in the bridge project selection process. These are the attributes presently used in the system presented in Chapter 4. Some discussion is included on how the attributes can benefit from a level of service concept as the one presented in Chapter 2 and utilized by several states.

These attributes are divided in the broad categories of safety and service. They are determined from the coded information for each structure on the BRINSAP tape, and are either calculated by the computer programs that compose the overall selection system presented in Chapter 4, or read directly as stored in the BRINSAP tape. The attributes comprise:

ADT. Average daily traffic over the structure This measure rates the importance of the bridge relative to service provided to the vehicle users. If the bridge is posted or closed, users suffer immediate economic impacts leading to higher travel costs. Such impacts could include detouring, translating into longer travel time and higher fuel and vehicle maintenance expenditures. The ideal approach would be to combine the Average Daily Truck Traffic (ADTT), detour length and a measure of the load deficiency as quantified by the inability to meet a desired capacity goal for a road functional classification. This approach has been used, with ADT instead of ADTT, by several states and was discussed in Chapter 2. Tascione et al (Ref 18) combined ADT and detour length in what was called an Essential Service Index (ESI). ADT also measures indirectly the number of vehicles exposed to accidents or traffic delays by a geometrically deficient bridge. Ideally this purpose would be achieved by having it combined with an attribute that measures the inability of a particular structure to meet desired geometric characteristics such as clear bridge deck widths, in a process that has some similarity with the approach used by other States and described in Chapter 2.

CPV. Cost per vehicle, defined as the cost of the proposed project divided by the ADT levels. This provides a measure of the cost effectiveness of the project. In the future, with more data available, adequate life cycle cost analysis can be used to quantify benefit-cost ratios for every candidate project. This benefit-cost ratios will more adequately quantify the benefits, usually the reduction of the user costs, achieved by undertaking the project. This process is illustrated by Fig 3.3, where the impact of the benefits of investing on a particular project are quantified by the reduction in the user costs. The CPV is an informal way of measuring the benefit-cost ratio, since it measures the number of users which benefit from funds invested in a particular project.

DSS. This attribute comprises a minimum of the deck, substructure and superstructure condition ratings. Condition ratings are discussed in Chapter 1 in the context of determining eligibility for Federal funds. These ratings are zero to nine integer values, where zero represents a critical condition and nine represents a new condition. Table 3.1 includes a description of the ratings, from (Ref 19, Plate III-1). They are assigned to each bridge structure component during BRINSAP inspections and give a measure of the current degree of deterioration of different bridge components. Each bridge component is composed of elements.

The condition rating for a component begins with ratings for each of its elements. A component condition rating is the minimum rating given to any of its elements. A condition rating of zero for a superstructure could be caused by rating one element zero or by rating four elements zero, a discussion about condition ratings can be found in Ref 1, p 27.

SR. The sufficiency rating index was created by FHWA staff and uses a zero to one hundred scale which reflects the ability of a structure to remain in service in

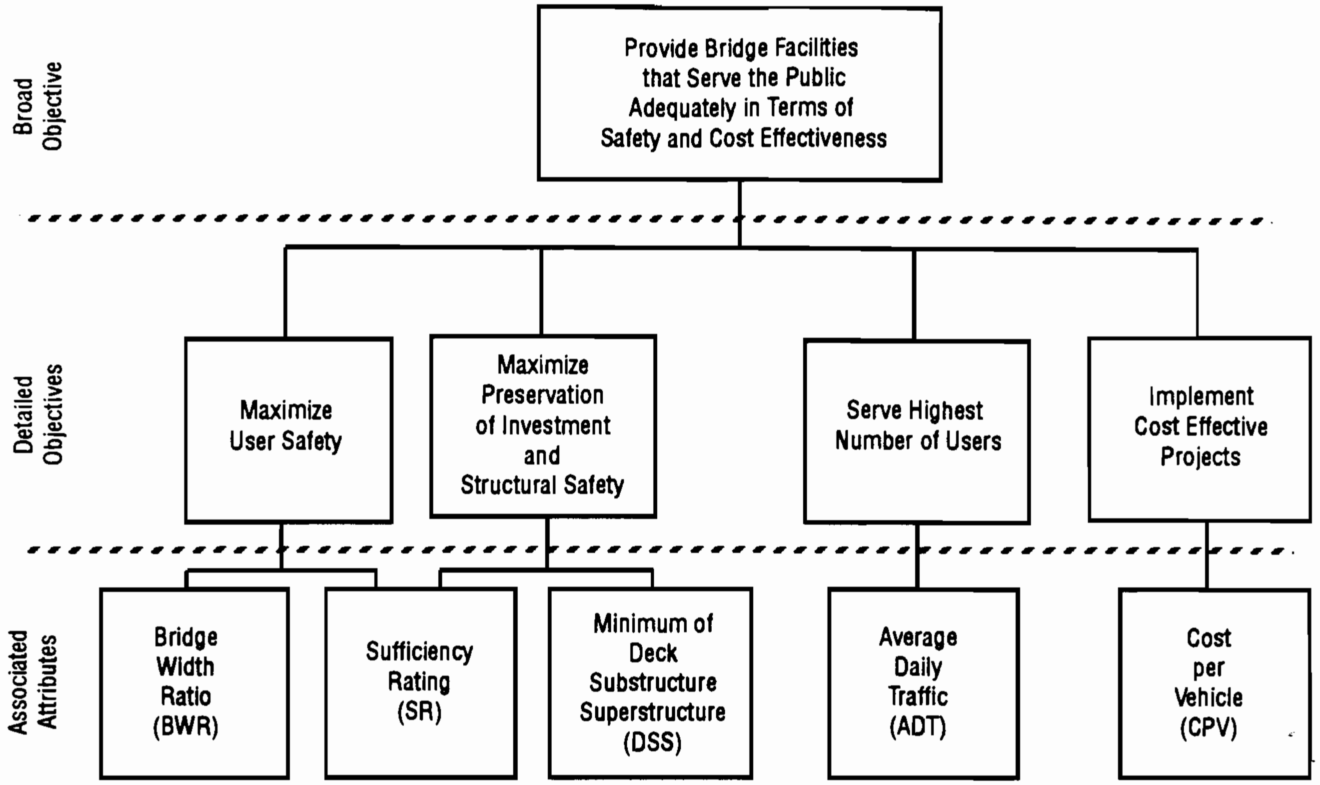

Fig 3.2. Objectives and associated attributes for Texas.

its present condition. The FHWA manual (Ref 29), defines the elements of the SR attribute, and their associated weights, as:

(1) structural adequacy and safety, weighted 55 percent,
(2) serviceability and functional obsolescence, weighted 30 percent, and
(3) essentiality of public use,weighted 15 percent.

Some discussion about the SR attribute was included in Chapter 2.

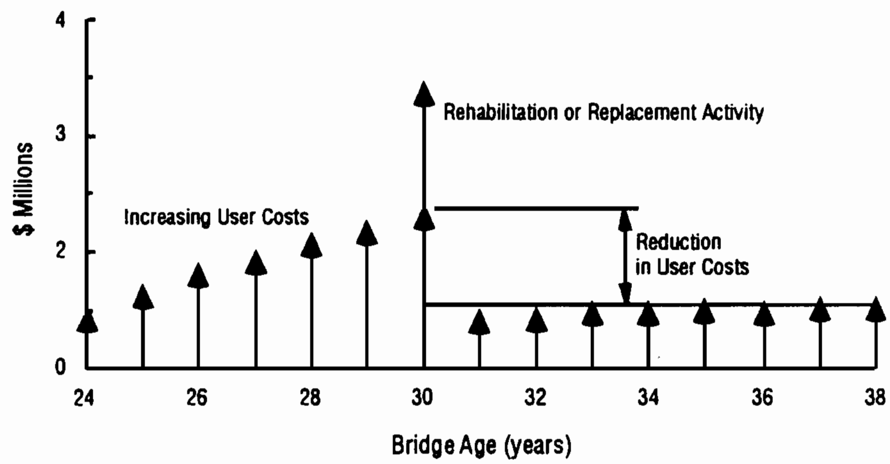

Fig 3.3. Reduction in user costs due to improvements.

BWR. This is a bridge width ratio, defined as the ratio between the existing roadway width and the standardized width, where the latter is a function of the ADT crossing the structure. The standardized values for the structure widths are defined in SDHPT specifications. This attribute measures the geometric safety of the bridge that may translate in higher accident rates and consequently higher user costs. It measures the degree to which a level of service of providing a standardized clear deck width is accomplished by a particular structure. North Carolina, (Ref 12), approaches the problem in a similar way by establishing desired levels of service for the bridge's width and vertical clearance and combining them with ADT, these were discussed in Chapter 2. The desired levels of service for the roadway width for the on and the off systems are presented in Table 3.2. These values were established by the Texas State Department of Highways and Public Transportation (SDHPT).

THE SYSTEM MODELING STEP

The discrete bridge project selection problem can be represented by a payoff matrix such as the one shown in Fig 3.4. The rating of the j^{th} alternative on the i^{th} criterion is represented by r_{ij}. In the bridge selection problem the alternatives are the projects to be selected for funding and the criteria the attributes that are used for ranking the projects. In this case, there are five attributes, as defined above, and the number of alternatives are the projects to be funded.

TABLE 3.1. CONDITION RATING DESCRIPTIONS

9	-New Condition	
8	-Good Condition	No Repairs Needed
7	-Generally Good Condition	Potential Exists for Minor Maintenance
6	-Fair Condition	Potential Exists for Major Maintenance
5	-Generally Fair Condition	Potential Exists for Minor Rehabilitation
4	-Marginal Condition	Potential Exists for Major Rehabilitation
3	-Poor Condition	Repair or Rehabilitation Required Immediately
2	-Critical Condition	Bridge Should Be Closed until Repairs Are Complete
1	-Critical Condition	Bridge Closed but Repairable
0	-Critical Condition	Bridge Closed and Beyond Repair
N	-Not Applicable	

Source/(Ref 19, Plate III - I)

Clearly the solution of selecting alternatives in a problem such as depicted by Fig 3.4 is sufficiently complex to require some type of formal assistance. Because of the severe limitations of an intuitive decision making process, analytical methods are needed to help determine the worth of multi-attribute alternatives such as the ones involved in the bridge selection problem.

TABLE 3.2. ROADWAY WIDTH, CURB TO CURB, GOALS FOR TEXAS

On-System	Roadway Width Goal (ft)	Off-System	Roadway Width Goal (ft)
ADT < 50	28	ADT < 50	24
50 ≤ ADT <400	28	50 ≤ ADT <400	28
400 ≤ ADT <750	34	400 ≤ ADT <750	34
750 ≤ ADT <1,500	38	750 ≤ ADT <1,500	40
1500 ≤ ADT <3,000	40	ADT ≥ 1,500	44
ADT≥ 3,000	44		

Source/Texas SDHPT

The technique that is presented below, selects the projects that maximize the preferences of the decision maker, and this is achieved by applying concepts of Utility Theory (Refs 4, 6, and 13). This theory assumes that an individual can choose among alternatives available in such a manner that the satisfaction derived from his choice is as large as possible. This, of course, implies that the decision maker is aware of his alternatives, the projects to be funded, and is capable of evaluating them under a set of common criteria. Moreover it is assumed that the decision maker is able to translate his preference structure through a utility function that is a formal mathematical representation of his preference structure.

Alternatives

$$
\text{Criteria}\quad
\begin{array}{c|cccc}
 & 1 & 2 & \cdots & n \\
\hline
1 & r_{11} & r_{12} & \cdots & r_{1n} \\
2 & r_{21} & r_{22} & \cdots & r_{2n} \\
\vdots & \vdots & \vdots & & \vdots \\
m & r_{m1} & r_{m2} & \cdots & r_{mn}
\end{array}
$$

Fig 3.4. Payoff matrix.

THE DECISION MAKER'S PREFERENCE STRUCTURE

It is generally recognized in the specialized literature that an individual's preferences must satisfy certain conditions in order to be represented by a utility function. The axioms that follow relate both to choices among certain and uncertain outcomes. That is, if an individual conforms to the axioms below, a utility function that represents either the certain or the uncertain outcomes exists. In the case of the bridge selection problem the solution will involve the certainty case. The utility functions for the certainty case are known as value functions. The axioms are, (Ref 4):

(1) For two alternatives, A_1 and A_2, one of the following must be true: the individual prefers A_1 to A_2, prefers A_2 to A_1, or is indifferent between them.

(2) The individual's evaluation of alternatives is transitive: if he prefers A_1 to A_2 and A_2 to A_3 then he prefers A_1 to A_3.

(3) Assume that A_1 is preferred to A_2 and A_2 to A_3, then there exists some probability p, $0 < p < 1$, that the individual is indifferent between outcome A_2 with certainty or getting A_1 with probability p and A_3 with probability (1-p). In other words there exists a certainty equivalent to any gamble.

(4) Assuming an individual is indifferent between two choices A_1 and A_2, and if A_3 is any third alternative, then he will be indifferent between the following two gambles: Gamble 1 offers a probability p of receiving A_1 and a probability (1-p) of receiving A_3, and gamble 2 offers a probability p of receiving A_2 and a probability (1-p) of receiving A_3.

If an individual conforms to these four axioms, an utility function can be constructed. In the case of the proposed technique for the bridge selection case the solution will involve determining the multi-attribute deterministic utility function for the attributes involved in the decision process. One difficulty that is likely to arise when attempting to construct such a function is the amount of work, especially in the process of questioning the decision maker, to elicit necessary information to construct the single attribute value functions that compose the multi-attribute value function. In an ideal case a function for each attribute is constructed, one at a time, after which the resulting single attribute functions are combined in an additive fashion. When this is possible the preference structure of the decision maker is said to be additive. If a preference structure is additive it can be represented by the following Eq.

$$v(x) = l_1 v_1(x_1) + l_2 v_2(x_2) + \ldots + l_n v_n(x_n) \qquad (3.1)$$

where, for each $1 \leq i \leq n$, $v(x)$ is the multi-attribute value function, v_i is the corresponding component value function for the ith attribute X_i; $l_i > 0$ is a scaling constant; and isu(i=1,n, l_i) = 1. Intuitively we would expect that Eq 3.1 would be true if each X_i is independent of the remaining attributes. A theorem (Ref 13, p 112) formalizes this under the preferential independence condition.

This gives the formal theoretical background for applying the weighted average method, probably the most common evaluation procedure applyed from the Multiobjective Decision Making Theory. The result of this weighted average technique is a score in a zero to 100 or zero to 1 scale, depending of the range used for the single attribute value function. This score is calculated for each alternative project to be funded and measures the priority of the project for funding, from the decision maker's point of view. A score of one hundred means high priority for funding and zero low priority. This weighted average technique is defined as:

$$U_j = \text{isu}(i=1,n,\ l_i\ v_i(x_{ij})) \qquad (3.2)$$

where

l_i = scaling constant for the i^{th} attribute,
U_j = worth or score for the j^{th} project,
$v_i(x_{ij})$ = value of the ith attribute for the j^{th} project, and
n = number of attributes.

ACCESSING SINGLE ATTRIBUTE VALUE FUNCTIONS

Two of the suggested methods in the literature (Refs 4, 6, and 13) for accessing the single attribute value functions are the direct rating method and the midpoint method which are described as follows.

The direct rating method is the simplest method of assessing a value function $v_i(x_i)$. The process consists of asking the decision maker to assess directly the value of $v_i(x_i)$ for each X_i. In this process the decision maker is presented with the physical bounds of the numerical value of the attribute for which the value function is to be determined and asked to value them in a zero to 100 scale or zero to 1, with zero representing the least preferred and 100 or 1 the most preferred. The process is repeated with additional points, between these extremes, until enough points are available to draw the value function.

The midpoint method finds the midpoint between two values of the attribute X_i through questioning the decision maker. The point x'''_i is said to be the midpoint between x'_i and x''_i of the attribute X_i if:

$$v_i(x'''_i) = 1/2\,[(v_i(x'_i) + v_i(x''_i)] \qquad (3.3)$$

The sequence for assessing the value function using the midpoint technique follows (Ref 4):

(1) Fix all other attributes at their least desirable levels w_i, and identify the lower and the upper bounds of values of x_i, denoted w_i and b_i, respectively. Then set

$$v_i(w_i) = 0 \text{ and } v_i(b_i) = 1$$

(2) To find the midpoint $x_i^{0.5}$ between a_i and b_i, pick up a point x'_i between w_i and b_i and ask the decision maker to compare exchanging w_i for x'_i with exchanging x'_i for b_i. If the decision maker is indifferent between the two exchanges, set $x_i^{0.5} = x'_i$. If, on the other hand, the

decision maker prefers one or the other, select x''_i from the interval with higher preference and repeat the above process with x''_i replacing x'_i. Repeat the process until the midpoint $x_i^{0.5}$ is found. Clearly from (3.3)

$$v(x_i^{0.5}) = 1/2\,[\,v(w_i) + v(b_i)\,] = 0.5 \qquad (3.4)$$

(3) Repeat Step 2 to find the midpoint between w_i and $x_i^{0.5}$, denoted $x_i^{0.25}$, and the midpoint between $x_i^{0.5}$ and b_i, denoted $x_i^{0.75}$.

(4) To ensure consistency, check whether $x_i^{0.5}$ is the midpoint between $x_i^{0.25}$ and $x_i^{0.75}$ in the sense given by Eq 3.3.

(5) Steps 2 to 4 can be repeated to find midpoints between midpoints that have already been generated, until enough points have been obtained for curve fitting.

An hypothetical example of the result for the assessment for the attribute SR (Sufficiency Rating) is depicted in Fig 3.5. The value function depicts decreasing preferences for rehabilitating or replacing bridges with increasing sufficiency rating values. This reflects the fact that a bridge with a sufficiency rating of 100 is a new fully functional bridge and a bridge with a low sufficiency rating a bridge that is in need of rehabilitation or replacement activities.

ESTIMATING SCALING CONSTANTS

The approach recommended in the literature of multi-objective decision theory (Ref 13), for additive value functions, uses preference information derived from the decision maker to set up a system of independent Eqs with as many Eqs as there are scaling constants to be determined.

For the i^{th} attribute X_i, let w_i represent the worst value and bi the best value. This means that the values for the attribute X_i will be located in between w_i and b_i and that $v_i(w_i)=0$ and $v_i(b_i)=1$ as before. Let **I** be the complete set of attribute indices, in the proposed set of five attributes **I**={1,2,3,4,5}. Let **T** be subset of **I** and **T'** be the complementary set of **T**. Let x^T be that profile where all the component x_i are equal to b_i for $i \in$ **T** and equal to w_i for $j \in$ **T'**. For example if **T**={2,3}, then

$$x^T = x^{\{2,3\}} = (w_1, b_2, b_3, w_4, w_5)$$

Since $v_i(w_i) = 0$ and $v_i(b_i) = 1$ then

$$v(x^T) = l_2 + l_3$$

This concepts can be utilized in establishing a system of Eqs for the determination of the scaling constants λ_i. Take for example the comparison between $(w_1, x_2, w_3, w_4, w_5)$ and $x^{\{1\}}$, and change the levels of x_2 until the decision maker is indifferent between the two options. The point of indifference i_2 means that

$$\lambda_2\, v_2(i_2) = \lambda_1,$$

and since it is assumed that the component value function v_2 has already been assessed, it is possible to get $v_2(i_2)$, and one equation of the system is established. Similarly it is possible to determine the relationships between the other attributes and finally assemble a system of equations to calculate the λ_i.

EXAMPLE OF MODEL PARAMETER ESTIMATION FOR TEXAS

An application of these concepts in the determination of the scaling factors, for the model presented in Eq 3.2 follows. For this purpose the preferences of a decision maker with a strong transportation economics background were elicited. These were used to estimate the parameters of the multi-attribute model presented in Eq 3.2. The best and worst ranges of the attributes for the bridge population, for this example, are depicted in Table 3.3.

TABLE 3.3. BEST AND WORST RANGE FOR THE ATTRIBUTES INVOLVED IN THE DECISION PROCESS

Attribute	Best	Worst
CPV	5	15,000
ADT	10,000	10
SR	2	80
DSS	0	9
BWR	0.4	1

Best in the sense of a project being a better candidate for funding. These ranges encompass almost all of the bridges of the off-system population. Some extreme values for ADT and CPV were deleted to avoid confusing the decision maker, and these accounted for just a few projects.

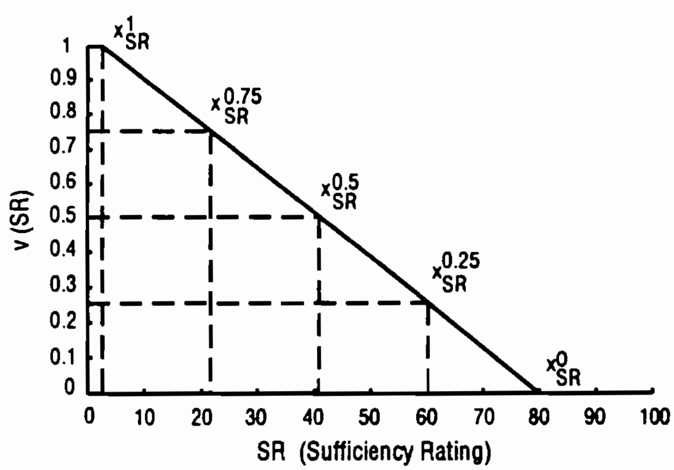

Fig 3.5. The midpoint method.

The value functions for the single attributes involved in the decision process were assessed with the decision maker, using the midpoint technique described previously and are depicted in Figs 3.6 through 3.10.

In Fig 3.6, for the value function of CPV, an inflection point is observed around CPV of 1000, showing that this particular decision maker values less variations on CPV above the 1000 range.

In Fig 3.7, for the value function of ADT, it is observed that in the range of zero to 1200 vehicles per day the decision maker values each extra vehicle with great importance. From 1200 vehicles on the curve flattens, showing less sensitivity to extra vehicles served per day.

In Fig 3.8, for the value function of SR, one would expect a value function where the slope would decrease rather than increase for higher levels of SR. This does not happen in the value function for this decision maker, and seems quite inconsistent. The decision maker needs to be made aware of this kind of inconsistencies and these need to be solved with the decision maker's help.

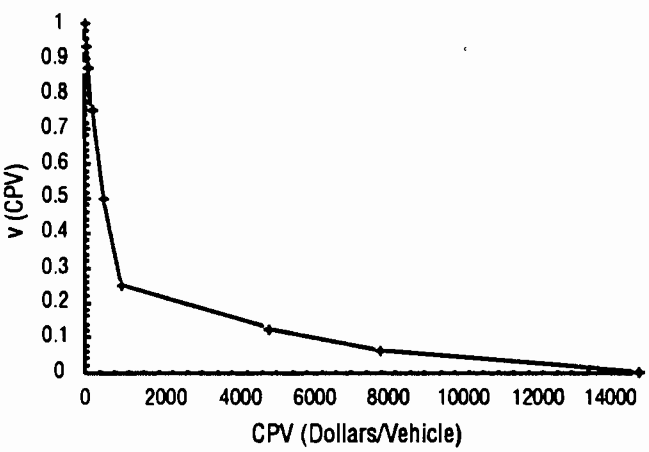

Fig 3.6. Value function for the attribute Cost Per Vehicle (CPV).

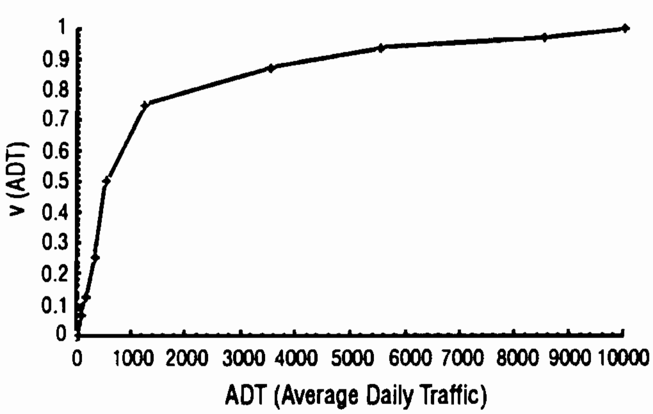

Fig 3.7. Value function for the attribute Average Daily Traffic.

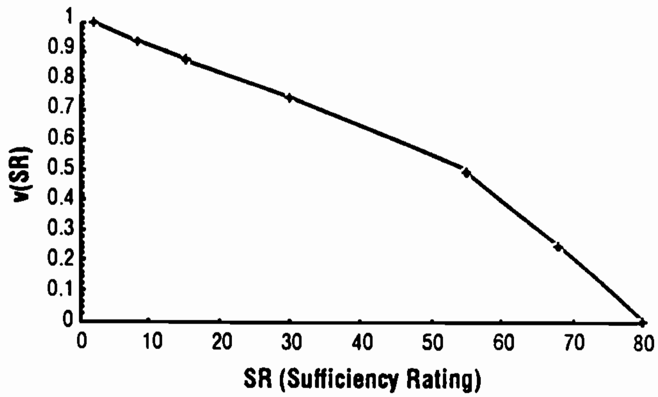

Fig 3.8. Value function for the attribute SR (Sufficiency Rating).

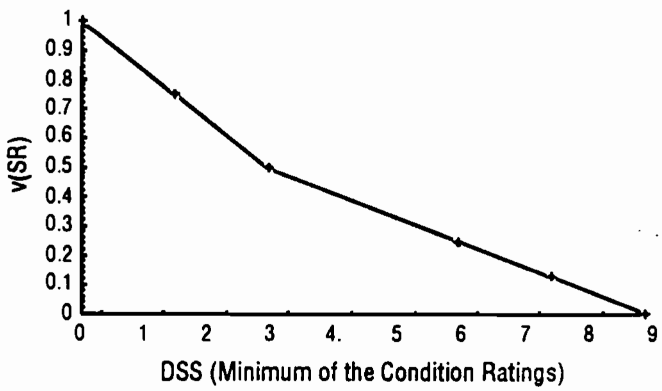

Fig 3.9. Value function for the attribute DSS (Minimum of the Deck Substructure Superstructure condition ratings).

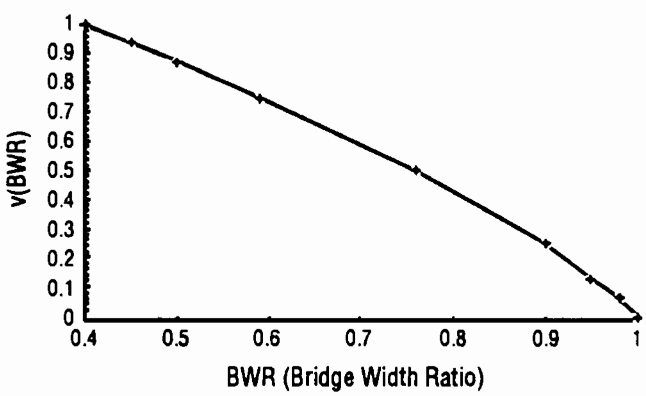

Fig 3.10. Value function for the attribute BWR (Bridge Width Ratio).

In Fig 3.9, for the value function of DSS, it is observed that although the values for the attribute DSS can only assume integer values, the decision maker asked that fractional values in 0.5 increments be used in the assessment process. This decision maker is less sensitive to a decrease in DSS in the range of zero to three than in the range of three to nine. This behavior is consistent with the expectations.

In the value function for BWR, depicted in Fig 3.10, a steeper slope is expected for lower values of BWR, which indicate better candidates for funding. This is not observed and must be usually fine tuned with the decision maker.

With the assessed value functions, it is possible to ask questions to the decision maker in order to assemble the system of Eqs for the determination of the scaling factors l_i for Eq 3.2. The first question involves determining the level of ADT that makes the decision maker indifferent between two candidate projects for funding. The alternatives presented to the decision maker follow:

$\{w_{CPV}, x_{ADT}, w_{SR}, w_{DSS}, w_{BWR}\}$ versus
$\{b_{CPV}, w_{ADT}, w_{SR}, w_{DSS}, w_{BWR}\}$

or substituting the numerical values,

$\{15000, x_{ADT}, 80, 9, 1\}$ versus $\{5, 10, 80, 9, 1\}$.

The value that makes the decision maker indifferent between the two alternatives is 1000 for the ADT. This means that the following equation holds,

$$l_{ADT} v_{ADT}(1000) \quad = \quad l_{CPV}$$

and the first equation for the system is determined since the value function of ADT is available. Consulting the value function for ADT in Fig 3.7 the result is:

$$0.68\ l_{ADT} \quad = \quad l_{CPV}$$

With another set of values for two candidate projects, again the level of ADT that makes the decision maker indifferent between the projects is investigated.

$\{w_{CPV}, x_{ADT}, w_{SR}, w_{DSS}, w_{BWR}\}$ versus
$\{w_{CPV}, w_{ADT}, w_{SR}, b_{DSS}, w_{BWR}\}$

or substituting the numerical values,

$\{15000, x_{ADT}, 80, 9, 1\}$ versus $\{1500, 10, 80, 0, 1\}$.

The value that makes the decision maker indifferent between the two alternatives is 9000 for the ADT. This means that the following equation holds,

$$l_{ADT} v_{ADT}(9000) \quad = \quad l_{DSS}$$

and the second equation for the system is determined since the value function of ADT is available. Consulting the value function for ADT in Fig 3.7 the result is:

$$0.98\ l_{ADT} \quad = \quad l_{DSS}$$

With another set of values for two candidate projects, again the level of ADT that makes the decision maker indifferent between the projects is investigated.

$\{w_{CPV}, x_{ADT}, w_{SR}, w_{DSS}, w_{BWR}\}$ versus
$\{w_{CPV}, w_{ADT}, b_{SR}, w_{DSS}, w_{BWR}\}$

or substituting the numerical values,

$\{15000, x_{ADT}, 80, 9, 1\}$ versus $\{1500, 10, 2, 9, 1\}$.

The value that makes the decision maker indifferent between the two alternatives is 1500 for the ADT. This means that the following equation holds,

$$l_{ADT} v_{ADT}(1500) \quad = \quad l_{SR}$$

and the third equation for the system is determined since the value function of ADT is available. Consulting the value function for ADT in Fig 3.7 the result is:

$$0.77\ l_{ADT} \quad = \quad l_{SR}$$

With another set of values for two candidate projects, again the level of ADT that makes the decision maker indifferent between the projects is investigated.

$\{w_{CPV}, x_{ADT}, w_{SR}, w_{DSS}, w_{BWR}\}$ versus
$\{w_{CPV}, w_{ADT}, w_{SR}, w_{DSS}, b_{BWR}\}$

or substituting the numerical values,

$\{15000, x_{ADT}, 80, 9, 1\}$ versus $\{1500, 10, 80, 9, 0.4\}$

The value that makes the decision maker indifferent between the two alternatives is 8000 for the ADT. This means that the following equation holds,

$$l_{ADT} v_{ADT}(8000) \quad = \quad l_{BWR}$$

and the fourth equation for the system is determined since the value function of ADT is available. Consulting the value function for ADT in Fig 3.7 the result is:

$$0.96\ l_{ADT} \quad = \quad l_{BWR}$$

The last equation in the system and the system of Eqs to be solved follows:

$l_{ADT} + l_{CPV} + l_{SR} + l_{DSS} + l_{BWR} = 1$, as discussed before in Eq 3.1.

The system of Eqs to be solved follows:

$$\begin{aligned} 0.68\ l_{ADT} - l_{CPV} &= 0 \\ 0.98\ l_{ADT} - l_{DSS} &= 0 \\ 0.77\ l_{ADT} - l_{SR} &= 0 \\ 0.96\ l_{ADT} - l_{BWR} &= 0 \\ l_{ADT} + l_{CPV} + l_{SR} + l_{DSS} + l_{BWR} &= 1 \end{aligned} \qquad (3.5)$$

The solution for the system presented in Eqs 3.5 is:

$$\begin{aligned} l_{ADT} &= 0.23 \\ l_{CPV} &= 0.15 \\ l_{DSS} &= 0.22 \\ l_{SR} &= 0.18 \\ l_{BWR} &= 0.22 \end{aligned}$$

Consistency checks are fundamental to validate the calculation of the scaling factors calculated with Eqs 3.5. An example of such a consistency test follows. The decision maker is presented with the following alternatives of possible projects to be funded and asked which is the level of BWR that will make him indifferent between the two alternatives.

$\{w_{CPV}, w_{ADT}, w_{SR}, w_{DSS}, x_{BWR}\}$ versus
$\{w_{CPV}, w_{ADT}, w_{SR}, b_{DSS}, w_{BWR}\}$

or substituting the numerical values,

$\{15000, 10, 80, 9, x_{BWR}\}$ versus $\{1500, 10, 80, 0, 1\}$

The value for BWR that makes the decision maker indifferent between the two alternatives needs to be 0.4 to be consistent with the previously assessed preference structure. This means that the following equation holds,

$$l_{BWR} v_{BWR}(0.4) \quad = \quad l_{DSS}$$

and consulting the value function for BWR in Fig 3.10 the result would be,

$$l_{BWR} \quad = \quad l_{DSS}$$

consistent with the previous calculations for l_{BWR} and l_{DSS} as calculated with Eqs 3.5. This is only one of the many possible consistency checks that can be made until the final set of scaling factors is defined based on the decision maker's preference structure. The decision maker needs to be made aware of any inconsistencies and these need to be solved with the help of the decision analyst.

With the single attribute value functions assessed and the calculated scaling factors the process of ranking the candidate projects for rehabilitation and replacement is carried out using Eq 3.2, which translates the weighted average technique.

A SUBSTITUTE FOR VALUE FUNCTIONS; PERCENTILE SCALING OF THE ATTRIBUTES

An issue when using a weighted average technique centers on how to value the attributes involved in the decision process. The ideal way to perform this operation is to assess the value function for each attribute in an assessment process with the decision maker and as discussed previously in this chapter. These value functions reflect the decision maker's preference structure when choosing between different alternatives characterized by attributes. However, the numerical range of the attributes, combined with the number of projects involved in the decision process, makes this task cumbersome to accomplish in a consistent manner. Another issue is the need to capture the dynamics of the bridge selection problem. This is characterized by the fact that the priorities of the bridge population, as measured by the bridge attributes, is always changing. This requires a technique that would reflect the results of recent inspections on the bridge ranking, capturing the dynamics of the problem. The proposed solution, which is termed attribute percentile scaling addresses the discused issues.

Percentile scaling is defined as a statistically based methodology that is meant to substitute the value function assessment for the attributes involved in the decision making process. As a simple example of this technique, the selection criteria is assumed to be based on one attribute, Average Daily Traffic (ADT), and applied to a reduced bridge population comprising two hundred projects. Table 3.4 shows the frequency distribution for the ADT attribute for this hypothetical bridge population.

Percentile scaling, in the recommended approach, corresponds to the cumulative frequency of the attribute. This means that by choosing a project with an ADT of 9000, this project is better than, or equal to, 80 percent of all projects in the bridge population as a candidate for funding. The percentile scaling numeric value is therefore a function of the numeric value of a particular attribute and measures the position of a project, as a better candidate for funding, relative to the rest of the projects in the set. This approach is based on concepts of descriptive statistics, where the cumulative frequency distributions of the attributes are used as a measure of the position of one project, relatively to the other projects in the bridge population. It is important to stress that this idea does not involve any probabilistic concepts, the technique is deterministic by definition.

In terms of multi-attribute decision theory, this technique assumes a linear value function based on the cumulative frequency of the attribute, as depicted in Fig 3.11. In the system presented in Chapter 4, this technique is extended to all attributes involved in the decision process. The range for the value function will be adopted as zero to one hundred, so that the values for the weighted average technique described by Eq 3.2 will be expressed in a scale of zero to 100, and the percentile scaling values can be used in lieu of the value function.

Figures 3.12 through 3.16 depict the percentile scaling curves for the on-system bridges as determined from data extracted from the BRINSAP data base and for the bridges eligible for Federal funding. It is important to observe that these percentile scaling curves are valid as of a determined date, these were determined from the

TABLE 3.4. FREQUENCY DISTRIBUTION FOR A HYPOTHETICAL BRIDGE POPULATION USING THE ADT ATTRIBUTE

ADT	Number of Projects	Cumulative Number of Projects	Frequency (%)	Cumulative Frequency (%)
800	60	60	30	30
2,500	40	100	20	50
5,500	40	140	20	70
9,000	20	160	10	80
14,000	20	180	10	90
50,000	20	200	10	100
Totals	200			100

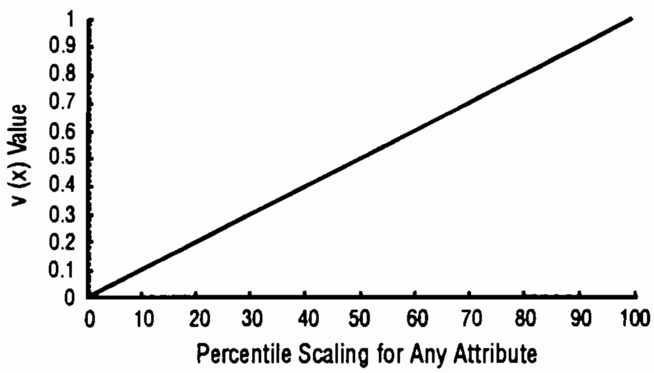

Fig 3.11. Value function for Percentile Scaling for any attribute.

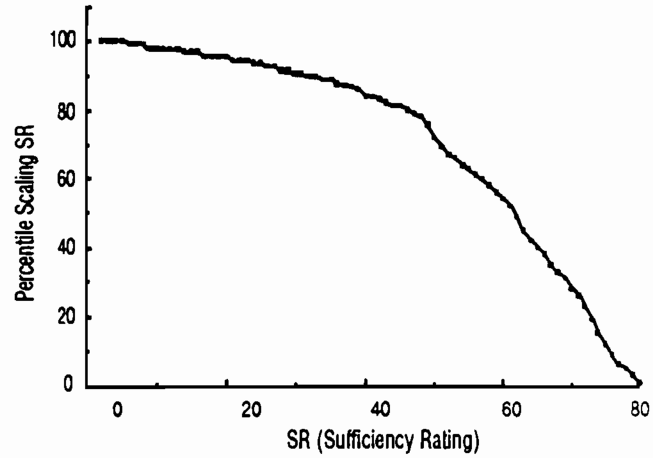

Fig 3.14. Percentile Scaling Curve for the attribute SR (Sufficiency Rating), On system.

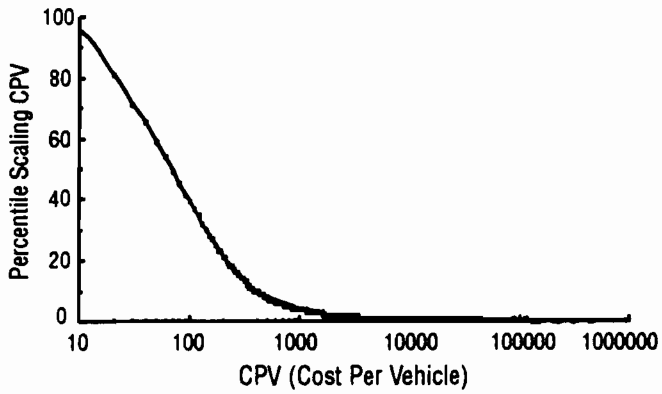

Fig 3.12. Percentile Scaling Curve for the attribute CPV (Cost per Vehicle), On system.

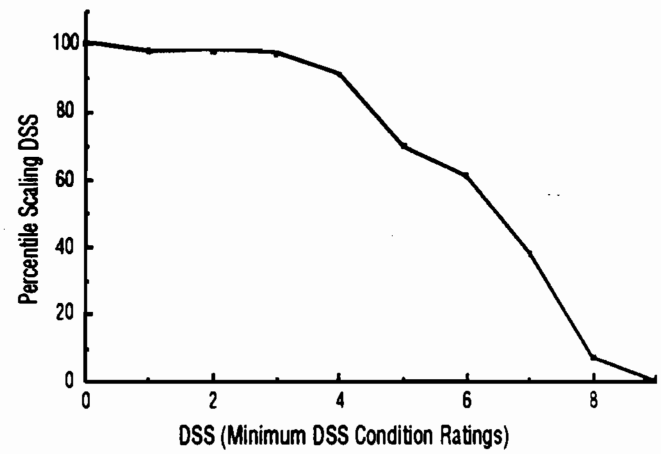

Fig 3.15. Percentile Scaling Curve for the attribute DSS (Minimum of the Deck Substructure Superstructure condition ratings), On system.

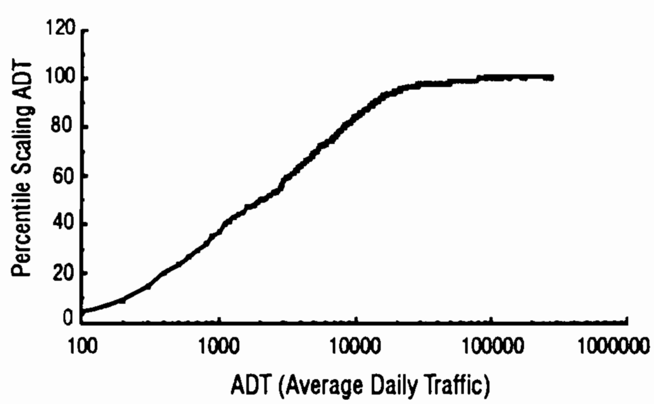

Fig 3.13. Percentile Scaling Curve for the attribute ADT (Average Daily Traffic), On system.

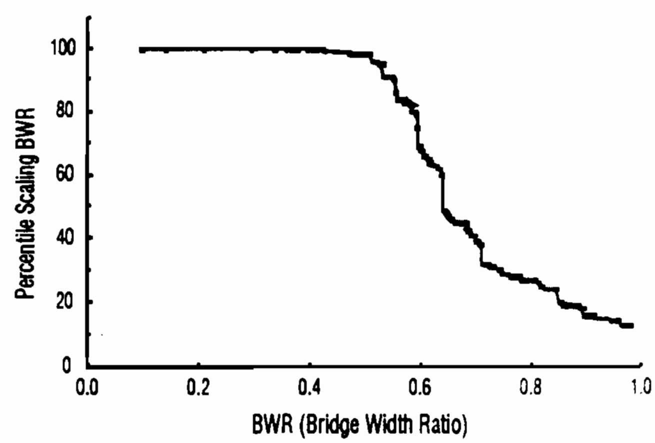

Fig 3.16. Percentile Scaling Curve for the attribute BWR (Bridge Width Ratio), On system.

BRINSAP/1988 computer tape. This happens because the BRINSAP data base is being updated constantly and consequently the frequency distributions and also the percentile scaling for the attributes reflect the value of the attributes, for each bridge, as of the last available inspection.

In the system presented in Chapter 4, one of the modules of the ranking system calculates all percentile scaling values, based on the the frequency distributions for each attribute, and makes the results available to other modules of the system which utilize the weighted average ranking process described by Eq 3.2.

AUTOMATIC QUALIFICATION

Another feature in the ranking process utilized by the system presented in Chapter 4, is the automatic qualification of bridge projects by means of user selected attribute thresholds. Automatic qualification uses critical values for the attributes, established by the decision maker, to position projects at the top of the ranked list. This concept was introduced by Boyce et al. (Ref 2) and reflects the flexibility desired by the Texas SDHPT officials in the selections. One or more of the attributes may be used for this purpose. As an example, the user might want to include all structures with DSS less than or equal to 3, or an SR less than or equal to 20. The use of the automatic qualifying feature by-passes the previously defined weighted average technique. A project with these DSS or SR attribute values would be included at the top of the ranked list, regardless of the weighted average score. The appeal of this feature, is that it adds flexibility to the system by allowing the decision maker to include projects that might not be selected using the basic weighted combination process. Finally, not using the automatic qualification feature is also an option available to the user, and this links the ranking process solely to the weighted average scoring technique previously defined.

EXAMPLE OF COMPARISON OF TWO PROJECTS

Assume that two projects A and B, as depicted in Table 3.5, need to be compared as better candidates for funding and that they belong to the eligible On system bridge population. Using the values for each project attributes and consulting Figs 3.12 through 3.16 it is possible to determine the percentile scaling values for each one of the projects, for each attribute value. Calculation of the multi-attribute value for each project, as defined by the weighted average technique, is performed using Eq 3.2. The Scaling Factors are assumed to be calculated based on the preference structure of the decision maker as reflected by value functions similar to the ones depicted in Figs 3.6 through 3.10 and assessed especially for the on system eligible bridges. This example also assumes that the decision maker is willing to take advantage of the automatic qualification feature for projects with a value of DSS less or equal to three. The results and comments for this example follow.

In Table 3.5 it can be observed that project A has a weighted average score or value of 74, greater than the one for project B, which has a value of 69. If the choice between the two projects was to be based solely on the score for the projects, project A would receive higher priority for funding than project B. In this example, although, an auto qualifying threshold for projects with a DSS less or equal to 3 was established. This would cause project B to receive higher priority than project A, since it has a value for the attribute DSS of 3, which makes it an automatic qualifyed project.

CHAPTER SUMMARY

This chapter presented the concepts of multi-objective decision analysis needed for the development of a multi-attribute based ranking process. This process will be applied in a network level ranking module for the selection of rehabilitation and replacement bridge projects, which is presented in Chapter 4. The proposed ranking process is known in the literature as a weighted average technique and involves assessing the multi-attribute value function for the decision maker. A technique for substituting the single attribute component value functions by a percentile scaling curve was suggested which adds flexibility to the system and permits an automatic update of the percentile scaling curves as more recent inspections are available from the BRINSAP data base. A process for calculating the scaling factors for the weighted average technique was presented. This process is based on the preference structure of the decision maker and is a more consistent approach than basing the scaling factors on a direct assessment technique.

TABLE 3.5. EXAMPLE OF COMPARISON OF TWO ON SYSTEM ELIGIBLE PROJECTS

		Project A		Project B	
Attributes	Scaling Factors	Attribute Value	Percentile Scaling	Attribute Value	Percentile Scaling
CPV	0.15	40	65	20	81
ADT	0.23	3,000	58	1,000	37
SR	0.18	60	54	50	72
DSS	0.22	4	91	3	97
BWR	0.22	0.5	98	0.6	68
Value			74		69

CHAPTER 4. A RANKING MODULE FOR THE SELECTION OF REHABILITATION AND REPLACEMENT PROJECTS

INTRODUCTION

Federal funding is important for all State bridge programs, since up to 80 percent of each project's contract price can be provided by federal funds. Funding programs are available for both the on- and off-state systems of bridges. Any federal funding takes place through the national Highway Bridge Replacement and Rehabilitation Program (HBRRP). The context and funding levels involved in the HBRRP are presented in Chapter 1. The two objectives of the selection system presented in this chapter are:

(1) to provide a consistent and systematic way of distributing funds statewide and
(2) to make project selections for rehabilitation and replacement,

both using the theoretical background presented in the previous chapter.

The system relies on data stored in the BRINSAP (Bridge Inventory, Inspection and Appraisal Program) database, which is forwarded periodically for processing by the FHWA, as a requirement for the state's eligibility for Federal funds. BRINSAP includes updated information about the inventoried bridges in Texas and a manual (Ref 19) describes the contents and the format in which the data are stored. Selected data items from BRINSAP are read by one of the computer programs described in this chapter, which retrieves appropriate information about each inventoried bridge, and allows the application of the ranking techniques presented in Chapter 3 by the other components of the system.

The statistically and decision theory based bridge prioritization techniques presented in Chapter 3 are incorporated in each one of the system's computerized component modules and make extensive use of data stored in BRINSAP. All programs in the system presented in this chapter are written in SAS (Statistical Analysis System), because the SAS programing language runs on both personal and mainframe computers, and contains powerful statistical analysis and database management routines. The computer programs involved in the proposed selection system take advantage of the SAS full screen product interface, which results in a high level of user friendliness. This system has been tested and was used to assist in determining the 1987 Texas SDHPT bridge budget allocation and project selection. The mainframe computer version was first developed and subsequently modified for PC applications. Comparative testing showed that both systems produce the same results, although the PC version is slower since it lacks the processing speed and storage capabilities of the mainframe system.

THE SELECTION MODULE

The proposed computerized bridge project selection management module termed Texas Bridge Selection System (TBSS) is a two-level closed-loop system for which a flowchart is depicted in Fig 4.1. The two levels of the process are the State level and the district level, where the State level applies general statewide selection criteria to the full bridge inventory. The district level takes into account specific local criteria, based on local engineering and planning knowledge about candidate bridge projects, and feeds it back to the State level. The system corresponds to the analysis and implementation steps for a multiobjective decision-making process, as depicted in

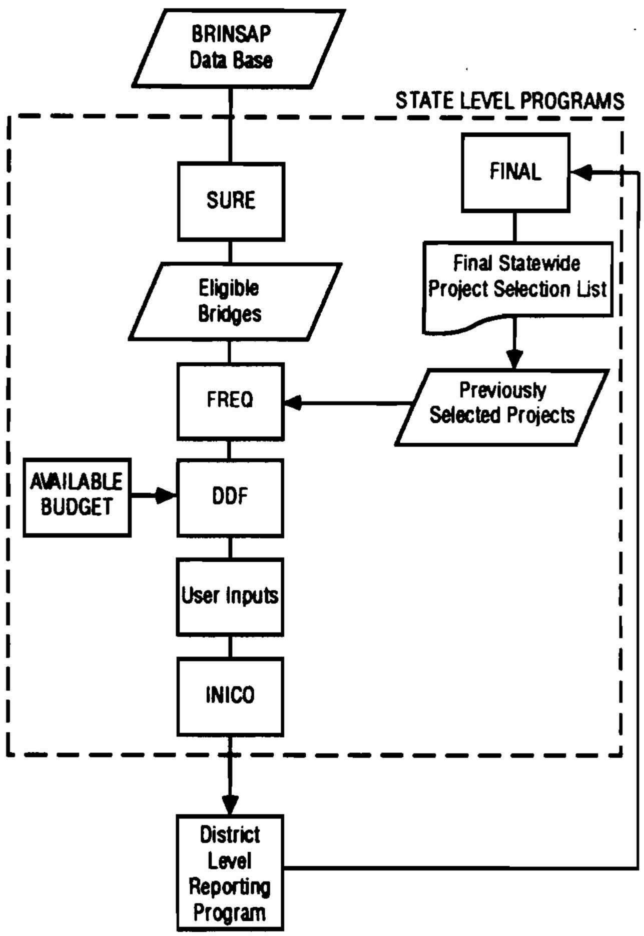

Fig 4.1. The TBSS (Texas Bridge Selection System).

Fig 3.1. Characteristics of the computerized components of this system are now described. The numerical data presented in this chapter corresponds to a BRINSAP database from the beginning of 1988.

THE STATE LEVEL PROGRAM SURE

The first computer program is termed the Sufficiency Rating Evaluator (SURE). It was originally developed in (Ref 2) and modified for interactive mode operation for use in this system. SURE has undergone major modifications for use in the PC based system. SURE reads appropriate data from the BRINSAP data base, and applies the FHWA criteria to determine eligibility of the inventoried bridges for Federal funding. The FHWA criteria for eligibility require that the Sufficiency Rating SR be less than or equal to 80 and also that the structure be determined as either structurally deficient or functionally obsolete, (Ref 29). If the SR for the bridge is less than or equal to 80, and it is also determined as either structurally deficient or functionally obsolete, the bridge is eligible for FHWA funds for rehabilitation. If the sufficiency rating for the bridge is less or equal to 50, and it is also determined as either structurally deficient or functionally obsolete, the bridge is eligible for FHWA funds for replacement. In the case of the latest Texas on-system set, the federal criteria for funding reduces approximately 30,000 inventoried bridges to nearly 3,000 eligible candidate projects. In the case of the off-system bridge set it reduces the approximately 17,000 bridges to nearly 9,000 eligible candidate projects.

In the PC version, computer files generated from the BRINSAP data base, in text format, have to be available in the machine's hard disk. Depending on the available disk space in the PC, the data from BRINSAP needs to be split in to several files which can be processed one at a time. The resulting eligible sets, for each run, are merged in order to be submitted to the next computer program within the system. The different processing approaches between SURE mainframe and SURE/PC is the only distinction between the mainframe and PC based versions of the TBSS system. This difference affects directly the source code for the SURE computer program and two versions are therefore needed.

The mainframe version reads the data directly from the BRINSAP data base, which may be stored on disk or tape. The final product of the both versions of SURE is a federally eligible SAS data set including all the data needed by the subsequent modules in the computer system. The on or the off system BRINSAP data base is processed automatically depending on the user's input.

SURE assigns a number, termed the Bridge Identification number (BRID), that is the unique number by which data for a specific bridge will be retrieved in any of the component programs of the system. It has twelve digits and follows the format XXX-XXXX-XX-XXX , where:

(1) the first three digits correspond to the county number,
(2) the next four digits correspond to the control number,
(3) the next two digits represent the section number, and
(4) the last three digits represent the structure number.

A flowchart for the SURE program is depicted in Fig 4.2. Listings of the source code for the PC and mainframe versions of SURE are included in the Appendix B, Appendix A includes a manual for the use of SURE.

THE STATE LEVEL PROGRAM FREQ

The program FREQ, for Frequencies, calculates the frequency distributions of the decision attributes in order to allow the percentile scaling methodology described in Chapter 3 to be used by the other programs that compose the selection system. Basically:

(1) it processes the federally eligible bridge set stored by the program SURE,
(2) deletes the bridge projects already funded in previous HBRRP allocations,

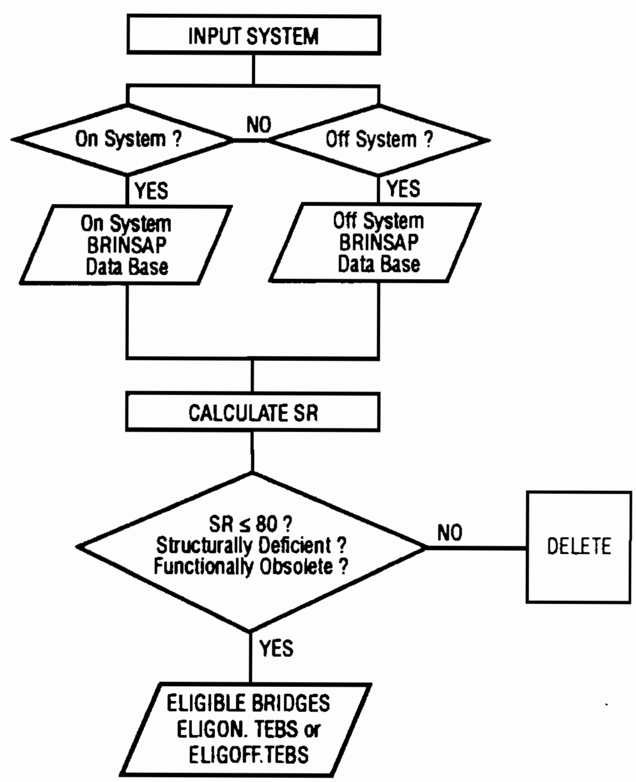

Fig 4.2. The program SURE (Sufficiency Rating Evaluator).

(3) calculates the frequency distributions for each attribute, and
(4) merges the corresponding percentile scaling values for each bridge project.

PERCENTILE SCALING CALCULATIONS

The percentile scaling values are used by related programs in the system, whenever ranking of the eligible set is needed in the weighted average process that was described in Chapter 3, Eq 3.2. This process uses the percentile scaling curves for the attributes in lieu of the value functions assessed for the decision maker as discussed in Chapter 3. After the FREQ program is run, each of the eligible projects will have five percentile scaling values, one for each attribute presently used by the weighted average technique represented by Eq 3.2. These percentile scaling values are stored together with other variables describing bridge identity, location and other physical, geometric and cost data. A summary table of the number of eligible bridge projects is printed by the program, separated into districts, including associated cost estimates for rehabilitating or replacing the federally eligible bridges. An example of this table is presented in Table 4.1 where it is observed that if all the eligible on-system projects in the state where to be funded, for this version of the BRINSAP data base, a total budget of $572,768,300 would be needed. Complete percentile scaling tables are also printed by the program, which contain information similar to the one used to plot Figs 3.12 through 3.16, a table for the SR attribute is presented in Table C.3.

TABLE 4.1. ELIGIBLE BRIDGE STATISTICS FOR THE ON SYSTEM AFTER DELETING PREVIOUSLY SELECTED PROJECTS

District	Number of Eligible Bridges	Cost	Percent of Total Cost
1	344	$51,928,000	9.07
2	148	$43,085,000	7.52
3	63	$11,915,000	2.08
4	11	$3,667,000	0.64
5	13	$5,670,000	0.99
6	1	$220,000	0.04
7	23	$5,762,000	1.01
8	74	$14,053,000	2.45
9	92	$32,218,000	5.62
10	143	$17,820,000	3.11
11	80	$15,060,000	2.63
12	120	$35,057,000	6.12
13	100	$18,923,000	3.30
14	80	$14,653,000	2.56
15	118	$32,192,300	5.62
16	204	$41,623,000	7.27
17	49	$13,770,000	2.40
18	506	$123,736,000	21.60
19	99	$20,128,000	3.51
20	134	$49,912,000	8.71
21	15	$2,946,000	0.51
23	11	$468,000	0.08
24	16	$7,526,000	1.31
25	38	$10,436,000	1.82
Totals	2482	$572,768,300	100.00

DELETING PREVIOUSLY SELECTED PROJECTS

The actual rehabilitation or replacement of the bridges selected for funding by the TBSS system, Fig 4.1, occurs after a substantial amount of time. After the final list of projects is generated it needs to be submitted for bidding and contracting, and as this process is taking place the BRINSAP data base is not updated. Even after it is completed it takes some time for the update to take place. In the meantime, if another bridge funding program needs to be processed, a need exists to delete from further consideration the projects that have been considered in previous programs and are still included in the BRINSAP data base. The first reason for doing this is to avoid selecting projects that were already funded in previous programs. The second reason is that the calculations of the percentile scaling factors need to reflect the statistics of the current eligible set. The way this is achieved in the TBSSS system, is by means of maintaining a data base of the previously selected projects, in SAS format, separated for the on and the off systems. A sample of a printout of the partial contents of this data base is presented in Table 4.2, for the on-system. This data base is linked to the eligible set generated by the program SURE by the BRID number and the projects in common are deleted from the eligible set. The program FREQ also determines which bridge projects have already been deleted from the BRINSAP data base, and updates the previously selected projects database.

TABLE 4.2. FORMAT OF THE PREVIOUSLY SELECTED PROJECTS DATA BASE FOR THE ON SYSTEM, PARTIAL LIST

Bridge ID Number	District	Flag	Program Year
075-0279-02-002	1	PREV	1987
139-0221-01-004	1	PREV	1987
112-0780-02-001	2	PREV	1987
120-0134-05-016	2	PREV	1987
120-0249-06-016	2	PREV	1987
120-1333-03-004	2	PREV	1987
182-0314-03-013	2	PREV	1987
184-0008-02-033	2	PREV	1987

A utility program, PREV for Previously Selected projects, allows the user of the system to make manual modifications to the previously selected projects database via interactive screens. Listing of the source code for PREV is included in Appendix B, a manual is included in Appendix A.

SPLITTING THE DATA INTO A DISTRICT BASIS

The statewide eligible data set, including the percentile scaling numbers, is separated into districts in order to make the appropriate data available to the District Level Reporting Module. Each district receives a SAS data set containing federally eligible project data to be used with the District Level Reporting Module. The data is available via the mainframe computer system, in the case of the mainframe system, or computer disks or modem transfers in the PC based system.

The flowchart for the program FREQ is depicted in Fig 4.3, the source code listing is included in Appendix B and the manual for the program is in Appendix A.

THE PROGRAM DDF

The program DDF, District Distribution Factors, calculates a budget allocation to the districts. DDF accomplishes this allocation task by using the weighted average technique combined with the automatic qualification method presented in Chapter 3. The projects are scored with Eq 3.2 for which the percentile scaling values have already been calculated and stored in a permanent SAS data set by the program FREQ. The needed scaling factors discussed in Chapter 3 are inputs together with the budget to be allocated and the system, On or Off, via interactive computer screens. The format of these screens is depicted in Appendix A where manuals for all the computer programs that compose the TBSS system are included.

The scaling factors are calculated in an approach similar to the one presented in Chapter 3, or obtained via a direct assessment process with the decision maker. In the case of a direct assessment process, the program allows the user to input seven different combinations for the scaling factors of the attributes in order to allow a sensitivity analysis. A sample of this combination of scaling factors is depicted in Table 4.3.

Another screen allows the user to input automatic qualification criteria for ranking the projects. The multiattribute value for all the eligible projects, for the seven methods, is calculated, using Eq 3.2, and at the same time the thresholds for automatic qualification are checked and the projects that auto qualify are flagged. The projects are then sorted, for each of the seven methods, in order of decreasing score with all the automatic qualified projects at the top of the list. The ranked projects are selected sequentially until the cumulative cost of the projects chosen matches the available state budget and the list is cut off. The chosen projects are then sorted by district and a budget allocation for every district is determined by accumulating the project costs on a district by district basis. The final results are seven different sets of budget allocation factors, one for each set of scaling factors.

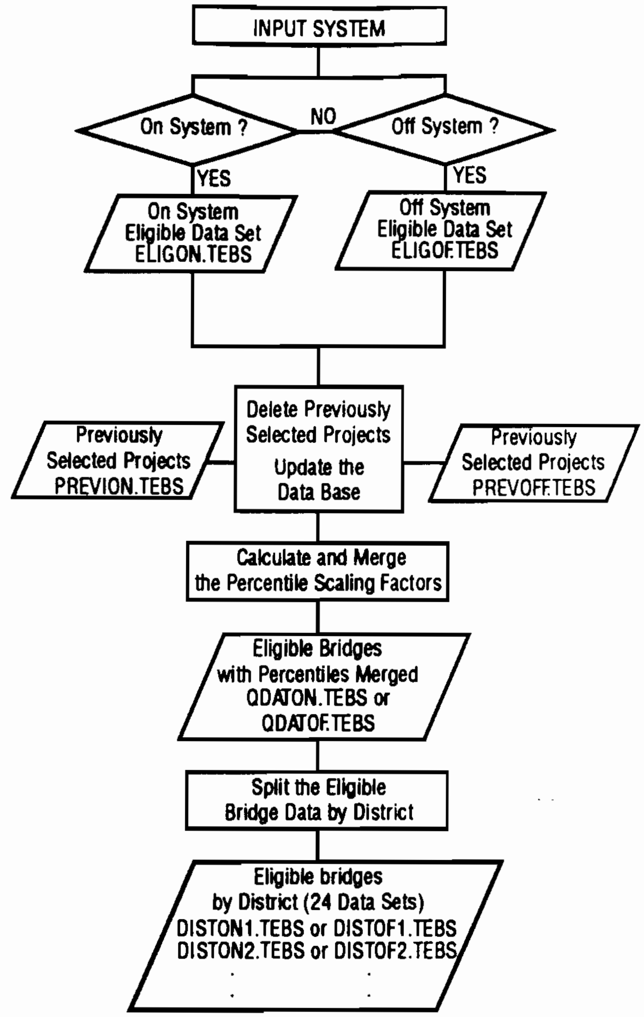

Fig 4.3. Flowchart for the program FREQ

TABLE 4.3. SCALING FACTOR SETS AS USED BY THE PROGRAM DDF

Method	CPV	ADT	SR	DSS	BWR
1	0.20	0.20	0.20	0.20	0.20
2	0.20	0.15	0.25	0.20	0.20
3	0.15	0.15	0.25	0.25	0.20
4	0.15	0.10	0.25	0.25	0.25
5	0.10	0.10	0.30	0.25	0.25
6	0.10	0.05	0.30	0.30	0.25
7	0.05	0.05	0.30	0.30	0.30

TABLE 4.4. SUMMARY OF THE ALLOCATION FACTORS FOR THE SEVEN SETS OF SCALING FACTORS

District	Meth1	Meth 2	Meth 3	Meth 4	Meth 5	Meth 6	Meth 7	Average
1	3.87	3.61	3.54	3.82	3.68	12.51	12.84	6.27
2	11.27	11.38	13.50	11.40	11.33	10.17	9.51	11.22
3	2.44	2.39	2.23	1.97	2.09	2.11	2.12	2.19
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	3.44	3.44	3.47	3.44	2.92	2.69	2.74	3.16
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7	0.90	1.07	1.08	0.90	0.95	0.88	0.43	0.89
8	3.36	3.36	3.20	3.18	3.46	3.31	3.30	3.31
9	0.42	0.16	0.09	0.26	0.10	0.09	0.10	0.18
10	0.72	0.75	0.64	0.66	0.69	0.67	1.12	0.75
11	0.32	0.37	2.02	2.01	2.19	2.03	2.05	1.57
12	13.86	13.63	12.18	11.85	11.51	10.32	10.43	11.97
13	1.79	1.79	2.00	2.02	2.12	2.17	3.35	2.18
14	3.67	3.68	2.89	3.34	3.12	2.88	2.94	3.22
15	4.16	4.30	3.82	3.84	3.69	3.52	3.37	3.82
16	9.04	9.39	9.65	9.57	10.27	11.21	11.37	10.07
17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18	34.33	33.17	32.15	31.26	31.76	25.57	24.52	30.40
19	1.83	1.83	1.85	2.01	2.00	1.96	2.00	1.93
20	3.44	4.52	4.52	7.33	6.90	6.76	6.63	5.73
21	0.24	0.24	0.24	0.24	0.26	0.24	0.25	0.25
23	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25	0.88	0.88	0.88	0.88	0.95	0.88	0.90	0.89

Program results are presented in the form of tables, graphs, and an allocation map. Table 4.4 shows a summary of the district distribution factors, in terms of a percentage of a planned budget, for the seven sets of scaling factors included in Table 4.3. Table 4.5, also generated by the program, shows the listing of a full allocation with a planned budget of US $150 million to the districts, using equal scaling factors for all attributes, as in method 1 in Table 4.3, and automatic qualification of all projects with a DSS less or equal to three. This table displays how the planned budget is divided into districts, and within each district how much is being allocated to the auto qualified projects. In this example a total of 572 projects were selected, from which 143 were selected via the auto qualifying threshold of DSS $\leq$ 3, which corresponds to $37,230,000 of the total allocated budget.

Figure 4.4 shows an example of an allocation map generated by this program module that summarizes the allocation of the planned budget on a district by district basis in terms of percentage of the total budget. A flow-chart for the program is presented in Fig 4.6, the listing of the source code is included in Appendix B and the manual for the program is in Appendix A.

DISCUSSION OF THE RESULTS OF DDF

It is important to note, that some of the districts may receive a zero apportionment of the budget. District 6, one of the districts that received a zero apportionment, has only 1 project that is eligible for Federal funds, as can be observed in Table 4.1. The number of eligible projects that are screened by the program SURE, is of course, a significant factor influencing the results of the program DDF. It is expected that as the condition of the bridge network gets more uniform, with the systematic investment on the high priority projects, that the budget distributions calculated by the program DDF will get closer to the distributions by district of the area or of the cost of the eligible projects statewide.

The allocation results of DDF from Table 4.5, are compared with the distributions by district of: eligible area, obtained from the BRINSAP database, and eligible cost, from Table 4.1, and the results can be observed in Fig 4.5. These comparisons are valid for the analysis of the data as of a particular edition of the BRINSAP database. It is observed that significant deviations between DDF and eligible area or eligible cost distributions occur for districts 12 and 18. This deviations may reflect the allocation of insufficient funds for the both districts on the

TABLE 4.5. LISTING OF AN ALLOCATION WITH A PLANNING BUDGET OF U.S. $150 MILLION (EQUAL WEIGHTS AND DSS ≤ 3)

District	Number of Projects	Dollars Allocated	Percent of Budget	Number of Auto Qualified Projects	Dollars Allocated to Auto Qualified Projects
1	40	$5,792,000	3.87	21	$3,455,000
2	53	$16,883,000	11.27	4	$7,295,000
3	21	$3,649,000	2.44	9	$270,000
4	0	$0	0.00	0	$0
5	11	$5,152,000	3.44	9	$4,016,000
6	0	$0	0.00	0	$0
7	3	$1,344,000	0.90	0	$0
8	15	$5,041,000	3.36	10	$4,241,000
9	3	$626,000	0.42	0	$0
10	10	$1,083,000	0.72	2	$433,000
11	4	$486,000	0.32	2	$69,000
12	55	$20,767,000	13.86	12	$6,354,000
13	8	$2,676,000	1.79	1	$322,000
14	16	$5,500,000	3.67	8	$1,440,000
15	31	$6,232,000	4.16	3	$507,000
16	17	$13,550,000	9.04	2	$83,000
17	0	$0	0.00	0	$0
18	237	$51,442,000	34.33	37	$4,363,000
19	18	$2,748,000	1.83	12	$1,472,000
20	23	$5,159,000	3.44	6	$1,565,000
21	2	$363,000	0.24	0	$0
23	1	$31,000	0.02	1	$31,000
24	0	$0	0.00	0	$0
25	4	$1,314,000	0.88	4	$1,314,000
Totals	572	$149,838,000	100.00	143	$37,230,000

previous HBRRP programs. This, most likely, resulted in an increased deterioration of bridges in these districts as compared with the other districts. This deterioration is measured by the deviation from the detailed objectives stated in Fig 3.2. This differences will probably be leveled by the continuous application of consistent allocation techniques such as the ones included in the formulation of DDF.

THE USER INPUTS

This component of the proposed ranking system allows the decision maker to adjust the budget allocations generated by the program DDF before forwarding the statewide allocations and suggested projects lists to the districts. This adds flexibility to the overall process allowing the decision maker to take into account specific needs of the districts and of the administration of the SDHPT. After going through this process the decision maker, based on the allocations generated with the help of the program DDF, has the dollar amounts to be invested in each of the districts. This amounts are submitted to the next program of the TBSS system, the program INICO. The allocation map after the adjustments is shown in Fig 4.7 which is also an output for the program INICO.

THE PROGRAM INICO

The program INICO, Initially Considered Projects, uses the budget allocations, by district, determined with the help of the program DDF and modified by any user's inputs to determine a list of projects to be submitted to the districts for their review. This is accomplished through the weighted average technique and the automatic qualification methodology described in Chapter 3. The user is asked to input a set of scaling factors for the attributes and a set of automatic qualifying thresholds. The set of eligible projects generated by the program FREQ are scored with the multi-attribute value generated by Eq 3.2 and the ones that meet automatic qualification thresholds are flagged, the resulting set is then sorted by automatic qualification, score and district. For each district the project cost is accumulated, while selecting the projects sequentially, until it meets the amount allocated for each district as an input for the

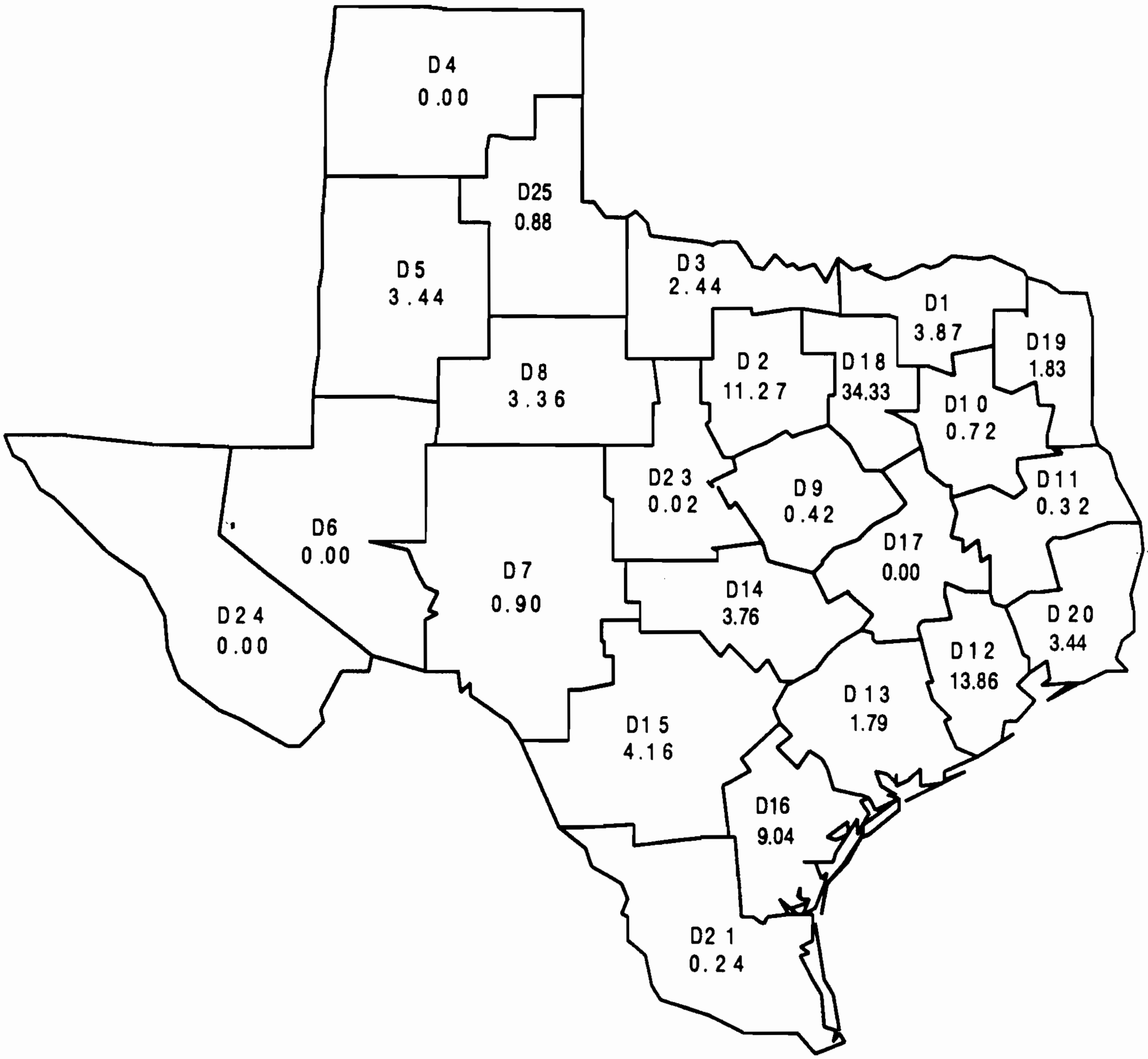

Fig 4.4. Allocation map with percentages of a planned budget of U.S. $150 million.

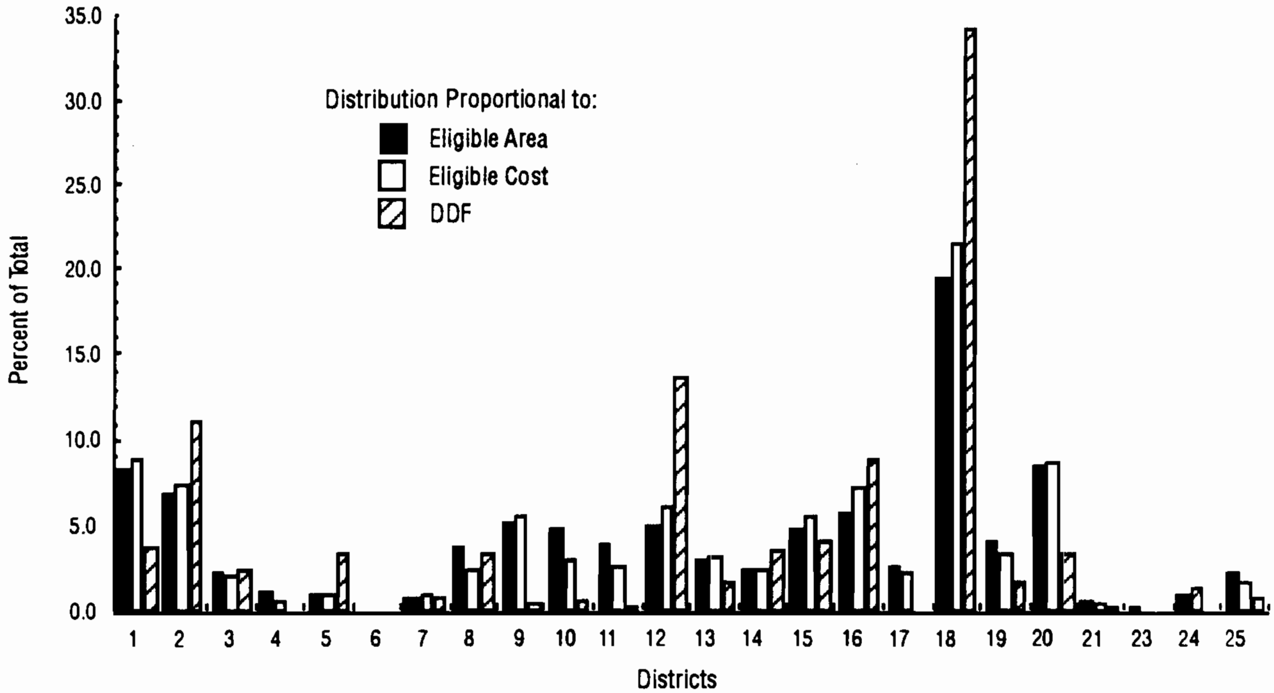

Fig 4.5. Comparison of the results of DDF with the distributions by district of eligible deck area and eligible cost.

program. The resulting list, for each district, is then submitted to the districts for review in the format of hard copy, similar to the one included in Table A.4., and also by means of SAS data sets. The SAS data sets, one for each district, are stored in the computer's mass storage in the mainframe solution, and are accessible at the districts with the District Level Reporting module.

In the case of the PC based solution the SAS data sets are made available to the districts via computer diskettes or modem transfers and are also processed with the District Level Reporting Program. The information contained by these data sets has a format similar to the one depicted in Table 4.6. The program prints a statewide report which contains the projects selected which will be submitted to the districts. A sample is included in Table A.4., and also a chart and a allocation map are depicted in Figs A.17. and A.18 summarizing the allocations. The flowchart of the program is depicted in Fig 4.8, the listing of the source code is included in Appendix B and the manual for the program in Appendix A.

DISCUSSION OF INICO RESULTS

If INICO receives the same inputs of the program DDF for the scaling factors of method 1, as in Table 4.4 , the same auto qualifying thresholds, DSS $\leq$ 3, and the budget to be allocated to each district is the same as the one depicted in Table 4.5, the list generated by the program INICO, for each district, will be composed of the same "anonymous" projects that were included in the distribution generated by the program DDF. This can be observed in Table 4.6 where the projects selected by the program INICO, under these conditions, are depicted for District 16 and the accumulated cost for the 17 selected projects matches exactly the DDF allocated budget for this district.

THE DISTRICT LEVEL REPORTING PROGRAM

District level staff receives two data files in SAS format. One contains the percentile scaling and bridge description data of the eligible bridges for their particular district, generated earlier by the program FREQ. A second file contains a list of the initially considered projects in the format depicted in Table 4.6. Several options are then available within the district level reporting module, which is available for use by the twenty four Texas districts, which are:

(1) print and review the list generated at the State level by the program INICO,
(2) rank the district's eligible projects,
(3) add comments to the selected and non selected projects, and
(4) forward list to the State level of the system.

PRINT AND REVIEW THE LIST GENERATED AT THE STATE LEVEL

The first option, generates a partial listing of the projects selected by the program INICO for the district that is using the reporting module. A sample of this output is included in Table A.5. A flowchart for this option is presented in Fig 4.9.

RANKING THE DISTRICT'S ELIGIBLE PROJECTS

The second option, is designed to allow the user at the district level to apply his own scoring and auto qualifying process to the district eligible bridge set. This procedure is similar to the one used by the program INICO for the statewide population of eligible bridges. The process takes advantage of the fact that the district engineers are in the best position to select appropriate scaling factors and auto qualifying thresholds for the bridges in their region, since they possess local knowledge of the structures. To further take advantage of the district's engineers knowledge, the district level reporting module includes another option for ranking the district's bridge projects termed automatic inclusion. This feature allows the district engineer to include bridges for reasons not directly covered by the attribute scoring process, or the auto qualification procedure, included in the general statewide selection process. An example would be the coordination of adjacent pavement rehabilitation programs with bridge deck replacement or rehabilitation projects. In this district automatic inclusion process, the district engineer inputs the BRID number of the desired bridge structure and the program automatically places this project at the top of the district priority list of bridges selected for rehabilitation and replacement.

The final product of this option is a list of all eligible projects in the district, ranked by descending score, with both the automatically included and the automatic qualified projects at the top. This list reflects the district engineer's priorities, and is recorded in the form of individual project and cumulative program cost streams. District engineers are therefore able, with the help of this ranked list, to generate their own list of projects based on the budget established by the program INICO. This list may differ significantly from that listing selected at the state level by the program INICO alone. The only restriction is a financial one. District engineers must limit the selected projects funding so that their total program funding does not exceed the statewide money allocation figures assigned to the district by the program INICO. An example of the financial restriction would be the total allocated budget depicted in Table 4.6, for District 16, which amounts to $13,550,000.

Table 4.7 presents the partial results of this option for District 16, straight equal scaling factors, automatic qualification of projects with DSS ≤ 3, and three district automatically included projects. A more complete table for this option with the same selection criteria is included in Appendix A, Table A.6. It is observed in Table 4.7, and in more detail in Table A.6, that indeed three projects are placed at the top of the ranked list regardless of their multi-attribute value or automatic qualification thresholds, because they were automatically included by the district decision makers. Projects with particularly low multi-attribute values were selected to illustrate the automatic inclusion process.

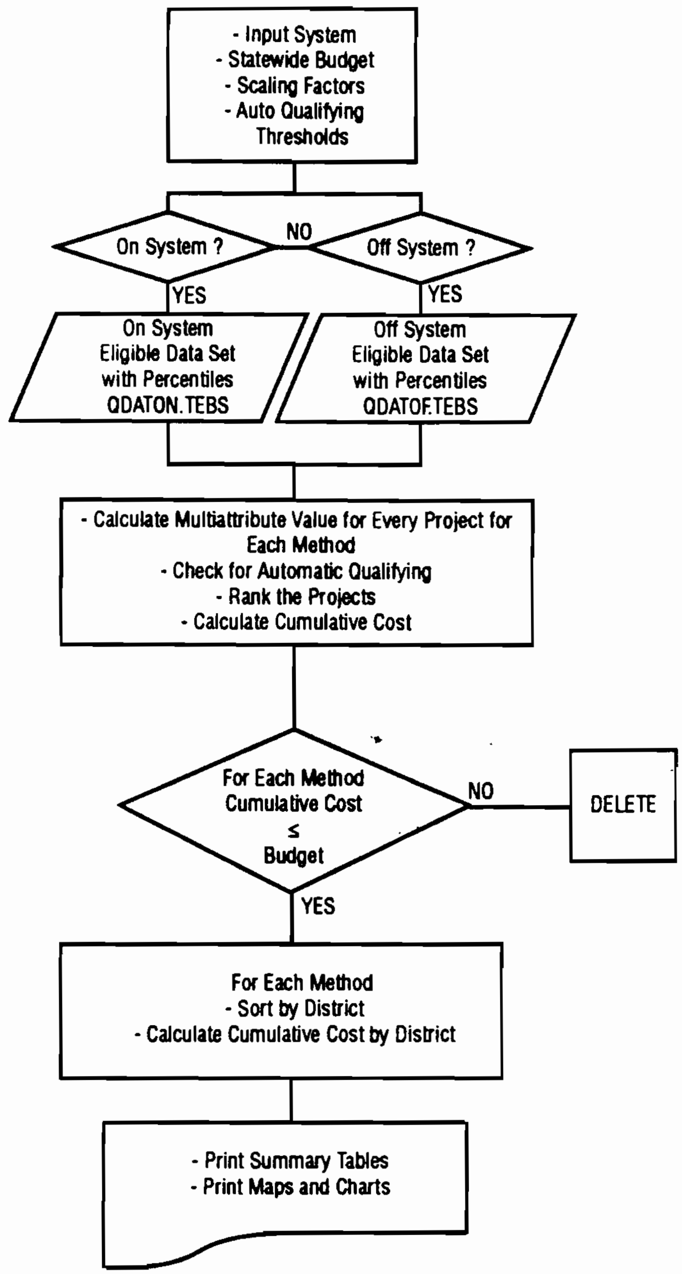

Fig 4.6. Flowchart for the program DDF (District Distribution Factors).

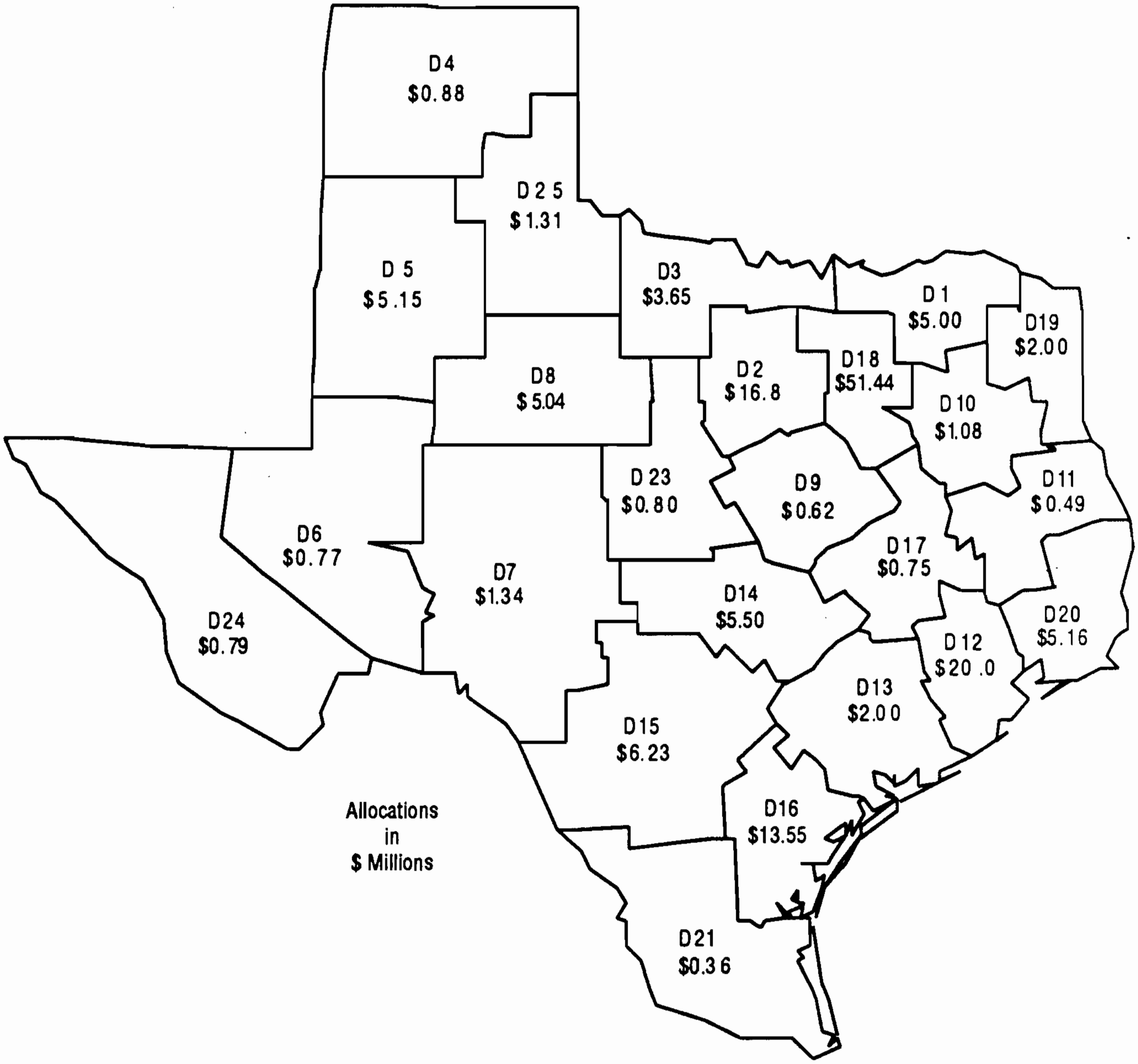

Fig 4.7. Allocation map after adjustments for a planned budget of U.S. $150 million.

TABLE 4.6. INITIALLY CONSIDERED PROJECTS FOR DISTRICT 16

Observation	Bridge Identification Number	Cost of Proposed Improvements	Flag Variable
1	126-0086-11-028	$70,000	INI
2	129-0100-06-073	$48,000	INI
3	129-0100-12-052	$23,000	INI
4	149-0542-06-015	$70,000	INI
5	178-0101-06-033	$11,969,000	INI
6	178-0102-01-003	$58,000	INI
7	178-0102-01-030	$26,000	INI
8	178-0989-02-003	$38,000	INI
9	178-0989-02-004	$53,000	INI
10	178-0989-02-005	$32,000	INI
11	178-0989-02-008	$66,000	INI
12	178-1052-01-024	$45,000	INI
13	178-1052-01-025	$126,000	INI
14	178-1052-01-026	$808,000	INI
15	178-1088-03-002	$40,000	INI
16	205-0994-01-001	$60,000	INI
17	205-1052-03-029	$18,000	INI
	Total Allocated Budget	$13,550,000	

The list needs to be cut-off, for these criteria, at the project with BRID 178-1052-01-026, this depending of the allowance for a variation over the state established budget for the district. The district decision maker can perform several runs of this option modifying scaling factors, automatic qualification thresholds and automatically included projects until a satisfactory ranked list is established. A flowchart for this option is depicted in Fig 4.10.

ADD COMMENTS TO THE SELECTED PROJECTS

This option allows the user of the district level reporting module to add comments to the selected project list, for example justifying the selections for priority treatment or reasons for not selecting a project. It prints a report of the current status of the comments for each project for which a sample can be found in Appendix A, Table A.7. The process of running this option can be repeated several times, until the district level decision maker is happy with the results of the comments list. A flowchart for this option is depicted in Fig 4.11.

FORWARD LIST TO THE STATE LEVEL OF THE SYSTEM

A final option is to forward a list of district selected projects, ranked by district priority, to the state level of the system for consideration, through a closed loop. The final product of the district level reporting module is a list of projects recommended for funding, for every district in the state, together with comments for each project. This list, from each district, is transferred to the state centralized bridge administration via file sharing for the mainframe system or via computer disks or modem for the PC based system. The SAS data set forwarded to the State level of the system has a format similar to the one depicted in Table 4.8 which represents a hypothetical list for District 16. Table A.8. depicts the list of district selected projects in more detail and is printed by the program. Figure 4.12 depicts the flowchart for this option. A manual for the operation of the district level reporting module is included in Appendix A and a listing of the source code is included in Appendix B.

THE STATE LEVEL PROGRAM FINAL

The State level reporting program FINAL is used to make the final SDHPT project selections and combine these into a coherent engineering and financial program. Several options are available to the state level decision maker, which are accessed via interactive screens, as follows:

(1) browse through the district selections,
(2) add or delete projects to the districts selections,
(3) assemble the statewide list of projects for all districts, and
(4) update the data set of previously selected projects.

THE OPTION OF BROWSING THROUGH THE DISTRICT SELECTIONS

In this option the user of the program is able to display the projects selected by each district, one district at a time, in the computer's video terminal. The projects are displayed, one at a time, in a tabular format, with the appropriate information displayed in the fields. After browsing through the district selected projects on the screen, the state level decision maker is able to print the list of district selected projects. Sample of the output for this option is included in Table A.9 in Appendix A. The computer's screen looks like Fig 4.13 when running this option.

THE OPTION OF ADDING OR DELETING PROJECTS TO THE DISTRICT SELECTIONS

Two sub-options are available within this option of the program, both work on a district by district basis. In the first case there is a list of projects, in SAS data set format, available from the districts selections and stored

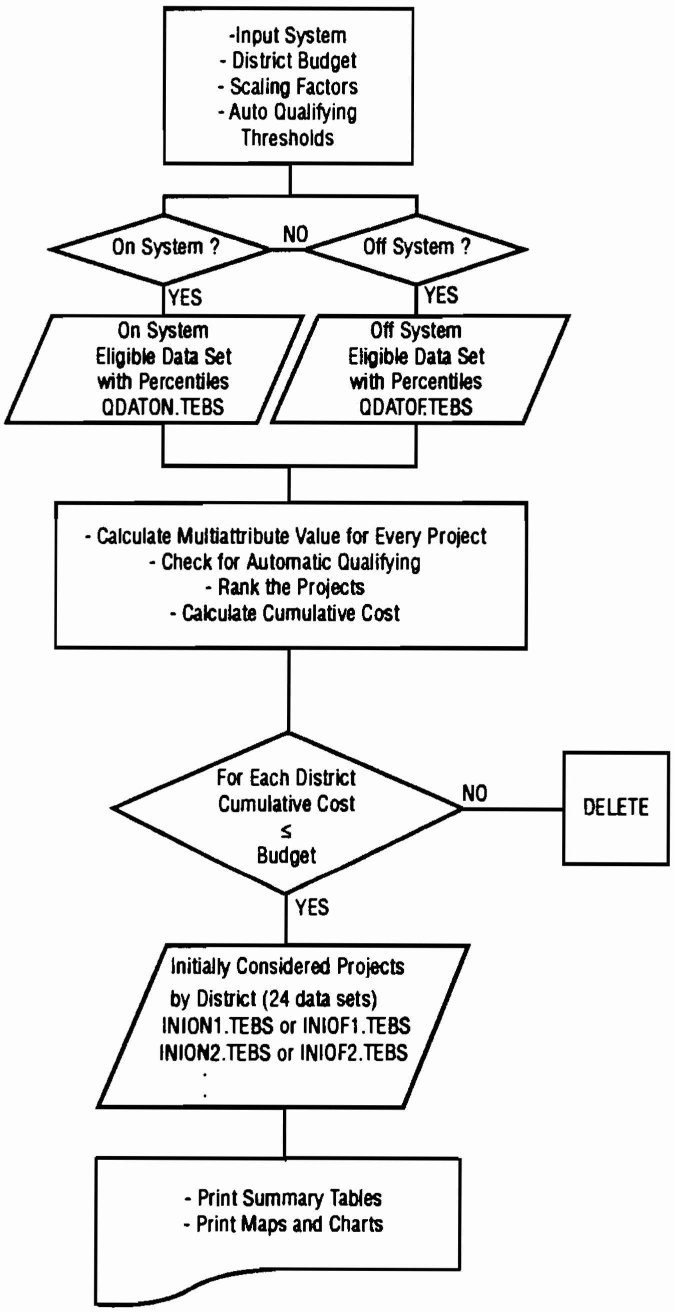

Fig 4.8. Flowchart for the program INICO.

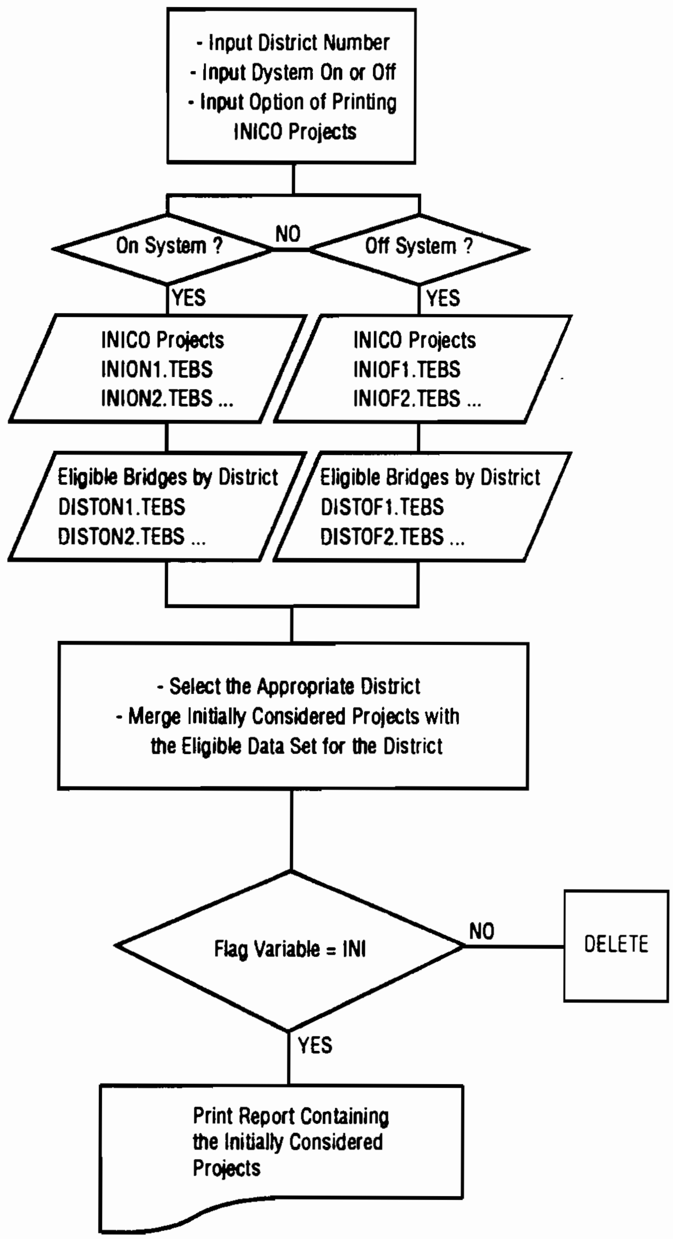

Fig 4.9. The option of printing the initially considered projects.

in the computer system. In this case the state level decision maker is able to add or delete projects to the existing selection via computer terminal screens. When each district selected project is displayed in the screen a command allows the user to delete it, if a desire exists to add projects to the district selection, a command allows the user to get a fresh screen, with nothing included in the project fields. A project can be added by filling only the BRID field, when adding projects the computer screen will look as in Fig 4.14.

In the second case, where a district selection is not available, the state level decision maker has the option of building the list for the district from scratch, by using a special option within FINAL and adding BRID numbers to screens similar to the one depicted in Fig 4.14.

In both cases the State level decision maker gets a printout of the results of the modifications made to the district's selection as of the last run, sample of this output is included in Table A.10. These option can be run as many times as desired by the State level decision maker, until the selected list for each district is satisfactory. In this process the State level decision maker is encouraged to exchange information with the district level engineers to get their input again for the final selection process.

ASSEMBLING THE FINAL STATEWIDE LIST OF PROJECTS FOR ALL DISTRICTS

This option is used when the selections for all the districts are already established, with the aid of the previous options of the program. The task accomplished by this option is to merge together all the final district project selections, into a final statewide project selection list to be submitted for bidding and contracting. This is accomplished by inputting to the program the districts which have projects included in the final statewide selection list. The interactive screen for this option is depicted in Fig 4.15.

A statewide project selection list is printed for this option, by district,for which a sample is included in Table A.12.

UPDATING THE DATA SET OF PREVIOUSLY SELECTED PROJECTS

The last option available in the program FINAL is to update the previously selected projects set. It is recommended that the user only makes use of this option when absolutely sure that the list submitted for bidding and contracting is not going to be modified further. The program gives a last chance for the user to make up his mind

TABLE 4.7. FEDERALLY ELIGIBLE PROJECTS FOR DISTRICT 16 RANKED WITH DISTRICT CRITERIA, PARTIAL LIST

Bridge Identification Number	Auto Qualified	Multi-Attribute Value	Cost of Proposed Improvement	Accumulated Cost
089-1958-01-001	District Selected	15.4	$86,000	$86,000
089-2342-01-001	District Selected	14.4	$51,000	$137,000
013-2024-01-003	District Selected	11.2	$85,000	$222,000
205-0994-01-001	Auto Qualified	51.6	$60,000	$282,000
129-0100-12-052	Auto Qualified	43.4	$23,000	$305,000
178-0102-01-030		75.6	$26,000	$331,000
178-0989-02-003		74.2	$38,000	$369,000
178-0989-02-004		73.4	$53,000	$422,000
178-0102-01-003		72.4	$58,000	$480,000
205-1052-03-029		72.0	$18,000	$498,000
126-0086-11-028		71.2	$70,000	$568,000
178-1088-03-002		70.6	$40,000	$608,000
178-0989-02-008		70.2	$66,000	$674,000
178-1052-01-024		70.0	$45,000	$719,000
178-0101-06-033		68.6	$11,969,000	$12,688,000
178-0989-02-005		68.4	$32,000	$12,720,000
149-0542-06-015		66.2	$70,000	$12,790,000
129-0100-06-073		66.0	$48,000	$12,838,000
178-1052-01-025		66.0	$126,000	$12,964,000
178-1052-01-026		65.4	$808,000	$13,772,000
178-1052-01-036		64.8	$18,000	$13,790,000
196-0371-03-031		64.6	$36,000	$13,826,000
178-0989-02-002		64.4	$18,000	$13,844,000
126-0255-01-026		64.2	$31,000	$13,875,000

after this option is run. This is accomplished by creating a back up of the file that contains the previously selected projects. After this option is run the previously selected list of projects will be updated and the system is ready for a new budget allocation, closing the loop depicted in Fig 4.1. The user is able to check and modify the status of the previously selected projects data set by using the utility program PREV, that was described at the beginning of this chapter

A manual for the operation of the FINAL state level computer program is included in Appendix A, the listing of the source code is included in Appendix B.

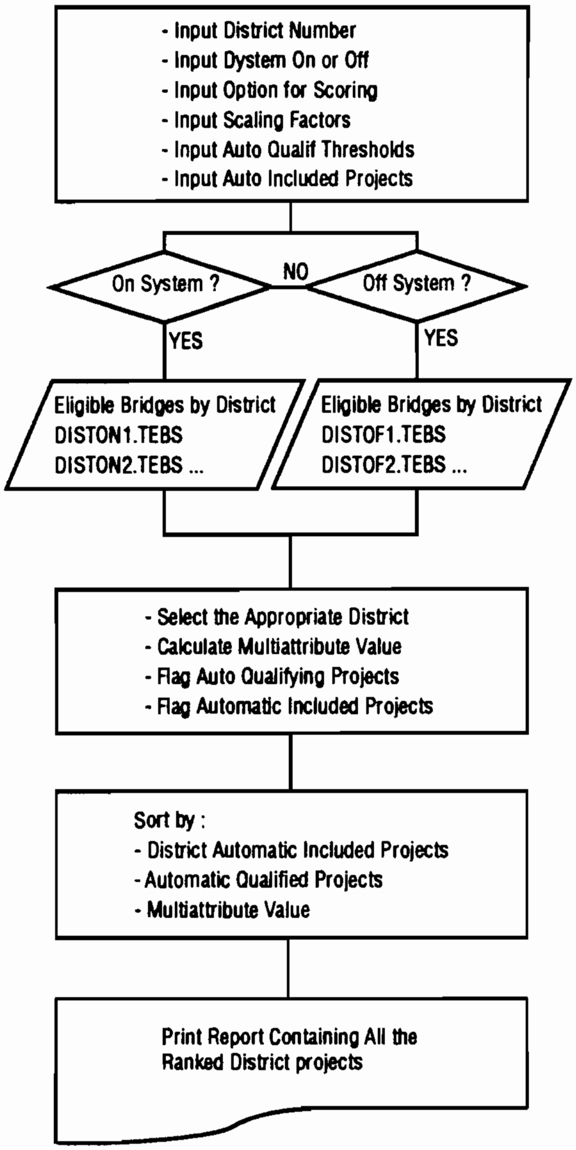

Fig 4.10. Flowchart for the option of ranking the district's elgible projects.

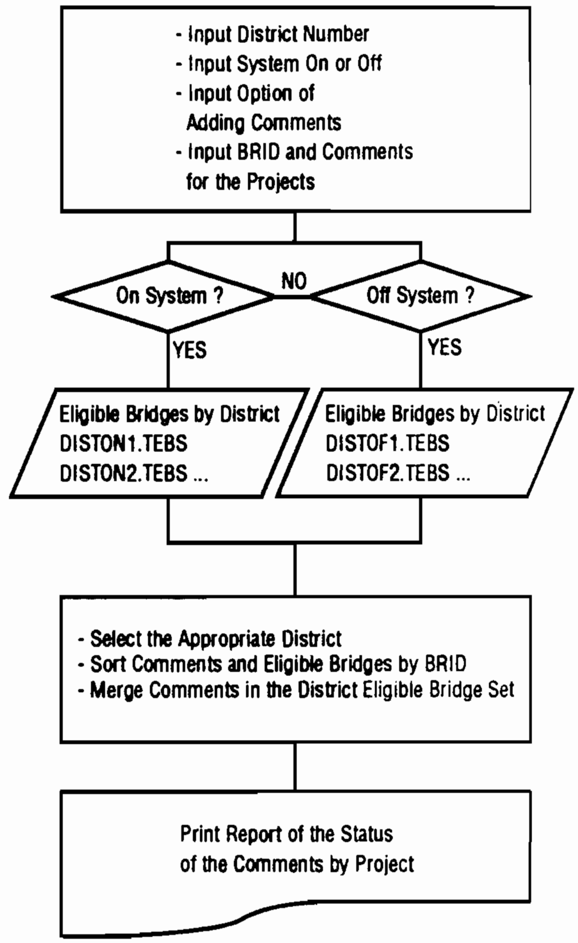

Fig 4.11. Flowchart for the option of adding comments to the projects.

SUMMARY

A Bridge Management Module for the statewide selection of projects for rehabilitation and replacement funding was presented in this chapter. This system can be processed with both mainframe and PC computers and takes into account both statewide and district criteria. It is designed to be user friendly and the user is prompted with screens in an interactive fashion. The district level reporting module is designed to run in batch mode because of computer processing restrictions at the Texas SDHPT. The conversion of this program to interactive screen inputs, however, is a simple task to be performed, hardware permitting and if so desired by the users.

TABLE 4.8. FORMAT OF THE SAS DATA SET THAT CONTAINTS THE PROJECTS SELECTED BY A DISTRICT AND FORWARDED TO THE STATE LEVEL (FOR DISTRICT 16)

Observation	Bridge Identification Number	Flag Variable	District Priority
1	089-1958-01-001	DISEL	1
2	089-2342-01-001	DISEL	2
3	013-2024-01-003	DISEL	3
4	205-0994-01-001	DISEL	4
5	129-0100-12-052	DISEL	5
6	178-0102-01-030	DISEL	6
7	178-0989-02-003	DISEL	7
8	178-0989-02-004	DISEL	8
9	178-0102-01-003	DISEL	9
10	205-1052-03-029	DISEL	10
11	126-0086-11-028	DISEL	11
12	178-1088-03-002	DISEL	12
13	178-0989-02-008	DISEL	13
14	178-1052-01-024	DISEL	14
15	178-0101-06-033	DISEL	15
16	178-0989-02-005	DISEL	16
17	149-0542-06-015	DISEL	17
18	129-0100-06-073	DISEL	18
19	178-1052-01-025	DISEL	19
20	196-0371-03-031	DISEL	20
21	178-0989-02-002	DISEL	21
22	126-0255-01-026	DISEL	22
23	178-1742-01-002	DISEL	23
24	004-0507-04-007	DISEL	24
25	178-1093-01-004	DISEL	25
26	178-1069-01-004	DISEL	26
27	196-0371-02-023	DISEL	27

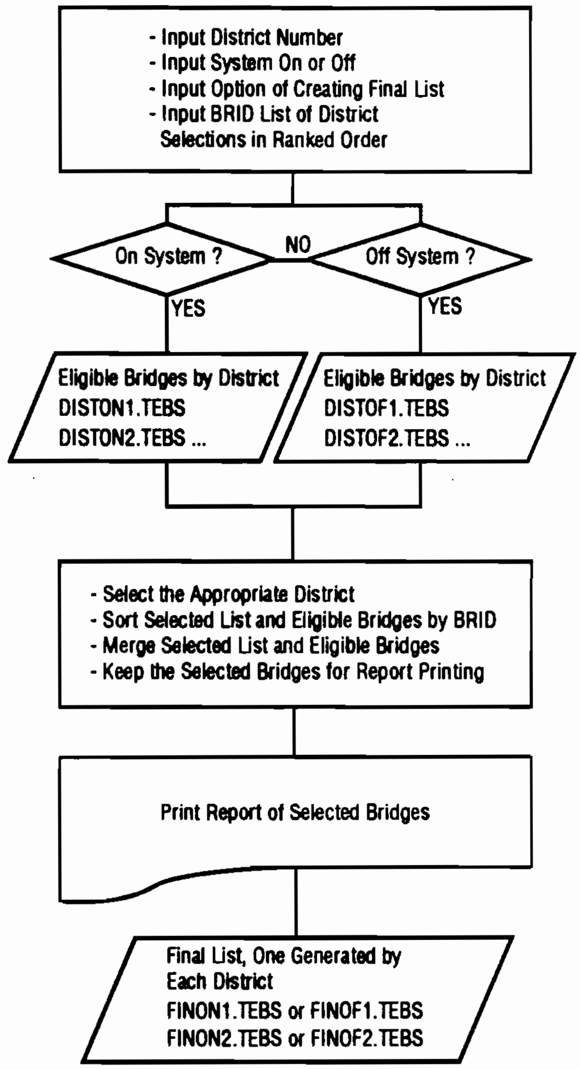

Fig 4.12. Flowchart for forwarding the district selected list to the state level of the system.

```
Command===>
======THIS IS THE DISTRICT LEVEL SELECTION OF PROJECTS===========
DATA FOR STRUCTURE WITH BRID= 089-1958-01-001  DISTRICT= 16
COUNTY: GOULIAD  BRIDGE: CABEZA CREEK        8506
               LOCATION
===================================   DECK: 7     ROADWAY WIDTH
|ATTR|    VALUE        |PERCENTILES|   SUB: 7     EXISTING: 23.3
|====|================|===========|  SUPER: 8     PROPOSED:   28
|CPV |          $4,095 |          1 |
|ADT |              21 |          0 |
|SR  |              80 |          1 |
|BWR |           0.832 |         29 | DETOUR LENGTH: 14
|DSS |               7 |         46 |
|====|================|===========| COST: $86,000

  TYPE OF WORK: REHABILITATE BRIDGE & APPROACHES
 ===================DISTRICT INPUT================================

 DISTRICT PRIORITY: 1

COMMENTS: ________________________________________________________
```

Fig 4.13. Computer screen for the option of browsing through the district's selection.

```
Command===>
-=THIS SCREEN ALLOWS YOU TO ADD PROJECTS BY THE BRID OR DELETE THEM=
DATA FOR STRUCTURE WITH BRID= _______________  DISTRICT= __
COUNTY: ____________  BRIDGE: ___________________________________
                       LOCATION
 ===================================   DECK: ___     ROADWAY WIDTH
 |ATTR|    VALUE        |PERCENTILES| SUB: ___     EXISTING: ____
 |====|================|===========| SUPER: ___    PROPOSED: ____
 |CPV | ______________ | _______   |
 |ADT | ______________ | _______   |
 |SR  | ______________ | _______   |
 |BWR | ______________ | _______   |      DETOUR LENGTH: _____
 |DSS | ______________ | _______   |
 |====|================|===========|      COST: _______________

 TYPE OF WORK: ________________________________
==================DISTRICT INPUT===============================

DISTRICT PRIORITY: ____

COMMENTS: ___________________________________________________
```

Fig 4.14. Computer screen for adding a project to the district's selection.

```
Command===>
IN THIS SCREEN THE USER SHOULD INPUT YES FOR THE DISTRICTS THAT
HAVE PROJECTS INCLUDED IN THE FINAL SELECTION LIST. FOR THE ONES
THAT DO NOT HAVE ANY PROJECTS SELECTED THE USER SHOULD INPUT NO
||=====|========||=====|========||=====|========||=====|========||
||DISTR|INCLUDE?||DISTR|INCLUDE?||DISTR|INCLUDE?||DISTR|INCLUDE?||
||=====|========||=====|========||=====|========||=====|========||
||  1  |  YES   ||  8  |  YES   || 15  |  YES   || 23  |  YES   ||
||=====|========||=====|========||=====|========||=====|========||
||  2  |  YES   ||  9  |  YES   || 16  |  YES   || 24  |  YES   ||
||=====|========||=====|========||=====|========||=====|========||
||  3  |  YES   || 10  |  YES   || 17  |  YES   || 25  |  YES   ||
||=====|========||=====|========||=====|========||=====|========||
||  4  |  YES   || 11  |  YES   || 18  |  YES   ||
||=====|========||=====|========||=====|========||  THIS SELECTION
||  5  |  YES   || 12  |  YES   || 19  |  YES   ||     IS FOR
||=====|========||=====|========||=====|========||       THE
||  6  |  YES   || 13  |  YES   || 20  |  YES   ||
||=====|========||=====|========||=====|========||     1988-1992
||  7  |  YES   || 14  |  YES   || 21  |  YES   ||
||=====|========||=====|========||=====|========||      PROGRAM
```

Fig 4.15. Inputting the districts that have selected projects.

CHAPTER 5. SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

SUMMARY

A two-level closed-loop computer system developed to assist Texas SDHPT decision-makers in developing effective bridge rehabilitation and replacement budget allocations and project selections using multi-objective decision criteria has been described. The first level addresses the concerns of the officials at central headquarters, while the second level captures local engineering knowledge at the district level and incorporates it into the overall evaluation. The system was successfully used in the allocation of the last Texas state bridge rehabilitation and replacement budget. It has a user-friendly screen-driven interface and is designed to be run on either mainframe or personal computers. The programming language employed, SAS, permits easy modifications and updates to the system. It also allows great flexibility in the modification of existing report formats and generation of extra reports required by the decision-makers.

CONCLUSIONS

PERCENTILE SCALING

The proposed percentile scaling process is a simple yet powerful technique. It is self-adaptive and able to capture the dynamic nature of the bridge selection problem. This means that if, for example, changes occur in the traffic distribution in the population of structures under analysis, they would be reflected in the values of the percentiles for the attributes Average Daily Traffic (ADT), Bridge Width Ratio (BWR), and Cost Per Vehicle (CPV) for each project. The ability to adapt to new frequency distributions for a particular attribute extends to all other attributes. As an example, if funding is undertaken, or deterioration occurs, the consequences would be reflected in the percentile scaling values of the attributes Sufficiency Rating (SR), Minimum of the Deck Substructure Superstructure condition ratings (DSS), and Bridge Width Ratio (BWR). These are important qualities of the percentile scaling method and add to the appeal of the proposed system.

SCALING FACTORS

The methodology, described in Chapter 3, for determining the scaling factors used in the weighted average technique allows the decision maker's preferences to be included in the process. This is an improvement over the direct assessment procedures used by many other States, when using the deficiency points calculation procedures described in Chapter 2.

MONITOR PREVIOUSLY SELECTED PROJECTS

The incorporation of a previously selected projects database is an appealing feature of the system. It covers the gap between the point at which a structure is selected for improvements and the point at which the structure is deleted from the State-maintained BRINSAP database. The tasks of

(1) deleting previously selected projects,
(2) updating the previously selected projects database as projects are deleted from BRINSAP, and
(3) including the most recent selected projects in the previously selected projects database

are performed automatically by the proposed system.

STATEWIDE CRITERIA FOR DISTRICT BUDGET ALLOCATIONS

Statewide criteria are applied to the allocation of the available budget. The results can be adjusted by the users of the system through user inputs, adding flexibility to the process.

DISTRICT-LEVEL CLOSED-LOOP FEATURE

The district-level closed-loop feature is very important for the performance of the overall system. District level staff—engineers and planners—have the closest contact with the physical structures, and are in a good position to contribute additional information about bridges that have only basic records in the central database. They are also the ones best able to input data on secondary attributes not included in the basic system, and their participation in the decision-making process therefore enhances program efficiency and effectiveness. Regional knowledge of the importance and condition of the district bridge infrastructure is relayed through computer terminals and therefore permits interaction with personnel at the State headquarters. These procedures are made possible by a district-level reporting program that permits the district engineers to

(1) rank the bridges within the district using their own preference structure,
(2) add comments to the selected and non selected projects, and
(3) forward district selections to the State level of the system.

THE STATE-LEVEL REPORTING PROGRAM

A State-level reporting program allows the State-level decision-maker to perform the final adjustments to the districts selections before assembling the final selection list. The district-by-district processing, via interactive screens, of the district selections, allows the State-level decision-maker to add or delete projects to the district chosen list, adding flexibility to the system.

INCLUSION OF NEW ATTRIBUTES

It is easy to include new attributes in the decision process due to the modular nature of the proposed system. The powerful database manipulation and descriptive statistical procedures of the chosen programming language, SAS, eases these update.procedures.

RELATION TO BRIDGE MANAGEMENT SYSTEMS

The system is a good starting point for developing and subsequently implementing some form of bridge management system (BMS). It would be best positioned as a module in an overall system which would allow the decision-maker to analyze the impact of his decisions in a specific time frame. A full BMS would cover the statewide organization of bridge planning, design, construction, maintenance, evaluation, and research together with interaction with other infrastructure management systems such as those for pavements (Ref 8).

THE PROPOSED SYSTEM CAN BE USED BY OTHER STATES

Although the considerable size of the Texas bridge infrastructure creates special problems, the basic system design and common database can be used by states with small or intermediate sized bridge networks. This is made possible because the system relies on data extracted from the National Bridge Inventory (NBI), which is standardized by the FHWA nationwide. The flexibility of the SAS programming language makes adaptations to tailor the system for a different State particularly easy to accomplish.

RECOMMENDATIONS FOR FUTURE RESEARCH

ESTABLISH LEVELS OF SERVICE GOALS FOR TEXAS

Research efforts should be directed at determining acceptable levels of service goals for the bridges in Texas. These efforts should address the impacts on the user of load posted bridges by establishing, via a vehicle weight survey, the bridge capacity goals associated with the functional classification of the road. This approach would be similar to the one adopted by North Carolina (Ref 12) and described in Chapter 2. The established bridge capacity goals would address the concerns of Texas SDHPT officials with the mail and school bus routes. The results of the research for establishing levels of service goals for the Texas bridges should be used to create new bridge selection attributes and these implemented in the proposed system.

GROUP DECISION-MAKING PROCESSES

Some effort should be invested in investigating group decision-making processes that would enhance the present system. Methods such as Delphi panels could be used to access the group value functions. Value functions for a single decision-maker were proposed in Chapter 3 for determining the scaling factors used in the weighted average technique. The use of group value functions would represent an enhancement of the proposed solution.

LIFE-CYCLE COST ANALYSIS

Life-cycle cost analysis procedures should be investigated for use at both the project and network levels. These procedures would contribute towards the goal of implementing comprehensive BMS activities. To allow this kind of analysis, the relationship between the predicted deterioration curves for the fulfillment of different level of service goals for a bridge, needs to be related to the life-cycle cost profile (LCCP) as depicted in Fig 5.1.

At the project level, these results can be used to make a capital budgeting analysis (Ref 24) to determine whether it is cost-effective to either rehabilitate or replace a particular deficient bridge.

At the network level, the life-cycle cost profiles, on a project-by-project basis, can be used in a planning approach to determine future funding needs (Ref 11) for the entire bridge population. A flowchart for this network application is depicted in Fig 5.2.

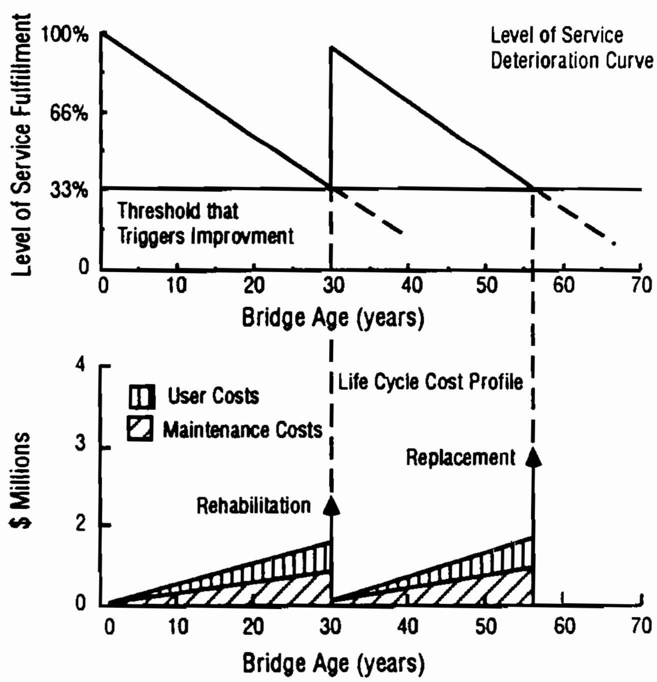

Fig 5.1. Life cycle cost profile (LCCP) as affected by deterioration curve for one of the bridge goals.

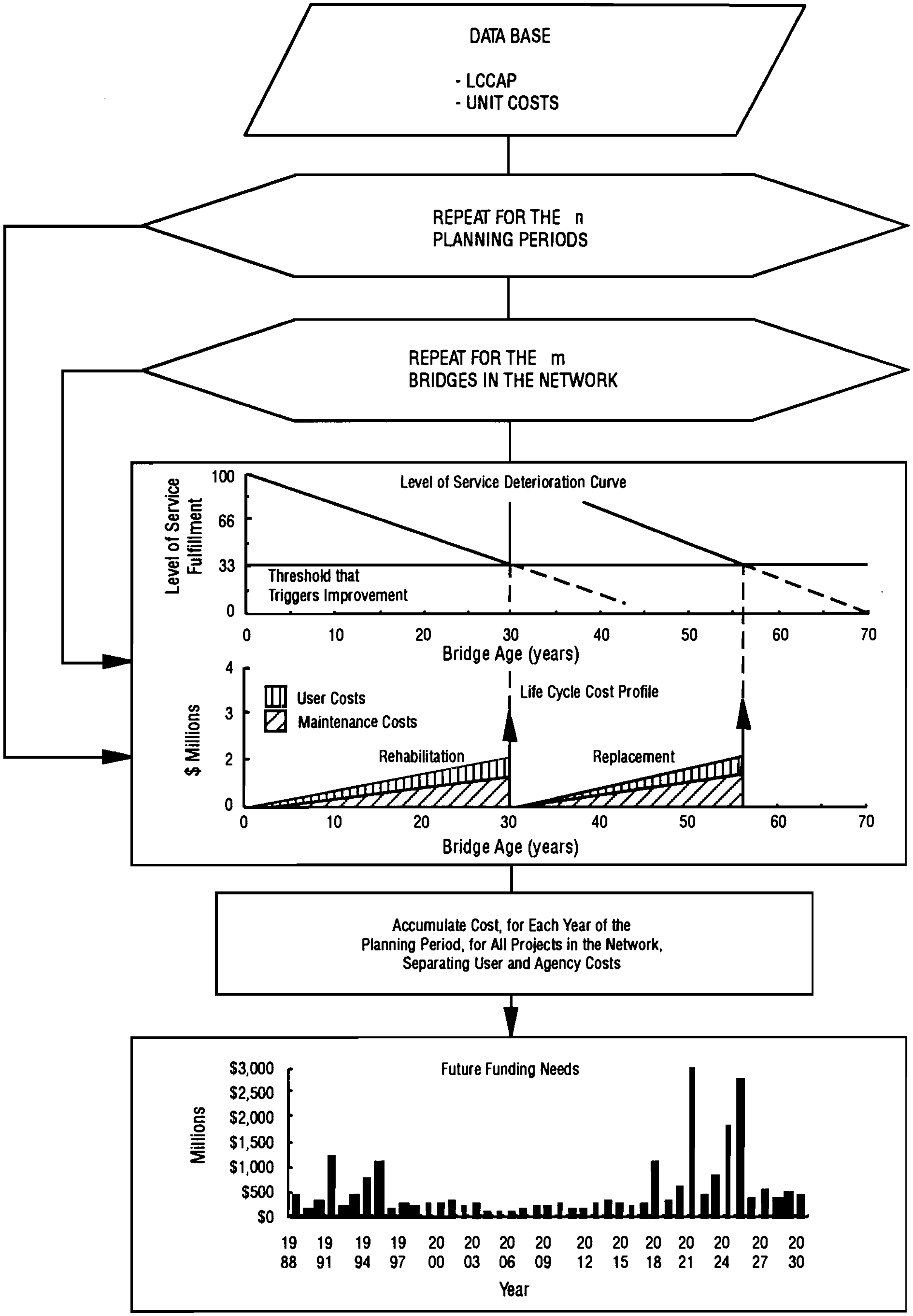

Fig 5.2. Planning application at the network level using LCCP.

This approach would allow better forecasts than the ones obtained with the simplified approach presented in Chapter 1. The investment in research for the determination of bridge life cycle cost profiles will also allow benefit-cost analysis to be performed (Ref 15) at both project and network levels.

CLOSURE

A considerable need exists worldwide for improved bridge management techniques. It is expected that the proposed bridge project selection system will contribute to the rationalization of such bridge management activities as determining district budget allocations and bridge rehabilitation and replacement selections for a large state. The proposed system has been employed in the determination of the State of Texas budget allocation and project selections over the last two years. Finally, the proposed system is a significant step towards the implementation of bridge management techniques in the State of Texas.

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APPENDIX A
PROGRAM MANUALS

PROGRAM MANUALS:

INTRODUCTION

This appendix is designed to provide the user with operating manuals for the computer program modules that compose the TBSS (Texas Bridge Selection System). The flowchart of the TBSS system is depicted in Fig 4.1. This flowchart also depicts the order in which the components of the system need to be run. This precedence of one module over the other needs to be maintained throughout a loop over the system, due to the interchange of data between the computer modules.

This appendix covers both the mainframe and PC versions of the system. The main differences between the mainframe and the PC versions is in the way the BRINSAP data is stored and retrieved by the system. The differences are a function of the hard disk storage space available in the PC. For the PC version to be able to have access to the BRINSAP database, a text file of part of the attributes, for each bridge record, contained in the BRINSAP database, which is stored in the SDHPT's mainframe system, needs to be stored in the PC's hard disk. Each set of 10,000 bridge records will require about 1 megabyte of storage space in the PC's hard disk. This means that for storing both on and off systems, around five megabytes of storage space will be needed. Another solution for the availability of the BRINSAP database to the PC version of the system is to run the SURE computer program at the mainframe level and download the resulting SAS data sets to the PC via the SAS micro to host link. This sets, in each case, would include only the bridges eligible for federal funding. Once the BRINSAP data is made available to the PC version of the system, both systems operate in a similar way as far as the user interface is concerned.

Another major difference in the way both systems exchange information between the component computer modules is the exchange of information between the State Level programs and the District level reporting program. The results generated by the Sate level computer programs need to be forwarded to the districts. This process is done automatically in the mainframe version, through the ROSCOE operating system available at the SDHPT. In the case of the PC version, the process needs to be carried out either via diskettes, or via binary modem transfers of the SAS data sets needed at the district level.

All the commands typed in the command line of the screen interactive programs must be followed by a carriage return key strike in order to be processed by the system. The interactive screens are not part of the source code of the component programs and must be generated with the help of the PROC FSEDIT procedure of the SAS system, for both micro and mainframe based systems.

THE PROGRAM SURE

The objective of the program SURE, Sufficiency Rating Evaluator is to read the data of the BRINSAP data base and create two output SAS data sets which contain the on- and the off-systems eligible bridges. It needs to be run one time to generate the on-system eligible bridges, and a second time to generate the off-system eligible bridges. Every time the user needs to supply the subsequent modules, depicted in Fig 4.1, with updated information from the BRINSAP data base, a run of the SURE computer module is needed. For more details refer to the chapter 4 where the components of the overall system are described. The two data sets that are created by the program are namely ELIGON.TEBS and ELIGOF.TEBS.

The program SURE is run in the same way that is used to submit a usual processing job to the computer system in use. Once the job is submitted, screens will pop-up in the terminal's video, prompting the user for inputs. The first screen, presented in Fig. A.1., describes briefly what are the features of the program and should be accepted by typing END in the command line followed by the return key.

```
Command ===>


   THIS IS THE FIRST PROGRAM OF THE SYSTEM FOR SELECTION OF
   BRIDGE PROJECTS FOR REHABILITATION AND REPLACEMENT. IT
   NEEDS DATA FROM THE BRINSAP DATABASE.IT GENERATES SAS
   DATA SETS OF THE BRIDGES ELIGIBLE FOR FEDERAL FUNDING
   ELIGON.TEBS FOR THE ON SYSTEM, AND ELIGOF.TEBS FOR THE
   OFF SYSTEM. THIS PROGRAM GENERATES DATA FOR THE NEXT
   MODULES IN THE SYSTEM.
```

Fig A.1. Initial screen for the program SURE

The next screen that will appear after a few seconds of processing time, asks whether the run is for the on or the off system, see Fig. A.2. The default selection that appears in the screen is for the on system, if there is a desire to modify this default selection for the off system, the cursor has to be placed in the appropriate field and the selection modifyed, by typing the word OFF for the off system over the existing selection. Use the arrow keys to move the cursor around the screen and make the suitable modifications. After the appropriate system selection is made, accept the screen by typing END in the command line, followed by return.

```
Command ===>

        THIS RUN IS FOR THE ON OR FOR THE OFF SYSTEM?

        POSSSIBLE ANSWERS ON,OFF ANS: ___
```

Fig A.2. Screen for choosing the correct system for the program SURE

After some processing time the system prompt will appear meaning that the program has finished running. SURE generated the SAS data set either for the on or for the off systems, named ELIGON or ELIGOFF respectively. After this module is run successfully it is possible to proceed to the subsequent modules.

THE PROGRAM FREQ

The module that follows the program SURE in the TEBS system is the program FREQ, for Frequencies, it is used to calculate the frequency distributions of the attributes involved in the decision model, as described in chapter 3. It merges these frequency distribution data in the eligible set generated by SURE. It also prepares other SAS data sets to be used by the following modules. It needs the data set that contains the eligible bridges generated by the program SURE. Depending if the on or the off system is under processing, either ELIGOF.TEBS or ELIGON.TEBS will be required. A data set containing the structures selected in previous funding programs is also needed, so that the FREQ program deletes them from further consideration. The previously selected data sets are namely PREVION.TEBS for the on system and PREVIOFF.TEBS for the off system.

Submit the program for processing in the usual way used for processing SAS jobs in the micro or mainframe computer available for use. The use of the program is oriented by screens that pop-up in the video terminal. The first screen describes briefly the features of the FREQ computer program. It should be accepted by typing END followed by return in the command line. The initial screen for FREQ is depicted in Fig A.3..

```
Command ===>

THIS IS THE FREQ MODULE. IT IS DESIGNED TO CALCULATE
THE FREQUENCY DISTRIBUTIONS OF THE ATTRIBUTES USED IN THE DDF
INICO AND DISTRICT LEVEL MODULES. THE ELEGIBLE BRIDGES WERE
GENERATED BY THE SURE PROGRAM AT THIS POINT. THE PROGRAM
AUTOMATICALLY ASKS FOR SAS DATA SETS THAT INCLUDE THE
PREVIOUSLY SELECTED STRUCTURES THAT ARE STILL UNDER BIDING
AND CONTRACTING PROCESS. IT DELETES THEM BEFORE CALCULATING
THE FREQUENCIES. IT GENERATES A SUMMARY TABLE OF THE ELIGIBLE
BRIDGES BEING CONSIDERED BY DISTRICT AFTER THE DELETION OF THE
PREVIOUSLY SELECTED PROJECTS. IT GENERATES DATA SETS WITH
ELIGIBLE STRUCTURES AND FREQUENCIES FOR DISTRICT USE. FOR MORE
DETAILS CONSULT RESEARCH REPORT 439-4.
```

Fig A.3. Initial screen for the program FREQ

The next screen, Fig A.4., will present a choice for either the on or off systems, please answer the question displayed by filing the field with the appropriate system typing ON or OFF. Type END in the command line followed by the return key to proceed.

```
Command ===>

THIS RUN IS FOR THE ON OR FOR THE OFF SYSTEM ?

POSSIBLE ANSWERS ON OR OFF.     ANSWER: ________
```

Fig A.4. Selection of the appropriate system for the program FREQ

Depending of the previous choice being for the on system, another screen will pop up asking if the 8000 series of bridges are to be deleted from further consideration. The 8000 series of bridges are characterized by the fact that this structures are located within urban areas. The screen prompt for this situation is depicted in Fig A.5. Answer the question and accept the screen, as usual, by typing END followed by the return key in the command line.

```
Command ===>

THIS ALLOWS THE USER TO EXCLUDE FROM FURTHER CONSIDERATION
THE STRUCTURES FROM THE 8000 SERIES.

   DO YOU WHANT TO EXCLUDE THE 8000 SERIES FROM THE
   SELECTION PROCESS ? POSSIBLE ANSWERS YES OR NO

            ANSWER: ___
```

Fig A.5. Screen for excluding the 8000 series from further consideration

After this last screen prompt the program takes a fair amount of time to process, due to the fact that it has to sort and merge the percentile scaling factors and frequency tables for the five attributes used in the decision process. The final product of this program are SAS data sets, QDATON.TEBS and QDATOF.TEBS, which contain statewide information that is needed by the subsequent modules. It also subsets the eligible data, containing the percentiles, in SAS data sets for each district. At the end of the run twenty four data sets will be available, one for every district. The program generates a summary table of all the eligible bridges by district and the cost associated in their repair, this output is presented in Table A.1. It also prints percentile scaling tables for all the attributes. A partial printout of such a table is presented in Table A.2.

TABLE A.1. PRINTOUT FOR THE PROGRAM FREQ

1 SAS 11:25 THURSDAY, AUGUST 10, 1989 1

ON -STATE SYSTEM FEDERAL AID BRIDGE REPLACEMENT
AND REHABILITATION PROGRAM
ELIGIBLE BRIDGES PER DISTRICT STATISTICS

ELIGIBLE BRIDGES AND COST			
DISTRICT	N	COST	%
1	344	$51,928,000	9.07
2	148	$43,085,000	7.52
3	63	$11,915,000	2.08
4	11	$3,667,000	0.64
5	13	$5,670,000	0.99
6	1	$220,000	0.04
7	23	$5,762,000	1.01
8	74	$14,053,000	2.45
9	92	$32,218,000	5.62
10	143	$17,820,000	3.11
11	80	$15,060,000	2.63
12	120	$35,057,000	6.12
13	100	$18,923,000	3.30
14	80	$14,653,000	2.56
15	118	$32,192,300	5.62
16	204	$41,623,000	7.27
17	49	$13,770,000	2.40
18	506	$123,736,000	21.60
19	99	$20,128,000	3.51
20	134	$49,912,000	8.71
21	15	$2,946,000	0.51
23	11	$468,000	0.08
24	16	$7,526,000	1.31
25	38	$10,436,000	1.82
TOTALS	2482	$572,768,300	100.00

TABLE A.2. PRINTOUT FOR THE PROGRAM FREQ

1 THESE ARE THE TABLES OF THE FREQUENCY PERCENTILES FOR THE ATTRIBUTES 39

11:25 THURSDAY, AUGUST 10, 1989

OBS	SR	COUNT	PERCENT	SRPTL
1	2	4	0.16116	100
2	3	1	0.04029	100
3	5	4	0.16116	100
4	6	3	0.12087	100
5	7	2	0.08058	100
6	8	3	0.12087	99
7	9	3	0.12087	99
8	10	2	0.08058	99
9	12	2	0.08058	99
10	13	4	0.16116	99
11	14	1	0.04029	99
12	15	1	0.04029	99
13	16	2	0.08058	99
14	17	5	0.20145	99
15	18	1	0.04029	99
16	19	3	0.12087	98
17	20	7	0.28203	98
18	21	4	0.16116	98
19	22	5	0.20145	98
20	23	5	0.20145	98
21	24	4	0.16116	98
22	25	1	0.04029	97
23	26	4	0.16116	97
24	27	5	0.20145	97
25	28	9	0.36261	97
26	29	7	0.28203	97
27	30	4	0.16116	96
28	31	7	0.28203	96
29	32	5	0.20145	96
30	33	9	0.36261	96
31	34	7	0.28203	95
32	35	9	0.36261	95
33	36	10	0.40290	95
34	37	13	0.52377	94
35	38	20	0.80580	94
36	39	15	0.60435	93
37	40	12	0.48348	92
38	41	12	0.48348	92
39	42	18	0.72522	91
40	43	10	0.40290	91
41	44	13	0.52377	90
42	45	11	0.44319	90
43	46	13	0.52377	89
44	47	23	0.92667	89
45	48	41	1.65189	88
46	49	68	2.73973	86
47	50	63	2.53828	83
48	51	43	1.73247	81
49	52	44	1.77276	79
50	53	48	1.93392	77
51	54	34	1.36986	75
52	55	36	1.45044	74
53	56	40	1.61160	73
54	57	55	2.21595	71
55	58	55	2.21595	69

TABLE A.2. (continued)

OBS	SR	COUNT	PERCENT	SRPTL
56	59	57	2.29654	67
57	60	65	2.61886	64
58	61	77	3.10234	62
59	62	92	3.70669	59
60	63	93	3.74698	55
61	64	69	2.78002	51
62	65	64	2.57857	48
63	66	65	2.61886	46
64	67	72	2.90089	43
65	68	59	2.37712	40
66	69	72	2.90089	38
67	70	62	2.49799	35
68	71	87	3.50524	32
69	72	131	5.27800	29
70	73	113	4.55278	24
71	74	102	4.10959	19
72	75	95	3.82756	15
73	76	70	2.82031	11
74	77	48	1.93392	8
75	78	75	3.02176	6
76	79	61	2.45770	3
77	80	23	0.92667	1

TABLE A.2. (continued)

OBS	DSS	COUNT	PERCENT	DSSPTL
1	0	74	2.9815	100
2	1	1	0.0403	97
3	2	10	0.4029	97
4	3	58	2.3368	97
5	4	359	14.4641	94
6	5	228	9.1861	80
7	6	608	24.4964	71
8	7	915	36.8654	46
9	8	221	8.9041	9
10	9	8	0.3223	0

THE PROGRAM DDF

The program DDF calculates distribution factors that are applied to a planned total statewide budget, in order to make apportionment of the available funds to the districts. The final result is a table of budget distribution factors and for seven possible sets of weights for the decision attributes. The first screen describes briefly the features of the program and is presented in Fig A.6.

```
Command ===>

THIS PROGRAM CALCULATES BUDGET DISTRIBUTION FACTORS USING
A WEIGHTED AVERAGE SCORING TECHNIQUE. CONSULT CTR RESEARCH
REPORT 439-4 FOR FURTHER INFORMATION.
   YOU SHOULD INITIALLY RUN THE SURE AND THE FREQ PROGRAMS TO
PREPARE DATA  NEEDED BY DDF.
   TYPE END ON THE COMMAND LINE TO PROCEED.
```

Fig A.6. Initial screen for the program DDF

Type END followed by the return key in the command line, as usual, to accept it and proceed to the next screen prompts.

The next screen asks the user whether the calculations that are going to follow are for the on- or for the off-systems. Fig A.7. shows the screen, where the choice between the on and the off systems must be made. In this screen the user is supposed to supply a planned budget to be distributed between the districts. The default value for this planned budget is $150,000,000 and any desired value can be specified. Use the arrow keys to move to the BUDGET field and modify it, if so desired. Make the selection for the appropriate system, ON or OFF, by modifying the ANSWER field, type END followed by the return key in the command line when satisfied with the selections.

```
Command ===>

INPUT THE EXPECTED BUDGET BY TYPING OVER THE EXISTING DEFAULT
VALUE (150,000,000). ANSWER THE QUESTION ABOUT WHAT SYSTEM IS
TO BE USED, ON OR OFF.TYPE 'END ' ON THE COMMAND LINE TO PROCEED
THE ANALYSIS.



                BUDGET:  $150,000,000

THIS RUN IS FOR WHICH SYSTEM, ON OR OFF? ANSWER: ON
```

Fig A.7. Budget and system selection for the program DDF

The next screen in the program DDF, Fig A.8., asks for the selection of the seven possible weight combinations to be used in the budget allocation process. The user can accept the default weights, or change them by using the arrow keys or the tab key to move around the screen, from field to field. After the correct selection of weights is depicted in the screen, type END followed by the return key in the command line to accept the selected weights.

Command ===>

METH!	WCPV !	WADT !	WSR !	WDSS !	WBWR !
1 !	0.20 !	0.20 !	0.20 !	0.20 !	0.20
2 !	0.20 !	0.15 !	0.25 !	0.20 !	0.20
3 !	0.15 !	0.15 !	0.25 !	0.25 !	0.20
4 !	0.15 !	0.10 !	0.25 !	0.25 !	0.25
5 !	0.10 !	0.10 !	0.30 !	0.25 !	0.25
6 !	0.10 !	0.05 !	0.30 !	0.30 !	0.25
7 !	0.05 !	0.05 !	0.30 !	0.30 !	0.30

Fig A.8. Selection of weights for the program DDF

The next screen allows for the selection of auto qualifying features to be used in the distribution of the planned budget. The default selection is the no consideration of the automatic qualifying features. If automatic qualification is desired, the answer to the question displayed in Fig A.9. needs to be changed to YES and a desired selection of auto qualifying thresholds should be selected. Leave the auto qualifying thresholds not to be used at their default blank values. For more details about the automatic qualification concept refer to chapter 3. Type END in the command line, followed by the return key when satisfied with the thresholds

```
Command ===>

 DO YOU WANT TO USE THE AUTO-QUALIFYING FEATURE? ANSWER: NO

      PROJECTS LESS OR EQUAL THAN  AQCPV: ____________

      PROJECTS MORE OR EQUAL THAN  AQADT: ____________

      PROJECTS LESS OR EQUAL THAN  AQSR:  ____________

      PROJECTS LESS OR EQUAL THAN  AQDSS: ____________

      PROJECTS LESS OR EQUAL THAN  AQBWR: ____________


                TYPE "END" ON THE COMMAND LINE TO CONTINUE.
```

Fig A.9. Selection of automatic qualification thresholds for the program DDF

This is the last screen for the program. The program will run for a while and will generate a line printer file containing tables for the distribution factors for each one of the seven selected methods. An allocation map and a allocation chart, by district, of an average of the seven methods is also stored in a graphics output file. The graphics and the line printer outputs should be routed to the appropriate printing and plotting devices, using the computer system commands. Sample of the output file is presented in Table A.3., sample of the graphics output is presented in Fig A.10. and Fig A.11.

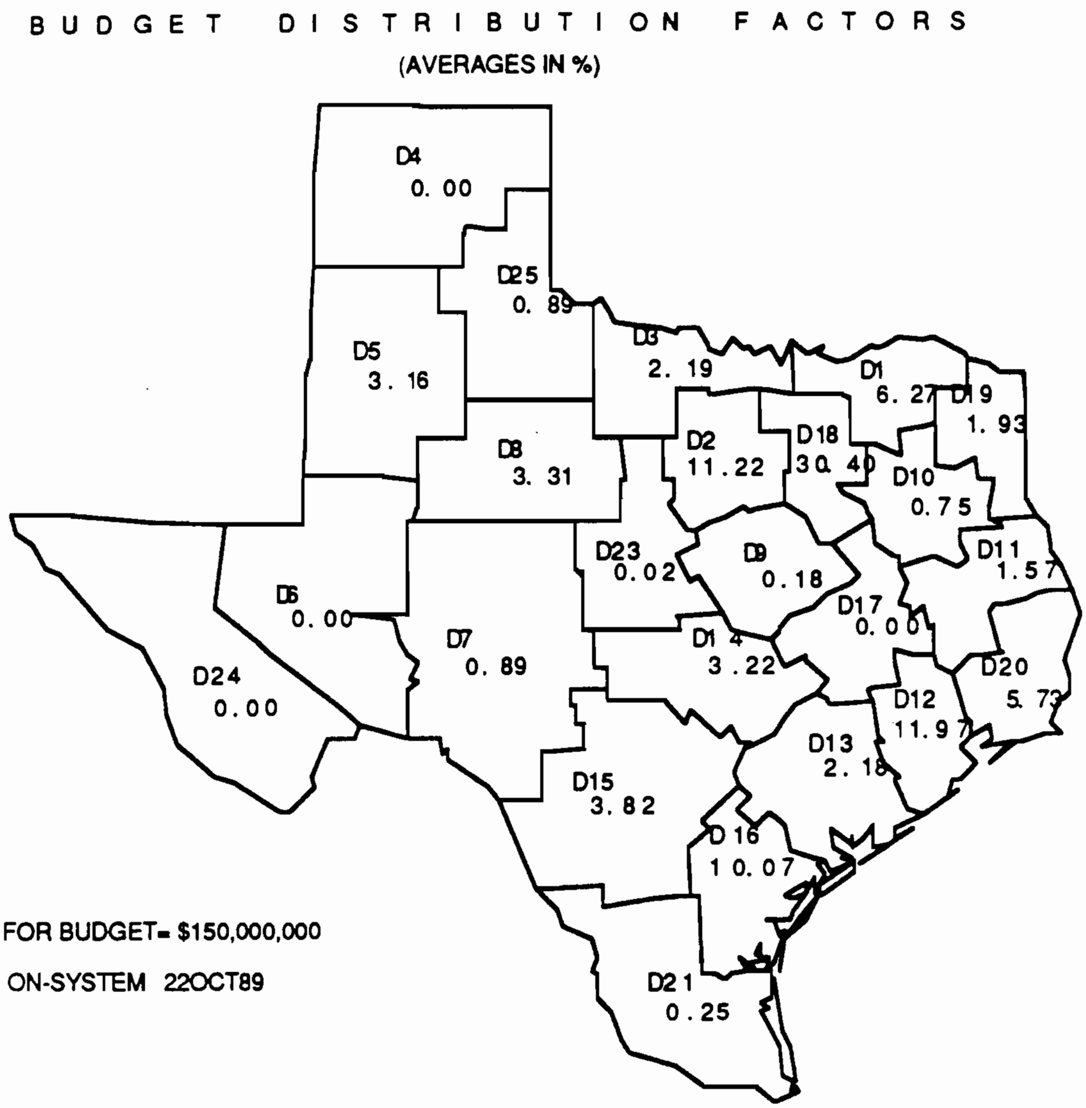


Fig A.10 Map generated by the program DDF

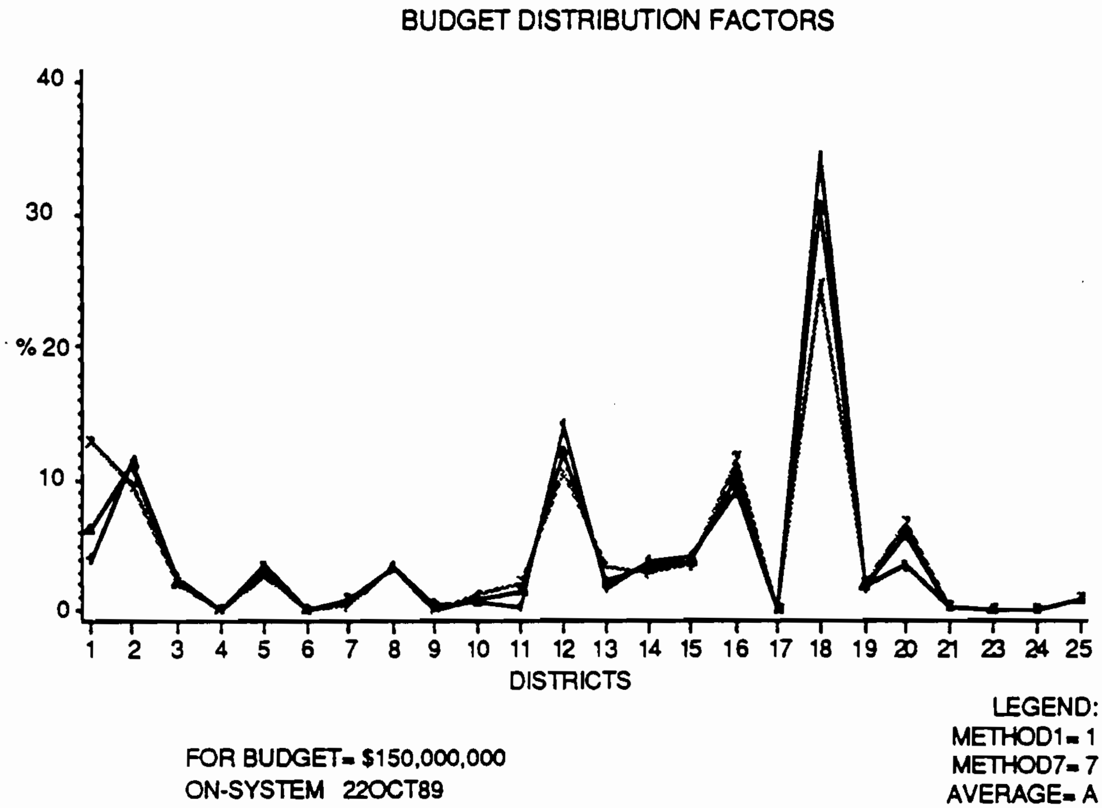


Fig A.11 Chart generated by the program DDF

TABLE A.3. PRINTOUT FOR THE PROGRAM DDF

WEIGHTS					
METHOD	CPV	ADT	SR	DSS	BWR
1	0.20	0.20	0.20	0.20	0.20
2	0.20	0.15	0.25	0.20	0.20
3	0.15	0.15	0.25	0.25	0.20
4	0.15	0.10	0.25	0.25	0.25
5	0.10	0.10	0.30	0.25	0.25
6	0.10	0.05	0.30	0.30	0.25
7	0.05	0.05	0.30	0.30	0.30
CPV = COST PER VEHICLE					
ADT = AVERAGE DAILY TRAFFIC					
SR = SUFFICIENCY RATING					
DSS = MINIMUM OF CONDITION RATINGS					
BWR = BRIDGE WIDTH RATIO					

AUTO QUALIFYING FEATURES USED :

CPV	M
ADT	M
SR	M
DSS	3
BWR	M

M = MISSING

TABLE A.3. (continued)

FOR BUDGET= $150,000,000 ON -SYSTEM

DISTRICT	M1	M2	M3	M4	M5	M6	M7	AVRG.
1	3.87	3.61	3.54	3.82	3.68	12.51	12.84	6.27
2	11.27	11.38	13.50	11.40	11.33	10.17	9.51	11.22
3	2.44	2.39	2.23	1.97	2.09	2.11	2.12	2.19
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	3.44	3.44	3.47	3.44	2.92	2.69	2.74	3.16
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7	0.90	1.07	1.08	0.90	0.95	0.88	0.43	0.89
8	3.36	3.36	3.20	3.18	3.46	3.31	3.30	3.31
9	0.42	0.16	0.09	0.26	0.10	0.09	0.10	0.18
10	0.72	0.75	0.64	0.66	0.69	0.67	1.12	0.75
11	0.32	0.37	2.02	2.01	2.19	2.03	2.05	1.57
12	13.86	13.63	12.18	11.85	11.51	10.32	10.43	11.97
13	1.79	1.79	2.00	2.02	2.12	2.17	3.35	2.18
14	3.67	3.68	2.89	3.34	3.12	2.88	2.94	3.22
15	4.16	4.30	3.82	3.84	3.69	3.52	3.37	3.82
16	9.04	9.39	9.65	9.57	10.27	11.21	11.37	10.07
17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18	34.33	33.17	32.15	31.26	31.76	25.57	24.52	30.40
19	1.83	1.83	1.85	2.01	2.00	1.96	2.00	1.93
20	3.44	4.52	4.52	7.33	6.90	6.76	6.63	5.73
21	0.24	0.24	0.24	0.24	0.26	0.24	0.25	0.25
23	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25	0.88	0.88	0.88	0.88	0.95	0.88	0.90	0.89

TABLE A.3. (continued)

FOR BUDGET= $150,000,000 ON -SYSTEM

	METHOD 1			AUTO-QUALIF. STATISTICS	
DISTRICT	N	SUM	%	N AQ	SUM AQ
1	40	$5,792,000	3.87	21	$3,455,000
2	53	$16,883,000	11.27	4	$7,295,000
3	21	$3,649,000	2.44	9	$270,000
4	0	$0	0.00	0	$0
5	11	$5,152,000	3.44	9	$4,016,000
6	0	$0	0.00	0	$0
7	3	$1,344,000	0.90	0	$0
8	15	$5,041,000	3.36	10	$4,241,000
9	3	$626,000	0.42	0	$0
10	10	$1,083,000	0.72	2	$433,000
11	4	$486,000	0.32	2	$69,000
12	55	$20,767,000	13.86	12	$6,354,000
13	8	$2,676,000	1.79	1	$322,000
14	16	$5,500,000	3.67	8	$1,440,000
15	31	$6,232,000	4.16	3	$507,000
16	17	$13,550,000	9.04	2	$83,000
17	0	$0	0.00	0	$0
18	237	$51,442,000	34.33	37	$4,363,000
19	18	$2,748,000	1.83	12	$1,472,000
20	23	$5,159,000	3.44	6	$1,565,000
21	2	$363,000	0.24	0	$0
23	1	$31,000	0.02	1	$31,000
24	0	$0	0.00	0	$0
25	4	$1,314,000	0.88	4	$1,314,000
TOTALS	572	$149,838,000	100.00	143	$37,230,000

TABLE A.3. (continued)

FOR BUDGET= $150,000,000 ON -SYSTEM

	METHOD 2			AUTO-QUALIF. STATISTICS	
DISTRICT	N	SUM	%	N AQ	SUM AQ
1	42	$5,417,000	3.61	21	$3,455,000
2	50	$17,061,000	11.38	4	$7,295,000
3	22	$3,590,000	2.39	9	$270,000
4	0	$0	0.00	0	$0
5	11	$5,152,000	3.44	9	$4,016,000
6	0	$0	0.00	0	$0
7	4	$1,608,000	1.07	0	$0
8	15	$5,041,000	3.36	10	$4,241,000
9	2	$238,000	0.16	0	$0
10	11	$1,123,000	0.75	2	$433,000
11	5	$557,000	0.37	2	$69,000
12	51	$20,433,000	13.63	12	$6,354,000
13	8	$2,676,000	1.79	1	$322,000
14	17	$5,520,000	3.68	8	$1,440,000
15	30	$6,451,000	4.30	3	$507,000
16	21	$14,079,000	9.39	2	$83,000
17	0	$0	0.00	0	$0
18	227	$49,730,000	33.17	37	$4,363,000
19	18	$2,748,000	1.83	12	$1,472,000
20	25	$6,775,000	4.52	6	$1,565,000
21	2	$363,000	0.24	0	$0
23	1	$31,000	0.02	1	$31,000
24	0	$0	0.00	0	$0
25	4	$1,314,000	0.88	4	$1,314,000
TOTALS	566	$149,907,000	100.00	143	$37,230,000

TABLE A.3. (continued)

FOR BUDGET= $150,000,000 ON -SYSTEM

METHOD 3				AUTO-QUALIF. STATISTICS	
DISTRICT	N	SUM	%	N AQ	SUM AQ
1	37	$5,257,000	3.54	21	$3,455,000
2	51	$20,061,000	13.50	4	$7,295,000
3	20	$3,317,000	2.23	9	$270,000
4	0	$0	0.00	0	$0
5	11	$5,152,000	3.47	9	$4,016,000
6	0	$0	0.00	0	$0
7	4	$1,608,000	1.08	0	$0
8	13	$4,759,000	3.20	10	$4,241,000
9	1	$141,000	0.09	0	$0
10	10	$952,000	0.64	2	$433,000
11	6	$3,008,000	2.02	2	$69,000
12	46	$18,105,000	12.18	12	$6,354,000
13	8	$2,973,000	2.00	1	$322,000
14	13	$4,296,000	2.89	8	$1,440,000
15	24	$5,682,000	3.82	3	$507,000
16	19	$14,347,000	9.65	2	$83,000
17	0	$0	0.00	0	$0
18	186	$47,771,000	32.15	37	$4,363,000
19	18	$2,748,000	1.85	12	$1,472,000
20	25	$6,715,000	4.52	6	$1,565,000
21	2	$363,000	0.24	0	$0
23	1	$31,000	0.02	1	$31,000
24	0	$0	0.00	0	$0
25	4	$1,314,000	0.88	4	$1,314,000
TOTALS	499	$148,600,000	100.00	143	$37,230,000

TABLE A.3. (continued)

FOR BUDGET= $150,000,000 ON -SYSTEM

	METHOD 4			AUTO-QUALIF. STATISTICS	
DISTRICT	N	SUM	%	N AQ	SUM AQ
1	44	$5,727,000	3.82	21	$3,455,000
2	49	$17,084,000	11.40	4	$7,295,000
3	20	$2,952,000	1.97	9	$270,000
4	0	$0	0.00	0	$0
5	11	$5,152,000	3.44	9	$4,016,000
6	0	$0	0.00	0	$0
7	3	$1,344,000	0.90	0	$0
8	13	$4,759,000	3.18	10	$4,241,000
9	2	$391,000	0.26	0	$0
10	11	$992,000	0.66	2	$433,000
11	6	$3,008,000	2.01	2	$69,000
12	42	$17,760,000	11.85	12	$6,354,000
13	10	$3,027,000	2.02	1	$322,000
14	19	$5,006,000	3.34	8	$1,440,000
15	23	$5,760,000	3.84	3	$507,000
16	20	$14,349,000	9.57	2	$83,000
17	0	$0	0.00	0	$0
18	209	$46,857,000	31.26	37	$4,363,000
19	19	$3,012,000	2.01	12	$1,472,000
20	29	$10,990,000	7.33	6	$1,565,000
21	2	$363,000	0.24	0	$0
23	1	$31,000	0.02	1	$31,000
24	0	$0	0.00	0	$0
25	4	$1,314,000	0.88	4	$1,314,000
TOTALS	537	$149,878,000	100.00	143	$37,230,000

TABLE A.3. (continued)

FOR BUDGET= $150,000,000 ON -SYSTEM

METHOD 5				AUTO-QUALIF. STATISTICS	
DISTRICT	N	SUM	%	N AQ	SUM AQ
1	38	$5,070,000	3.68	21	$3,455,000
2	39	$15,589,000	11.33	4	$7,295,000
3	18	$2,877,000	2.09	9	$270,000
4	0	$0	0.00	0	$0
5	9	$4,016,000	2.92	9	$4,016,000
6	0	$0	0.00	0	$0
7	2	$1,307,000	0.95	0	$0
8	13	$4,759,000	3.46	10	$4,241,000
9	1	$141,000	0.10	0	$0
10	10	$952,000	0.69	2	$433,000
11	6	$3,008,000	2.19	2	$69,000
12	35	$15,845,000	11.51	12	$6,354,000
13	7	$2,918,000	2.12	1	$322,000
14	12	$4,288,000	3.12	8	$1,440,000
15	19	$5,075,000	3.69	3	$507,000
16	15	$14,131,000	10.27	2	$83,000
17	0	$0	0.00	0	$0
18	160	$43,714,000	31.76	37	$4,363,000
19	18	$2,748,000	2.00	12	$1,472,000
20	20	$9,492,000	6.90	6	$1,565,000
21	2	$363,000	0.26	0	$0
23	1	$31,000	0.02	1	$31,000
24	0	$0	0.00	0	$0
25	4	$1,314,000	0.95	4	$1,314,000
TOTALS	429	$137,638,000	100.00	143	$37,230,000

TABLE A.3. (continued)

FOR BUDGET= $150,000,000 ON -SYSTEM

	METHOD 6			AUTO-QUALIF. STATISTICS	
DISTRICT	N	SUM	%	N AQ	SUM AQ
1	41	$18,686,000	12.51	21	$3,455,000
2	37	$15,178,000	10.17	4	$7,295,000
3	22	[illegible]53,000	2.11	9	$270,000
4	0	$0	0.00	0	$0
5	9	$4,016,000	2.69	9	$4,016,000
6	0	$0	0.00	0	$0
7	2	$1,307,000	0.88	0	$0
8	14	$4,935,000	3.31	10	$4,241,000
9	1	$141,000	0.09	0	$0
10	12	$1,005,000	0.67	2	$433,000
11	7	$3,033,000	2.03	2	$69,000
12	32	$15,412,000	10.32	12	$6,354,000
13	11	$3,237,000	2.17	1	$322,000
14	13	$4,305,000	2.88	8	$1,440,000
15	19	$5,251,000	3.52	3	$507,000
16	20	$16,744,000	11.21	2	$83,000
17	0	$0	0.00	0	$0
18	148	$38,186,000	25.57	37	$4,363,000
19	20	$2,928,000	1.96	12	$1,472,000
20	23	$10,088,000	6.76	6	$1,565,000
21	2	$363,000	0.24	0	$0
23	1	$31,000	0.02	1	$31,000
24	0	$0	0.00	0	$0
25	4	$1,314,000	0.88	4	$1,314,000
TOTALS	438	$149,313,000	100.00	143	$37,230,000

TABLE A.3. (continued)

1 BUDGET DISTRIBUTION FACTORS 15:34 FRIDAY, AUGUST 11, 1989 9

FOR BUDGET= $150,000,000 ON -SYSTEM

	METHOD 7			AUTO-QUALIF. STATISTICS	
DISTRICT	N	SUM	%	N AQ	SUM AQ
1	39	$18,814,000	12.84	21	$3,455,000
2	34	$13,933,000	9.51	4	$7,295,000
3	21	$3,105,000	2.12	9	$270,000
4	0	$0	0.00	0	$0
5	9	$4,016,000	2.74	9	$4,016,000
6	0	$0	0.00	0	$0
7	1	$630,000	0.43	0	$0
8	13	$4,832,000	3.30	10	$4,241,000
9	1	$141,000	0.10	0	$0
10	10	$1,646,000	1.12	2	$433,000
11	6	$3,008,000	2.05	2	$69,000
12	31	$15,280,000	10.43	12	$6,354,000
13	13	$4,903,000	3.35	1	$322,000
14	13	$4,305,000	2.94	8	$1,440,000
15	16	$4,943,000	3.37	3	$507,000
16	18	$16,660,000	11.37	2	$83,000
17	0	$0	0.00	0	$0
18	139	$35,920,000	24.52	37	$4,363,000
19	20	$2,928,000	2.00	12	$1,472,000
20	21	$9,706,000	6.63	6	$1,565,000
21	2	$363,000	0.25	0	$0
23	1	$31,000	0.02	1	$31,000
24	0	$0	0.00	0	$0
25	4	$1,314,000	0.90	4	$1,314,000
TOTALS	412	$146,478,000	100.00	143	$37,230,000

THE PROGRAM INICO

The program INICO, Initially Considered Projects, has the objective of generating a list of projects to be forwarded for the district's consideration. It uses the eligible bridge set generated by the program SURE and the percentile scaling of the attributes merged to the eligible set by the program FREQ. The data sets that are needed to process either the on- or the off-systems are respectively QDATON.TEBS and QDATOF.TEBS, which were previously generated by the program FREQ. The results of the program DDF are used in the User Inputs module, see Fig 4.1, to set the amount of money to be allocated for each district. This is one of the inputs for the program INICO. The final result of the program INICO is a list of projects to be considered for funding, which is submitted for the districts appreciation. The first screen describes briefly the features of the program INICO. Type END in the command line, followed by the return key to accept the screen and proceed.

```
Command ===>

THIS MODULE IS DESIGNED TO GENERATE THE INITIALLY CONSIDERED
PROJECT LIST TO BE FORWARDED TO THE DISTRICTS.THE USER AT
THIS POINT HAS ALREADY RUN THE DDF (DISTRICT DISTRIBUTION
FACTORS) MODULE, AND IS ABLE TO ASSIGN A PART OF THE
AVAILABLE BUDGET TO EACH DISTRICT. THE USER WILL BE PROMPTED
WITH VALUES OF BUDGET, WEIGHTS, AND AUTO QUALIFYING. TYPE
"END" ON THE COMMAND LINE TO CONTINUE. SEE RESEARCH REPORT
439-4 FOR MORE DETAILS.
```

Fig A.12. Initial screen for the program INICO.

The next screen asks for the budget to be allocated for each district. Use the tab key, or the arrow-keys, to move from field to field and modify the default budget allocations. Fig A.13. depicts the screen that allows the selection of the budget allocations, for each one of the districts. There is no need to type the numbers in dollar comma formatted values. Type them as regular numbers and before typing END in the command line to proceed type the return key to display the formatted values. Make any corrections if needed and repeat the process of typing the return key. When finally satisfied with the values type END in the command line, followed by the return key to proceed.

Command ===>

DIST1:	$4,445,000	DIST2:	$19,263,000	DIST3:	$10,584,000
DIST4:	$1,789,000	DIST5:	$5,240,000	DIST6:	$0
DIST7:	$283,000	DIST8:	$4,744,000	DIST9:	$193,000
DIST10:	$4,009,000	DIST11:	$1,070,000	DIST12:	$19,792,000
DIST13:	$460,000	DIST14:	$3,146,000	DIST15:	$5,176,000
DIST16:	$2,102,000	DIST17:	$0	DIST18:	$37,066,000
DIST19:	$11,079,000	DIST20:	$13,471,000	DIST21:	$466,000
DIST23:	$141,000	DIST24:	$0	DIST25:	$5,332,000

Fig A.13. Budget allocation for each district.

The next screen of the program INICO, depicted in Fig A.14., allows for the selection of the weights for the attributes. The weights are used in the scoring process employed in ranking the projects statewide and generate the initially considered project list within the budget constraint for each district.

Command ===>

ATTRIBUTES	WEIGHTS
COST PER VEHICLE	0.20
AVERAGE DAILY TRAFFIC	0.20
SUFFICIENCY RATING	0.20
MINIMUM OF CONDITION RATINGS	0.20
BRIDGE WIDTH RATIO	0.20

THIS IS THE RUN FOR THE ON OR OFF SYSTEM? ANSW: ON

WHAT PROGRAM IS THIS RUN SUPPOSE TO COVER? ANSW: 1988-1990

Fig A.14. Selection of weights and the system for the program INICO.

In this screen, the user is also asked whether the run is being performed for the on or for the off systems. Place the cursor over the appropriate field and correct the answer in case the run is for the off system, use the tab and the arrow keys to move around the screen as before. Finally the years that the budget allocation is supposed to cover need to be typed in the appropriate field. This entry is needed for including the correct headers in the printed reports generated by the program. When satisfied with the contents of the fields of this screen type END in the command line, followed by the return key to proceed.

The next screen and also the last screen for this program, depicted in Fig A.15., asks whether auto qualifying features should be used or not. Change the default value NO, for the answer to the question whether auto qualifying features should be used, if auto qualifying features are desired. Use the tab and the arrow keys to move around the fields and make the appropriate changes and the selections for auto qualifying thresholds. Remember that is mandatory that the answer for the question be changed to YES if auto qualifying features are to be used. Type END in the command line, followed by the return key when satisfied with the contents of the fields.

```
Command ===>

 DO YOU WANT TO USE THE AUTO-QUALIFYING FEATURE? ANSWER: NO

      PROJECTS LESS OR EQUAL THAN  AQCPV: ____________

      PROJECTS MORE OR EQUAL THAN  AQADT: ____________

      PROJECTS LESS OR EQUAL THAN  AQSR:  ____________

      PROJECTS LESS OR EQUAL THAN  AQDSS: ____________

      PROJECTS LESS OR EQUAL THAN  AQBWR: ____________

                TYPE "END" ON THE COMMAND LINE TO CONTINUE.
```

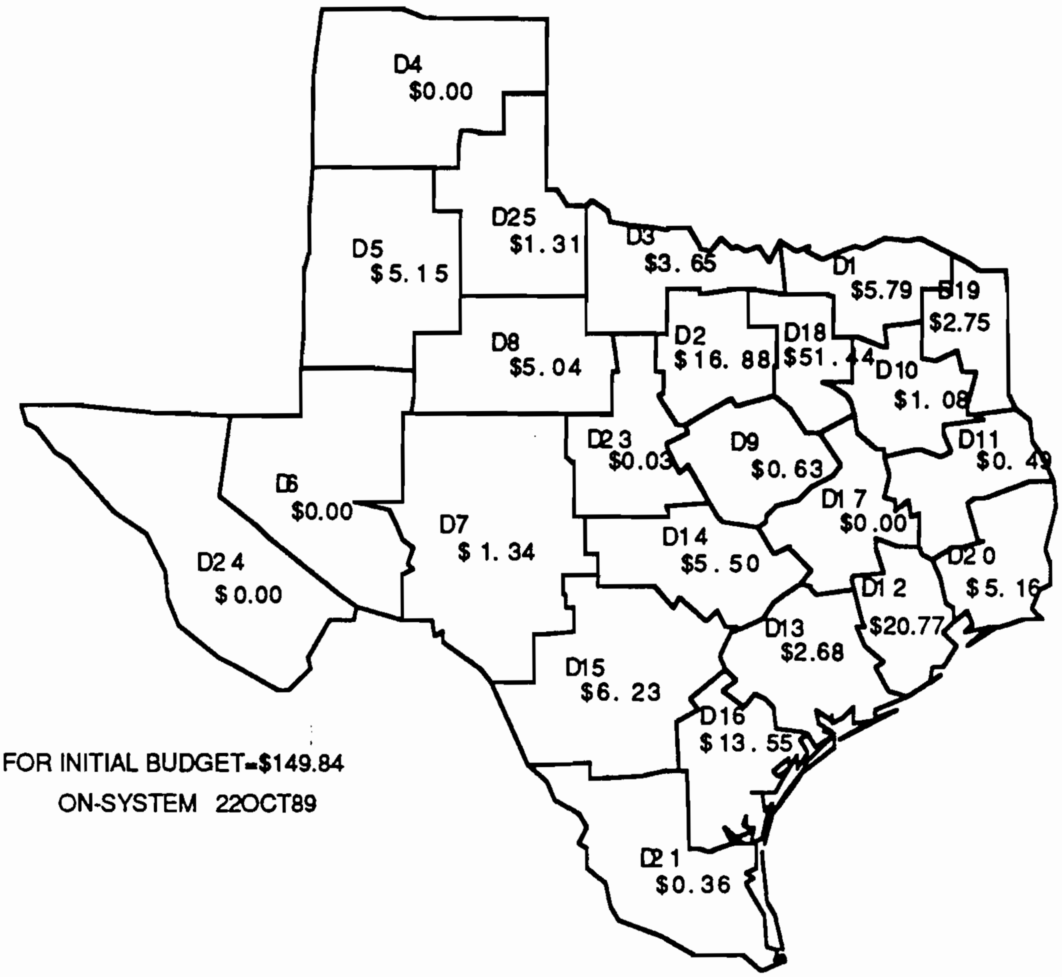
Fig. A.15. Selection of auto qualifying thresholds for the program INICO.

The program is going to run for a while and when it finishes running line printer and plotter output will be available. Line printer files will contain the list of initially considered projects sorted by district. Two plotter files will contain respectively a budget by district curve and a map with a final statewide allocation of the planned budget by district. The line printer and the plotter files should be routed to the appropriate output devices, using the commands available in the computer system that is being used. Sample of these outputs are presented in Table A.4. and figures A.16. and A.17.

The line printer output is splitted in two files because the information contained for each bridge record is wider than 132 columns. In order to read the output the 2 parts of the output have to be placed side by side and flipped together. The numbers that links the two parts of the line printer output are: the control section structure number (CSS) and the page number. This applies to all the two part lineprinter outputs that follow for the other computer modules of the system.

BUDGET DISTRIBUTION FOR INITIAL LIST OF PROJECTS

(BUDGET IN MILLIONS)



FOR INITIAL BUDGET=$149.84

ON-SYSTEM 22OCT89

Fig A.16 Map generated by the program INICO

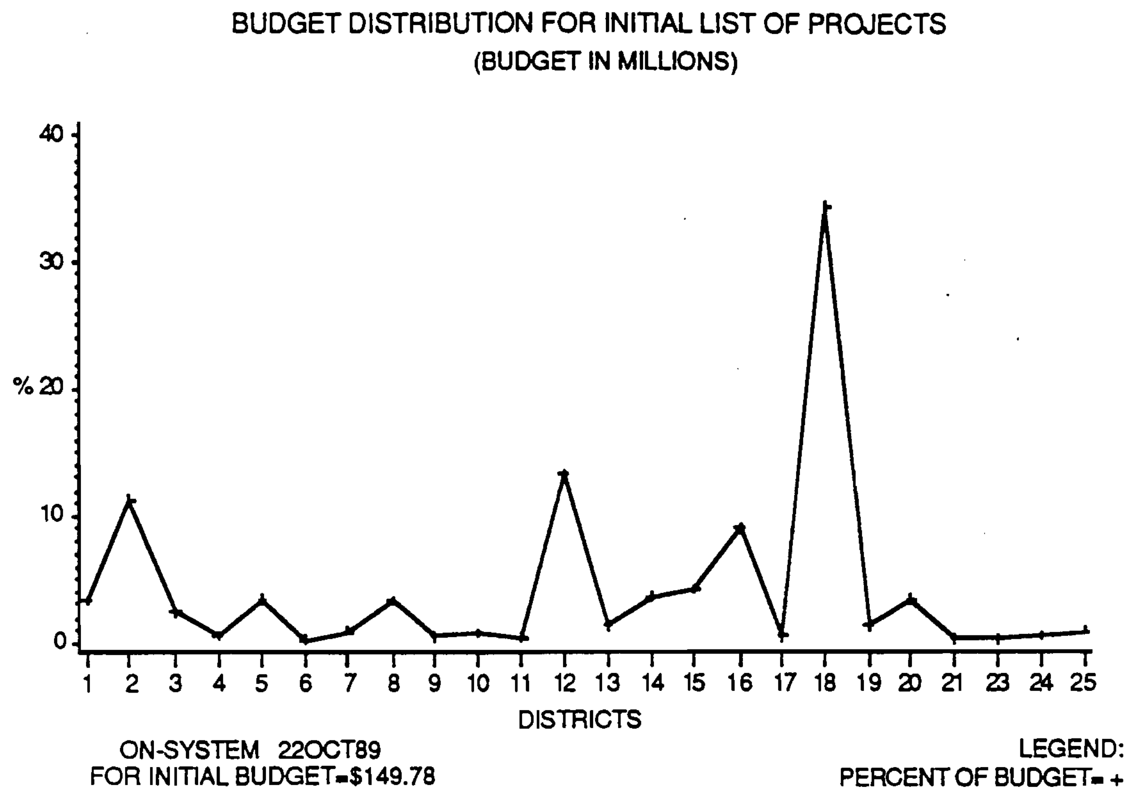


Fig A.17 Chart generated by the program INICO

TABLE A.4. PRINTOUT FOR THE PROGRAM INICO

1988-1990 ON -STATE SYSTEM FEDERAL AID BRIDGE REPLACEMENT
AND REHABILITATION PROGRAM
INITIALLY CONSIDERED PROJECTS

WEIGHTS					
	CPV	ADT	SR	DSS	BWR
	0.20	0.20	0.20	0.20	0.20

CPV = COST PER VEHICLE
ADT = AVERAGE DAILY TRAFFIC
SR = SUFFICIENCY RATING
DSS = MINIMUM OF CONDITION RATINGS
BWR = BRIDGE WIDTH RATIO

AUTO QUALIFYING FEATURES USED :

CPV	M
ADT	M
SR	M
DSS	3
BWR	M

M = MISSING

TABLE A.4. (continued)

1 SAS 15:36 WEDNESDAY, AUGUST 16, 1989 1

1988-1990 ON -STATE SYSTEM FEDERAL AID BRIDGE REPLACEMENT
AND REHABILITATION PROGRAM
INITIALLY CONSIDERED PROJECTS

BUDGET DISTRIBUTION				AUTO-QUALIF. STATISTICS	
DISTRICT	N	SUM	%	N AQ	SUM AQ
1	40	$5,792,000	3.87	21	$3,455,000
2	53	$16,883,000	11.27	4	$7,295,000
3	21	$3,649,000	2.44	9	$270,000
4	0	$0	0.00	0	$0
5	11	$5,152,000	3.44	9	$4,016,000
6	0	$0	0.00	0	$0
7	3	$1,344,000	0.90	0	$0
8	15	$5,041,000	3.36	10	$4,241,000
9	3	$626,000	0.42	0	$0
10	10	$1,083,000	0.72	2	$433,000
11	4	$486,000	0.32	2	$69,000
12	55	$20,767,000	13.86	12	$6,354,000
13	8	$2,676,000	1.79	1	$322,000
14	16	$5,500,000	3.67	8	$1,440,000
15	31	$6,232,000	4.16	3	$507,000
16	17	$13,550,000	9.04	2	$83,000
17	0	$0	0.00	0	$0
18	237	$51,442,000	34.33	37	$4,363,000
19	18	$2,748,000	1.83	12	$1,472,000
20	23	$5,159,000	3.44	6	$1,565,000
21	2	$363,000	0.24	0	$0
23	1	$31,000	0.02	1	$31,000
24	0	$0	0.00	0	$0
25	4	$1,314,000	0.88	4	$1,314,000
TOTALS	572	$149,838,000	100.00	143	$37,230,000

TABLE A.4. (continued)

1988-1990 ON -STATE SYSTEM FEDERAL AID BRIDGE REPLACEMENT
AND REHABILITATION PROGRAM
INITIALLY CONSIDERED PROJECTS

DISTRICT-HDQRTRS	COUNTY	HWY NO	CONT-SECT-STR	TYPE OF WORK	ESTIMATED COST
1 PARIS	GRAYSON	00131	2454-01-001	REPLACE BRIDGE & APPROACHES	$127,000
BRIDGE LOCATION: IRON CRK					
EXISTING FACILITY: 2 LANE, 24 FT ROADWAY			PROPOSED FACILITY: 2 LANE, 40 FT ROADWAY		
1 PARIS	HOPKINS	00313	0009-18-362	REHABILITATE BRIDGE & APPROACHES	$23,000
BRIDGE LOCATION: TOWN BRANCH					
EXISTING FACILITY: 2 LANE, 25.5 FT ROADWAY			PROPOSED FACILITY: 2 LANE, 44 FT ROADWAY		
1 PARIS	HOPKINS	01870	0735-05-018	REHABILITATE BRIDGE & APPROACHES	$100,000
BRIDGE LOCATION: ROCK CRK					
EXISTING FACILITY: 2 LANE, 23.1 FT ROADWAY			PROPOSED FACILITY: 2 LANE, 40 FT ROADWAY		
1 PARIS	HOPKINS	00313	0009-18-062	REHABILITATE BRIDGE & APPROACHES	$31,000
BRIDGE LOCATION: TOWNE BRANCH					
EXISTING FACILITY: 2 LANE, 27 FT ROADWAY			PROPOSED FACILITY: 2 LANE, 44 FT ROADWAY		
1 PARIS	RED RIVER	00410	0772-02-013	REHABILITATE BRIDGE & APPROACHES	$18,000
BRIDGE LOCATION: DEAN CRK					
EXISTING FACILITY: 2 LANE, 20.7 FT ROADWAY			PROPOSED FACILITY: 2 LANE, 40 FT ROADWAY		
1 PARIS	GRAYSON	00075	0047-02-216	REHABILITATE BRIDGE & APPROACHES	$159,000
BRIDGE LOCATION: US 82 O PASS					
EXISTING FACILITY: 2 LANE, 26 FT ROADWAY			PROPOSED FACILITY: 2 LANE, 44 FT ROADWAY		
			DISTRICT TOTAL OF 31 INITIALLY CONSIDERED PROJECTS:		$6,232,000

TABLE A.4. (continued)

1988-1990 ON -STATE SYSTEM FEDERAL AID BRIDGE REPLACEMENT
AND REHABILITATION PROGRAM
INITIALLY CONSIDERED PROJECTS

DISTRICT-HDQRTRS	COUNTY	HWY NO	CONT-SECT-STR	TYPE OF WORK	ESTIMATED COST
16 CORPUS CHRISTI	NUECES	00044	0102-01-030	REHABILITATE BRIDGE & APPROACHES	$26,000
BRIDGE LOCATION: DONIGAN FLAT					
EXISTING FACILITY: 2 LANE, 24 FT ROADWAY			PROPOSED FACILITY: 2 LANE, 36 FT ROADWAY		
16 CORPUS CHRISTI	NUECES	00624	0989-02-003	REHABILITATE BRIDGE & APPROACHES	$38,000
BRIDGE LOCATION: DRAW					
EXISTING FACILITY: 2 LANE, 24 FT ROADWAY			PROPOSED FACILITY: 2 LANE, 40 FT ROADWAY		
16 CORPUS CHRISTI	NUECES	00624	0989-02-004	REHABILITATE BRIDGE & APPROACHES	$53,000
BRIDGE LOCATION: DRAW					
EXISTING FACILITY: 2 LANE, 24 FT ROADWAY			PROPOSED FACILITY: 2 LANE, 40 FT ROADWAY		
16 CORPUS CHRISTI	NUECES	00044	0102-01-003	REHABILITATE BRIDGE & APPROACHES	$58,000
BRIDGE LOCATION: OSO CR					
EXISTING FACILITY: 2 LANE, 23 FT ROADWAY			PROPOSED FACILITY: 2 LANE, 44 FT ROADWAY		
16 CORPUS CHRISTI	SAN PATRICIO	00666	1052-03-029	REHABILITATE BRIDGE & APPROACHES	$18,000
BRIDGE LOCATION: DRAW					
EXISTING FACILITY: 2 LANE, 18 FT ROADWAY			PROPOSED FACILITY: 2 LANE, 40 FT ROADWAY		
16 CORPUS CHRISTI	JIM WELLS	00359	0086-11-028	REHABILITATE BRIDGE & APPROACHES	$70,000
BRIDGE LOCATION: INTERMITTENT CR					
EXISTING FACILITY: 2 LANE, 24 FT ROADWAY			PROPOSED FACILITY: 2 LANE, 44 FT ROADWAY		

TABLE A.4. (continued)

1988-1990 ON -STATE SYSTEM FEDERAL AID BRIDGE REPLACEMENT
AND REHABILITATION PROGRAM
INITIALLY CONSIDERED PROJECTS

DISTRICT-HDQRTRS	COUNTY	HWY NO	CONT-SECT-STR	TYPE OF WORK	ESTIMATED COST
16 CORPUS CHRISTI	NUECES	01889	1088-03-002	REHABILITATE BRIDGE & APPROACHES	$40,000

BRIDGE LOCATION: DRAW

EXISTING FACILITY: 2 LANE, 24 FT ROADWAY PROPOSED FACILITY: 2 LANE, 40 FT ROADWAY

16 CORPUS CHRISTI	NUECES	00624	0989-02-008	REPLACE BRIDGE & APPROACHES	$66,000

BRIDGE LOCATION: DRAW

EXISTING FACILITY: 2 LANE, 28 FT ROADWAY PROPOSED FACILITY: 2 LANE, 40 FT ROADWAY

16 CORPUS CHRISTI	NUECES	00666	1052-01-024	REHABILITATE BRIDGE & APPROACHES	$45,000

BRIDGE LOCATION: DRAW

EXISTING FACILITY: 2 LANE, 20 FT ROADWAY PROPOSED FACILITY: 2 LANE, 40 FT ROADWAY

16 CORPUS CHRISTI	NUECES	00181	0101-06-033	REPLACE BRIDGE & APPROACHES	$11,969,000

BRIDGE LOCATION: NUECES BAY CAUSEWAY

EXISTING FACILITY: 2 LANE, 28 FT ROADWAY PROPOSED FACILITY: 3 LANE, 56 FT ROADWAY

16 CORPUS CHRISTI	NUECES	00624	0989-02-005	REHABILITATE BRIDGE & APPROACHES	$32,000

BRIDGE LOCATION: DRAW

EXISTING FACILITY: 2 LANE, 24 FT ROADWAY PROPOSED FACILITY: 2 LANE, 40 FT ROADWAY

16 CORPUS CHRISTI	LIVE OAK	00059	0542-06-015	REHABILITATE BRIDGE & APPROACHES	$70,000

BRIDGE LOCATION: TIMON CREEK

EXISTING FACILITY: 2 LANE, 26 FT ROADWAY PROPOSED FACILITY: 2 LANE, 44 FT ROADWAY

TABLE A.4. (continued)

1988-1990 ON -STATE SYSTEM FEDERAL AID BRIDGE REPLACEMENT
AND REHABILITATION PROGRAM
INITIALLY CONSIDERED PROJECTS

DISTRICT-HDQRTRS	COUNTY	HWY NO	CONT-SECT-STR	TYPE OF WORK	ESTIMATED COST
16 CORPUS CHRISTI	NUECES	00666	1052-01-025	REPLACE BRIDGE & APPROACHES	$126,000
BRIDGE LOCATION: DRAW					
EXISTING FACILITY: 2 LANE, 20 FT ROADWAY			PROPOSED FACILITY: 2 LANE, 40 FT ROADWAY		
16 CORPUS CHRISTI	KARNES	00181	0100-06-073	REHABILITATE BRIDGE & APPROACHES	$48,000
BRIDGE LOCATION: CREEK					
EXISTING FACILITY: 4 LANE, 40 FT ROADWAY			PROPOSED FACILITY: 4 LANE, 68 FT ROADWAY		
16 CORPUS CHRISTI	NUECES	00666	1052-01-026	REPLACE BRIDGE & APPROACHES	$808,000
BRIDGE LOCATION: DRAW					
EXISTING FACILITY: 2 LANE, 20 FT ROADWAY			PROPOSED FACILITY: 2 LANE, 40 FT ROADWAY		
16 CORPUS CHRISTI	SAN PATRICIO	00630	0994-01-001	REPLACE BRIDGE & APPROACHES	$60,000
BRIDGE LOCATION: DRAW					
EXISTING FACILITY: 2 LANE, 19 FT ROADWAY			PROPOSED FACILITY: 2 LANE, 28 FT ROADWAY		
16 CORPUS CHRISTI	KARNES	02509	0100-12-052	REPLACE BRIDGE & APPROACHES	$23,000
BRIDGE LOCATION: DRAIN					
EXISTING FACILITY: 2 LANE, 24 FT ROADWAY			PROPOSED FACILITY: 2 LANE, 28 FT ROADWAY		
			DISTRICT TOTAL OF 17 INITIALLY CONSIDERED PROJECTS:		$13,550,000

TABLE A.4. (continued)

1 SAS

1988-1990 ON -STATE SYSTEM FEDERAL AID BRIDGE REPLACEMENT
AND REHABILITATION PROGRAM
INITIALLY CONSIDERED PROJECTS

DISTRICT-HDQRTRS	COUNTY	HWY NO	CONT-SECT-STR	TYPE OF WORK	ESTIMATED COST
23 BROWNWOOD	EASTLAND	00587	1239-01-001	REHABILITATE BRIDGE & APPROACHES	$31,000

BRIDGE LOCATION: COPPERAS CRK

EXISTING FACILITY: 2 LANE, 36 FT ROADWAY   PROPOSED FACILITY: 2 LANE, 34 FT ROADWAY

DISTRICT TOTAL OF 1 INITIALLY CONSIDERED PROJECTS: $31,000

TABLE A.4. (continued)

1988-1990 ON -STATE SYSTEM FEDERAL AID BRIDGE REPLACEMENT
AND REHABILITATION PROGRAM
INITIALLY CONSIDERED PROJECTS

DISTRICT-HDQRTRS	COUNTY	HWY NO	CONT-SECT-STR	TYPE OF WORK	ESTIMATED COST
25 CHILDRESS	KING	00083	0032-05-020	REHABILITATE BRIDGE & APPROACHES	$125,000
BRIDGE LOCATION: WILLOW CREEK					
EXISTING FACILITY: 2 LANE, 44 FT ROADWAY			PROPOSED FACILITY: 2 LANE, 44 FT ROADWAY		
25 CHILDRESS	COLLINGSWORTH	00338	0230-03-012	REPLACE BRIDGE & APPROACHES	$413,000
BRIDGE LOCATION: BUCK CR					
EXISTING FACILITY: 2 LANE, 20 FT ROADWAY			PROPOSED FACILITY: 2 LANE, 28 FT ROADWAY		
25 CHILDRESS	KNOX	00266	0758-01-001	REHABILITATE BRIDGE & APPROACHES	$750,000
BRIDGE LOCATION: SALT FK BRAZOS RIVER					
EXISTING FACILITY: 2 LANE, 24 FT ROADWAY			PROPOSED FACILITY: 2 LANE, 28 FT ROADWAY		
25 CHILDRESS	HALL	02361	2253-01-002	REHABILITATE BRIDGE & APPROACHES	$26,000
BRIDGE LOCATION: DRAW					
EXISTING FACILITY: 2 LANE, 30 FT ROADWAY			PROPOSED FACILITY: 2 LANE, 28 FT ROADWAY		

DISTRICT TOTAL OF 4 INITIALLY CONSIDERED PROJECTS: $1,314,000
STATE TOTAL OF 572 INITIALLY CONSIDERED PROJECTS: $149,838,000

TABLE A.4. part 2 (continued)

1988-1990 ON -STATE SYSTEM FEDERAL AID BRIDGE REPLACEMENT
AND REHABILITATION PROGRAM
INITIALLY CONSIDERED PROJECTS

WEIGHTS					
	CPV	ADT	SR	DSS	BWR
	0.20	0.20	0.20	0.20	0.20
CPV = COST PER VEHICLE					
ADT = AVERAGE DAILY TRAFFIC					
SR = SUFFICIENCY RATING					
DSS = MINIMUM OF CONDITION RATINGS					
BWR = BRIDGE WIDTH RATIO					

AUTO QUALIFYING FEATURES USED :

CPV	M
ADT	M
SR	M
DSS	3
BWR	M

M = MISSING

TABLE A.4. part 2 (continued)

1988-1990 ON -STATE SYSTEM FEDERAL AID BRIDGE REPLACEMENT
AND REHABILITATION PROGRAM
INITIALLY CONSIDERED PROJECTS

BUDGET DISTRIBUTION				AUTO-QUALIF. STATISTICS	
DISTRICT	N	SUM	%	N AQ	SUM AQ
1	40	$5,792,000	3.87	21	$3,455,000
2	53	$16,883,000	11.27	4	$7,295,000
3	21	$3,649,000	2.44	9	$270,000
4	0	$0	0.00	0	$0
5	11	$5,152,000	3.44	9	$4,016,000
6	0	$0	0.00	0	$0
7	3	$1,344,000	0.90	0	$0
8	15	$5,041,000	3.36	10	$4,241,000
9	3	$626,000	0.42	0	$0
10	10	$1,083,000	0.72	2	$433,000
11	4	$486,000	0.32	2	$69,000
12	55	$20,767,000	13.86	12	$6,354,000
13	8	$2,676,000	1.79	1	$322,000
14	16	$5,500,000	3.67	8	$1,440,000
15	31	$6,232,000	4.16	3	$507,000
16	17	$13,550,000	9.04	2	$83,000
17	0	$0	0.00	0	$0
18	237	$51,442,000	34.33	37	$4,363,000
19	18	$2,748,000	1.83	12	$1,472,000
20	23	$5,159,000	3.44	6	$1,565,000
21	2	$363,000	0.24	0	$0
23	1	$31,000	0.02	1	$31,000
24	0	$0	0.00	0	$0
25	4	$1,314,000	0.88	4	$1,314,000
TOTALS	572	$149,838,000	100.00	143	$37,230,000

TABLE A.4. part 2 (continued)

1988-1990 ON -STATE SYSTEM FEDERAL AID BRIDGE REPLACEMENT
AND REHABILITATION PROGRAM
INITIALLY CONSIDERED PROJECTS

	ADT	SUFFICIENCY RATINGS	CONDITION RATINGS RDWY	SUPR	SUB	COST/VEH	BRIDGE WIDTH RATIO	TEBS SCORE	DETOUR LENGTH	DISTRICT PRIORITY	DISTRICT ACCUM COST
2454-01-001	3,813	46	6	6	5	$33	0.545	79	5		$127,000
COMMENTS:											
0009-18-362	4,497	56	6	7	6	$5	0.580	77	1		$150,000
COMMENTS:											
0735-05-018	5,074	55	7	7	6	$20	0.525	76	2		$250,000
COMMENTS:											
0009-18-062	4,892	55	6	7	7	$6	0.614	74	5		$281,000
COMMENTS:											
0772-02-013	894	58	I	6	6	$20	0.545	73	0		$299,000
COMMENTS:											
0047-02-216	13,592	71	5	6	6	$12	0.591	72	0		$458,000
COMMENTS:											

TABLE A.4. part 2 (continued)

1988-1990 ON -STATE SYSTEM FEDERAL AID BRIDGE REPLACEMENT
AND REHABILITATION PROGRAM
INITIALLY CONSIDERED PROJECTS

	ADT	SUFFICIENCY RATINGS	CONDITION RATINGS RDWY	CONDITION RATINGS SUPR	CONDITION RATINGS SUB	COST/VEH	BRIDGE WIDTH RATIO	TEBS SCORE	DETOUR LENGTH	DISTRICT PRIORITY	DISTRICT ACCUM COST
0102-01-030	8,886	61	7	8	8	$3	0.545	76	1		$26,000
COMMENTS:											
0989-02-003	3,366	59	6	8	8	$11	0.545	74	20		$64,000
COMMENTS:											
0989-02-004	3,366	57	7	8	6	$16	0.545	73	20		$117,000
COMMENTS:											
0102-01-003	6,835	62	7	8	8	$8	0.523	72	1		$175,000
COMMENTS:											
1052-03-029	1,299	56	7	8	6	$14	0.474	72	50		$193,000
COMMENTS:											
0086-11-028	5,779	68	8	8	8	$12	0.545	71	1		$263,000
COMMENTS:											

TABLE A.4. part 2 (continued)

1988-1990 ON -STATE SYSTEM FEDERAL AID BRIDGE REPLACEMENT
AND REHABILITATION PROGRAM
INITIALLY CONSIDERED PROJECTS

	ADT	SUFFICIENCY RATINGS	CONDITION RATINGS RDWY	SUPR	SUB	COST/VEH	BRIDGE WIDTH RATIO	TEBS SCORE	DETOUR LENGTH	DISTRICT PRIORITY	DISTRICT ACCUM COST
1088-03-002	5,508	63	7	8	8	$7	0.545	71	4		$303,000
COMMENTS:											
0989-02-008	2,722	36	8	7	4	$24	0.700	70	5		$369,000
COMMENTS:											
1052-01-024	1,108	51	6	6	5	$41	0.526	70	45		$414,000
COMMENTS:											
0101-06-033	13,344	38	6	6	4	$897	0.636	69	50		$12,383,000
COMMENTS:											
0989-02-005	3,366	61	7	8	7	$10	0.545	68	20		$12,415,000
COMMENTS:											
0542-06-015	9,330	69	7	7	8	$8	0.591	66	8		$12,485,000
COMMENTS:											

TABLE A.4. part 2 (continued)

1988-1990 ON -STATE SYSTEM FEDERAL AID BRIDGE REPLACEMENT
AND REHABILITATION PROGRAM
INITIALLY CONSIDERED PROJECTS

	ADT	SUFFICIENCY RATINGS	CONDITION RATINGS RDWY	SUPR	SUB	COST/VEH	BRIDGE WIDTH RATIO	TEBS SCORE	DETOUR LENGTH	DISTRICT PRIORITY	DISTRICT ACCUM COST
1052-01-025	1,108	48	7	5	5	$114	0.526	66	45		$12,611,000
COMMENTS:											
0100-06-073	3,366	52	8	6	4	$14	0.909	66	6		$12,659,000
COMMENTS:											
1052-01-026	1,108	33	6	4	5	$729	0.526	65	45		$13,467,000
COMMENTS:											
0994-01-001	164	20	6	7	3	$366	0.679	52	12		$13,527,000
COMMENTS:											
0100-12-052	45	49	8	6	3	$511	0.857	43	12		$13,550,000
COMMENTS:											

DISTRICT TOTAL OF 17 INITIALLY CONSIDERED PROJECTS: $13,550,000

TABLE A.4. part 2 (continued)

1988-1990 ON -STATE SYSTEM FEDERAL AID BRIDGE REPLACEMENT
AND REHABILITATION PROGRAM
INITIALLY CONSIDERED PROJECTS

	ADT	SUFFICIENCY RATINGS	CONDITION RATINGS RDWY	SUPR	SUB	COST/VEH	BRIDGE WIDTH RATIO	TEBS SCORE	DETOUR LENGTH	DISTRICT PRIORITY	DISTRICT ACCUM COST
	473	67	I	8	8	$66	1.000	44	1		$31,000
1239-01-001											
COMMENTS:											

DISTRICT TOTAL OF 1 INITIALLY CONSIDERED PROJECTS: $31,000

TABLE A.4. part 2 (continued)

1988-1990 ON -STATE SYSTEM FEDERAL AID BRIDGE REPLACEMENT
AND REHABILITATION PROGRAM
INITIALLY CONSIDERED PROJECTS

	ADT	SUFFICIENCY RATINGS	CONDITION RATINGS RDWY	SUPR	SUB	COST/VEH	BRIDGE WIDTH RATIO	TEBS SCORE	DETOUR LENGTH	DISTRICT PRIORITY	DISTRICT ACCUM COST
0032-05-020	738	50	6	4	3	$169	1.000	48	0		$125,000
COMMENTS:											
0230-03-012	72	31	4	6	3	$5,736	0.714	47	9		$538,000
COMMENTS:											
0758-01-001	121	57	3	5	5	$6,198	0.857	40	28		$1,288,000
COMMENTS:											
2253-01-002	165	69	I	4	5	$158	1.000	36	6		$1,314,000
COMMENTS:											

DISTRICT TOTAL OF 4 INITIALLY CONSIDERED PROJECTS: $1,314,000
STATE TOTAL OF 572 INITIALLY CONSIDERED PROJECTS: $149,838,000

THE DISTRICT LEVEL REPORTING MODULE

The district level reporting module is the only computer program in the selection system that does not have a screen interactive interface. The lack of this kind of interfacing was due to the fact that interactive mainframe computing is not available at the district level for the Texas SDHPT. The inputs for the district level reporting module are made, therefore, via a file. The program is submitted for processing, together with the prepared input file, in batch mode. The input file is read automatically by the program. The following paragraphs and figures will explain the several options available and the format of the input file for the program, for the several options. Use any text editor to create the the input file MENU.TEBS and then modify it for the several options available within the district level reporting program. It is recommended that the options are run in the order presented, even though each option does not depend of data generated in the previous alternative. The information provided to the user after running each option, in the other hand, might help the user run the next option.

The option of printing the initially considered projects for the district

The first option available is to print a listing of the initially considered projects, generated by the program INICO at the state level. The inputs for the file MENU.TEBS need to be in the correct order of variables and at least one blank needs to separate one field from the other. The first field to be typed, in the first and only line for this option, is the district number. Leave a space between the district number and the next field, then type the system that is being processed. The next field includes the code for the option. Enter the word INICO, to tell the program that the option chosen is to print the initially considered list forwarded by the State level of the system. The MENU.TEBS file should look like the one displayed in Fig A.18. after all the appropriate entries for this option have been made. The example displayed is for district 17 and for the on-system. Submit the program for processing. It will read the MENU.TEBS file automatically. After the program runs line printer files are available, including information about the initially considered bridges. These files should be routed to the appropriate device, using the operating system commands. Sample output for this option is presented in Table A.5.

Fig A.18. Format of the input file for the district level reporting module for printing the initially considered list.

TABLE A.5. PRINTOUT FOR THE DISTRICT LEVEL REPORTING PROGRAM, INICO OPTION

1SAS 16:09 WEDNESDAY, AUGUST 16, 1989 1

DISTRICT-16 ON -STATE SYSTEM FEDERAL AID BRIDGE REPLACEMENT
AND REHABILITATION PROGRAM
INITIALLY CONSIDERED PROJECTS

DISTRICT	COUNTY	HWY NO	CONT-SECT-STR	TYPE OF WORK	ESTIMATED COST
16	NUECES	00044	0102-01-030	REHABILITATE BRIDGE & APPROACHES	$26,000

BRIDGE LOCATION: DONIGAN FLAT

EXISTING FACILITY: 2 LANE, 24 FT ROADWAY PROPOSED FACILITY: 2 LANE, 36 FT ROADWAY

16	NUECES	00624	0989-02-003	REHABILITATE BRIDGE & APPROACHES	$38,000

BRIDGE LOCATION: DRAW

EXISTING FACILITY: 2 LANE, 24 FT ROADWAY PROPOSED FACILITY: 2 LANE, 40 FT ROADWAY

16	NUECES	00624	0989-02-004	REHABILITATE BRIDGE & APPROACHES	$53,000

BRIDGE LOCATION: DRAW

EXISTING FACILITY: 2 LANE, 24 FT ROADWAY PROPOSED FACILITY: 2 LANE, 40 FT ROADWAY

16	NUECES	00044	0102-01-003	REHABILITATE BRIDGE & APPROACHES	$58,000

BRIDGE LOCATION: OSO CR

EXISTING FACILITY: 2 LANE, 23 FT ROADWAY PROPOSED FACILITY: 2 LANE, 44 FT ROADWAY

16	SAN PATRICIO	00666	1052-03-029	REHABILITATE BRIDGE & APPROACHES	$18,000

BRIDGE LOCATION: DRAW

EXISTING FACILITY: 2 LANE, 18 FT ROADWAY PROPOSED FACILITY: 2 LANE, 40 FT ROADWAY

TABLE A.5. (continued)

DISTRICT-16 ON -STATE SYSTEM FEDERAL AID BRIDGE REPLACEMENT
AND REHABILITATION PROGRAM
INITIALLY CONSIDERED PROJECTS

DISTRICT	COUNTY	HWY NO	CONT-SECT-STR	TYPE OF WORK	ESTIMATED COST
16	JIM WELLS	00359	0086-11-028	REHABILITATE BRIDGE & APPROACHES	$70,000
BRIDGE LOCATION: INTERMITTENT CR					
EXISTING FACILITY: 2 LANE, 24 FT ROADWAY			PROPOSED FACILITY: 2 LANE, 44 FT ROADWAY		
16	NUECES	01889	1088-03-002	REHABILITATE BRIDGE & APPROACHES	$40,000
BRIDGE LOCATION: DRAW					
EXISTING FACILITY: 2 LANE, 24 FT ROADWAY			PROPOSED FACILITY: 2 LANE, 40 FT ROADWAY		
16	NUECES	00624	0989-02-008	REPLACE BRIDGE & APPROACHES	$66,000
BRIDGE LOCATION: DRAW					
EXISTING FACILITY: 2 LANE, 28 FT ROADWAY			PROPOSED FACILITY: 2 LANE, 40 FT ROADWAY		
16	NUECES	00666	1052-01-024	REHABILITATE BRIDGE & APPROACHES	$45,000
BRIDGE LOCATION: DRAW					
EXISTING FACILITY: 2 LANE, 20 FT ROADWAY			PROPOSED FACILITY: 2 LANE, 40 FT ROADWAY		
16	NUECES	00181	0101-06-033	REPLACE BRIDGE & APPROACHES	$11,969,000
BRIDGE LOCATION: NUECES BAY CAUSEWAY					
EXISTING FACILITY: 2 LANE, 28 FT ROADWAY			PROPOSED FACILITY: 3 LANE, 56 FT ROADWAY		
16	NUECES	00624	0989-02-005	REHABILITATE BRIDGE & APPROACHES	$32,000
BRIDGE LOCATION: DRAW					
EXISTING FACILITY: 2 LANE, 24 FT ROADWAY			PROPOSED FACILITY: 2 LANE, 40 FT ROADWAY		

TABLE A.5. (continued)

DISTRICT-16 ON -STATE SYSTEM FEDERAL AID BRIDGE REPLACEMENT
AND REHABILITATION PROGRAM
INITIALLY CONSIDERED PROJECTS

DISTRICT	COUNTY	HWY NO	CONT-SECT-STR	TYPE OF WORK	ESTIMATED COST
16	LIVE OAK	00059	0542-06-015	REHABILITATE BRIDGE & APPROACHES	$70,000
BRIDGE LOCATION: TIMON CREEK					
EXISTING FACILITY: 2 LANE, 26 FT ROADWAY			PROPOSED FACILITY: 2 LANE, 44 FT ROADWAY		
16	KARNES	00181	0100-06-073	REHABILITATE BRIDGE & APPROACHES	$48,000
BRIDGE LOCATION: CREEK					
EXISTING FACILITY: 4 LANE, 40 FT ROADWAY			PROPOSED FACILITY: 4 LANE, 68 FT ROADWAY		
16	NUECES	00666	1052-01-025	REPLACE BRIDGE & APPROACHES	$126,000
BRIDGE LOCATION: DRAW					
EXISTING FACILITY: 2 LANE, 20 FT ROADWAY			PROPOSED FACILITY: 2 LANE, 40 FT ROADWAY		
16	NUECES	00666	1052-01-026	REPLACE BRIDGE & APPROACHES	$808,000
BRIDGE LOCATION: DRAW					
EXISTING FACILITY: 2 LANE, 20 FT ROADWAY			PROPOSED FACILITY: 2 LANE, 40 FT ROADWAY		
16	SAN PATRICIO	00630	0994-01-001	REPLACE BRIDGE & APPROACHES	$60,000
BRIDGE LOCATION: DRAW					
EXISTING FACILITY: 2 LANE, 19 FT ROADWAY			PROPOSED FACILITY: 2 LANE, 28 FT ROADWAY		
16	KARNES	02509	0100-12-052	REPLACE BRIDGE & APPROACHES	$23,000
BRIDGE LOCATION: DRAIN					
EXISTING FACILITY: 2 LANE, 24 FT ROADWAY			PROPOSED FACILITY: 2 LANE, 28 FT ROADWAY		

DISTRICT TOTAL OF 17 INITIALLY CONSIDERED PROJECTS: $13,550,000

TABLE A.5. part 2 (continued)

1SAS 16:09 WEDNESDAY, AUGUST 16, 1989 1

DISTRICT-16 ON -STATE SYSTEM FEDERAL AID BRIDGE REPLACEMENT
AND REHABILITATION PROGRAM
INITIALLY CONSIDERED PROJECTS

	ADT	SUFFICIENCY RATINGS	CONDITION RATINGS RDWY	SUPR	SUB	COST/VEH	BRIDGE WIDTH RATIO	TEBS SCORE	DETOUR LENGTH	DISTRICT PRIORITY	DISTRICT ACCUM COST
0102-01-030	8,886	61	7	8	8	$3	0.545	76	1		$26,000
COMMENTS:											
0989-02-003	3,366	59	6	8	8	$11	0.545	74	20		$64,000
COMMENTS:											
0989-02-004	3,366	57	7	8	6	$16	0.545	73	20		$117,000
COMMENTS:											
0102-01-003	6,835	62	7	8	8	$8	0.523	72	1		$175,000
COMMENTS:											
1052-03-029	1,299	56	7	8	6	$14	0.474	72	50		$193,000
COMMENTS:											

TABLE A.5. part 2 (continued)

1SAS 16:09 WEDNESDAY, AUGUST 16, 1989 2

DISTRICT-16 ON -STATE SYSTEM FEDERAL AID BRIDGE REPLACEMENT
AND REHABILITATION PROGRAM
INITIALLY CONSIDERED PROJECTS

	ADT	SUFFICIENCY RATINGS	CONDITION RATINGS RDWY	SUPR	SUB	COST/VEH	BRIDGE WIDTH RATIO	TEBS SCORE	DETOUR LENGTH	DISTRICT PRIORITY	DISTRICT ACCUM COST
0086-11-028	5,779	68	8	8	8	$12	0.545	71	1		$263,000
COMMENTS:											
1088-03-002	5,508	63	7	8	8	$7	0.545	71	4		$303,000
COMMENTS:											
0989-02-008	2,722	36	8	7	4	$24	0.700	70	5		$369,000
COMMENTS:											
1052-01-024	1,108	51	6	6	5	$41	0.526	70	45		$414,000
COMMENTS:											
0101-06-033	13,344	38	6	6	4	$897	0.636	69	50		$12,383,000
COMMENTS:											
0989-02-005	3,366	61	7	8	7	$10	0.545	68	20		$12,415,000
COMMENTS:											

TABLE A.5. part 2 (continued)

DISTRICT-16 ON -STATE SYSTEM FEDERAL AID BRIDGE REPLACEMENT
AND REHABILITATION PROGRAM
INITIALLY CONSIDERED PROJECTS

	ADT	SUFFICIENCY RATINGS	CONDITION RATINGS RDWY	SUPR	SUB	COST/VEH	BRIDGE WIDTH RATIO	TEBS SCORE	DETOUR LENGTH	DISTRICT PRIORITY	DISTRICT ACCUM COST
0542-06-015	9,330	69	7	7	8	$8	0.591	66	8		$12,485,000
COMMENTS:											
0100-06-073	3,366	52	8	6	4	$14	0.909	66	6		$12,533,000
COMMENTS:											
1052-01-025	1,108	48	7	5	5	$114	0.526	66	45		$12,659,000
COMMENTS:											
1052-01-026	1,108	33	6	4	5	$729	0.526	65	45		$13,467,000
COMMENTS:											
0994-01-001	164	20	6	7	3	$366	0.679	52	12		$13,527,000
COMMENTS:											
0100-12-052	45	49	8	6	3	$511	0.857	43	12		$13,550,000
COMMENTS:											

DISTRICT TOTAL OF 17 INITIALLY CONSIDERED PROJECTS: $13,550,000left

The option of scoring and ranking the eligible projects of the district

The second option available with the district level reporting module is to score and rank the eligible bridges of the district. The ranking process utilizes the weighted average technique and the auto qualifying technique described in chapter 3, together with a district level automatic inclusion described in chapter 4. The first line of the MENU.TEBS file must include the district number, the system, ON or OFF, and the key word for the alternative being processed. The key word for selecting the option of scoring and ranking the eligible set for the district is SCORE, as shown in Fig. A.19. As in the previous option the variables should be kept in the correct order and their values must be separated by at least one blank. The second line of the file for this option, includes the weights to be used in the scoring process in the following order, CPV ADT SR DSS BWR. In this particular example, as depicted in Fig A.19., the weights are set to straight equal 0.2 for all the attributes. In the same line the values for the automatic qualifying thresholds must be included, after the answer to the question if they are to be used in the ranking process, YES or NO. The order for the automatic qualification thresholds is the same as for the weights, CPV ADT SR DSS BWR. In the example depicted in Fig A.19., the only auto qualifying threshold applied is the one for the attribute DSS. This threshold has a value of 3 for this example. The values of the other auto qualifying thresholds are set to missing, by typing a dot in their fields. The third and subsequent lines of the file, list the structures to be automatically included at the top of the ranked list, if so desired by the district user. In this particular example, two structures are to be included at the top of the ranked list and are represented by their bridge identification number (BRID). If more automatically included projects are desired, the list of bridge identification numbers should follow the already described lines of the file. The only restriction is that the user should input one bridge identification number per line.

The user is encouraged to run the SCORE option as many times as needed to arrive to a final ranked list of projects that suits the district's project selections. These multiple runs for this option are fine tuned by changing the weights, automatic qualification thresholds and by automatically including projects by listing their bridge identification numbers. After the user is satisfied with the ranked list that fills the state level allocated budget, he can use this list to select the input for the option of forwarding a final list of projects to the State level of the system. This feature is described in more detail later in this manual.

After the processing of the program is finished the user should route the line printer output file to the printing device, using the appropriate system's commands. Sample output for this option is presented in Table A.6.

```
17  ON  SCORE
0.20 0.20 0.20 0.20 0.20 YES . . . 3 .
198-0540-06-010
094-0643-05-006
```

Fig A.19. Format of the input file for scoring the district's eligible bridges.

TABLE A.6.

LIST OF ELIGIBLE PROJECTS FOR DISTRICT-16
BY DESCENDING AUTO-QUALIFYING AND DESCENDING SCORE

WEIGHTS AND AUTO-QUALIFYING FEATURES USED:

WEIGHTS					
	CPV	ADT	SR	DSS	BWR
	0.2	0.2	0.2	0.2	0.2
CPV = COST PER VEHICLE					
ADT = AVERAGE DAILY TRAFFIC					
SR = SUFFICIENCY RATING					
DSS = MINIMUM OF CONDITION RATINGS					
BWR = BRIDGE WIDTH RATIO					

AUTO QUALIFYING FEATURES USED :

CPV	M
ADT	M
SR	M
DSS	3
BWR	M

M = MISSING

TABLE A.6. (continued)

1SAS 19:43 WEDNESDAY, AUGUST 16, 1989 2

LIST OF ELIGIBLE PROJECTS FOR DISTRICT-16
BY DESCENDING AUTO-QUALIFYING AND DESCENDING SCORE

BRIDGE ID. / STRUCTURE LOC.	COUNTY	CPV / CPV%	ADT / ADT%	SR / SR%	DSS / DSS%	BWR / BWR%	SCORE	AUTO-Q. FLAG / REHAB=RH REPL.=RP	PROJECT COST	CUMUL. COST
089-1958-01-001 / CABEZA CREEK	GOLIAD	$4,095 / 1	21 / 0	80 / 1	7 / 46	0.83 / 29	15	DS / RH	$86,000	$86,000
	EXISTING FACILITY: 2 LANE, 23.3 FT ROADWA PROPOSED FACILITY: 2 LANE, 28 FT ROADWAY									
089-2342-01-001 / HORD CREEK	GOLIAD	$183 / 19	278 / 11	75 / 15	8 / 9	0.93 / 18	14	DS / RH	$51,000	$137,000
	EXISTING FACILITY: 2 LANE, 26 FT ROADWAY PROPOSED FACILITY: 2 LANE, 28 FT ROADWAY									
013-2024-01-003 / TOTO CREEK	BEE	$304 / 12	280 / 11	78 / 6	8 / 9	0.93 / 18	11	DS / RH	$85,000	$222,000
	EXISTING FACILITY: 2 LANE, 26 FT ROADWAY PROPOSED FACILITY: 2 LANE, 28 FT ROADWAY									
205-0994-01-001 / DRAW	SAN PATRICIO	$366 / 10	164 / 5	20 / 98	3 / 97	0.68 / 48	52	AQ / RP	$60,000	$282,000
	EXISTING FACILITY: 2 LANE, 19 FT ROADWAY PROPOSED FACILITY: 2 LANE, 28 FT ROADWAY									
129-0100-12-052 / DRAIN	KARNES	$511 / 7	45 / 0	49 / 86	3 / 97	0.86 / 27	43	AQ / RP	$23,000	$305,000
	EXISTING FACILITY: 2 LANE, 24 FT ROADWAY PROPOSED FACILITY: 2 LANE, 28 FT ROADWAY									
178-0102-01-030 / DONIGAN FLAT	NUECES	$3 / 98	8,886 / 79	61 / 62	7 / 46	0.55 / 93	76	/ RH	$26,000	$331,000
	EXISTING FACILITY: 2 LANE, 24 FT ROADWAY PROPOSED FACILITY: 2 LANE, 36 FT ROADWAY									

TABLE A.6. (continued)

LIST OF ELIGIBLE PROJECTS FOR DISTRICT-16
BY DESCENDING AUTO-QUALIFYING AND DESCENDING SCORE

BRIDGE ID. / STRUCTURE LOC.	COUNTY	CPV / CPV%	ADT / ADT%	SR / SR%	DSS / DSS%	BWR / BWR%	SCORE	AUTO-Q. FLAG (REHAB=RH, REPL.=RP)	PROJECT COST	CUMUL. COST
178-0989-02-003	NUECES	$11	3,366	59	6	0.55	74		$38,000	$369,000
DRAW		83	57	67	71	93		RH		
	EXISTING FACILITY: 2 LANE, 24 FT ROADWAY PROPOSED FACILITY: 2 LANE, 40 FT ROADWAY									
178-0989-02-004	NUECES	$16	3,366	57	6	0.55	73		$53,000	$422,000
DRAW		75	57	71	71	93		RH		
	EXISTING FACILITY: 2 LANE, 24 FT ROADWAY PROPOSED FACILITY: 2 LANE, 40 FT ROADWAY									
178-0102-01-003	NUECES	$8	6,835	62	7	0.52	72		$58,000	$480,000
OSO CR		88	73	59	46	96		RH		
	EXISTING FACILITY: 2 LANE, 23 FT ROADWAY PROPOSED FACILITY: 2 LANE, 44 FT ROADWAY									
205-1052-03-029	SAN PATRICIO	$14	1,299	56	6	0.47	72		$18,000	$498,000
DRAW		79	39	73	71	98		RH		
	EXISTING FACILITY: 2 LANE, 18 FT ROADWAY PROPOSED FACILITY: 2 LANE, 40 FT ROADWAY									
126-0086-11-028	JIM WELLS	$12	5,779	68	6	0.55	71		$70,000	$568,000
INTERMITTENT CR		82	70	40	71	93		RH		
	EXISTING FACILITY: 2 LANE, 24 FT ROADWAY PROPOSED FACILITY: 2 LANE, 44 FT ROADWAY									
178-1088-03-002	NUECES	$7	5,508	63	7	0.55	71		$40,000	$608,000
DRAW		90	69	55	46	93		RH		
	EXISTING FACILITY: 2 LANE, 24 FT ROADWAY PROPOSED FACILITY: 2 LANE, 40 FT ROADWAY									

TABLE A.6. (continued)

LIST OF ELIGIBLE PROJECTS FOR DISTRICT-16
BY DESCENDING AUTO-QUALIFYING AND DESCENDING SCORE

BRIDGE ID. / STRUCTURE LOC.	COUNTY	CPV	CPV%	ADT	ADT%	SR	SR%	DSS	DSS%	BWR	BWR%	SCORE	AUTO-Q. FLAG (REHAB=RH, REPL.=RP)	PROJECT COST	CUMUL. COST
178-0989-02-008 DRAW	NUECES	$24	68	2,722	50	36	95	4	94	0.7	44	70	RP	$66,000	$674,000
	EXISTING FACILITY: 2 LANE, 28 FT ROADWAY PROPOSED FACILITY: 2 LANE, 40 FT ROADWAY														
178-1052-01-024 DRAW	NUECES	$41	57	1,108	36	51	81	5	80	0.53	96	70	RH	$45,000	$719,000
	EXISTING FACILITY: 2 LANE, 20 FT ROADWAY PROPOSED FACILITY: 2 LANE, 40 FT ROADWAY														
178-0101-06-033 NUECES BAY CAUSEW	NUECES	$897	4	13,344	88	38	94	4	94	0.64	63	69	RP	$11,969,000	$12,688,000
	EXISTING FACILITY: 2 LANE, 28 FT ROADWAY PROPOSED FACILITY: 3 LANE, 56 FT ROADWAY														
178-0989-02-005 DRAW	NUECES	$10	84	3,366	57	61	62	7	46	0.55	93	68	RH	$32,000	$12,720,000
	EXISTING FACILITY: 2 LANE, 24 FT ROADWAY PROPOSED FACILITY: 2 LANE, 40 FT ROADWAY														
149-0542-06-015 TIMON CREEK	LIVE OAK	$8	88	9,330	80	69	38	7	46	0.59	79	66	RH	$70,000	$12,790,000
	EXISTING FACILITY: 2 LANE, 26 FT ROADWAY PROPOSED FACILITY: 2 LANE, 44 FT ROADWAY														
129-0100-06-073 CREEK	KARNES	$14	79	3,366	57	52	79	4	94	0.91	21	66	RH	$48,000	$12,838,000
	EXISTING FACILITY: 4 LANE, 40 FT ROADWAY PROPOSED FACILITY: 4 LANE, 68 FT ROADWAY														

LIST OF ELIGIBLE PROJECTS FOR DISTRICT-16
BY DESCENDING AUTO-QUALIFYING AND DESCENDING SCORE

BRIDGE ID.	STRUCTURE LOC.	COUNTY	CPV	CPV%	ADT	ADT%	SR	SR%	DSS	DSS%	BWR	BWR%	SCORE	AUTO-Q. FLAG (REHAB=RH, REPL.=RP)	PROJECT COST	CUMUL. COST	FACILITY
178-1052-01-025	DRAW	NUECES	$114	30	1,108	36	48	88	5	80	0.53	96	66	RP	$126,000	$12,964,000	EXISTING FACILITY: 2 LANE, 20 FT ROADWAY PROPOSED FACILITY: 2 LANE, 40 FT ROADWAY
178-1052-01-026	DRAW	NUECES	$729	5	1,108	36	33	96	4	94	0.53	96	65	RP	$808,000	$13,772,000	EXISTING FACILITY: 2 LANE, 20 FT ROADWAY PROPOSED FACILITY: 2 LANE, 40 FT ROADWAY
178-1052-01-036	DRAW	NUECES	$13	80	1,353	40	61	62	7	46	0.53	96	65	RH	$18,000	$13,790,000	EXISTING FACILITY: 2 LANE, 20 FT ROADWAY PROPOSED FACILITY: 2 LANE, 40 FT ROADWAY
196-0371-03-031	DRAINAGE	REFUGIO	$5	94	7,328	75	61	62	6	71	0.91	21	65	RH	$36,000	$13,826,000	EXISTING FACILITY: 2 LANE, 40 FT ROADWAY PROPOSED FACILITY: 2 LANE, 44 FT ROADWAY
178-0989-02-002	DRAW	NUECES	$7	90	2,722	50	60	64	7	46	0.6	72	64	RH	$18,000	$13,844,000	EXISTING FACILITY: 2 LANE, 24 FT ROADWAY PROPOSED FACILITY: 2 LANE, 40 FT ROADWAY
126-0255-01-026	DRAIN	JIM WELLS	$4	96	6,892	73	64	51	6	71	0.82	30	64	RH	$31,000	$13,875,000	EXISTING FACILITY: 2 LANE, 36 FT ROADWAY PROPOSED FACILITY: 2 LANE, 44 FT ROADWAY

TABLE A.6. (continued)

1SAS 19:43 WEDNESDAY, AUGUST 16, 1989 6

LIST OF ELIGIBLE PROJECTS FOR DISTRICT-16
BY DESCENDING AUTO-QUALIFYING AND DESCENDING SCORE

BRIDGE ID. / STRUCTURE LOC.	COUNTY	CPV / CPV%	ADT / ADT%	SR / SR%	DSS / DSS%	BWR / BWR%	SCORE	AUTO-Q. FLAG (REHAB=RH, REPL.=RP)	PROJECT COST	CUMUL. COST
178-1742-01-002 / DRAW	NUECES	$81 / 37	861 / 30	36 / 95	4 / 94	0.63 / 65	64	RP	$70,000	$13,945,000
	EXISTING FACILITY: 2 LANE, 24 FT ROADWAY PROPOSED FACILITY: 2 LANE, 40 FT ROADWAY									
004-0507-04-007 / DRAW	ARANSAS	$5 / 94	3,496 / 57	73 / 24	7 / 46	0.46 / 99	64	RH	$18,000	$13,963,000
	EXISTING FACILITY: 2 LANE, 20 FT ROADWAY PROPOSED FACILITY: 2 LANE, 40 FT ROADWAY									
178-1093-01-004 / DRAW	NUECES	$128 / 27	1,095 / 36	36 / 95	4 / 94	0.63 / 65	63	RP	$140,000	$14,103,000
	EXISTING FACILITY: 2 LANE, 24 FT ROADWAY PROPOSED FACILITY: 2 LANE, 40 FT ROADWAY									
178-1069-01-004 / DRAIN	NUECES	$7 / 90	2,678 / 49	67 / 43	7 / 46	0.55 / 88	63	RH	$20,000	$14,123,000
	EXISTING FACILITY: 2 LANE, 22 FT ROADWAY PROPOSED FACILITY: 0 LANE, 0 FT ROADWAY									
196-0371-02-023 / MELLON CR	REFUGIO	$27 / 65	9,207 / 80	54 / 75	5 / 80	1 / 15	63	RH	$247,000	$14,370,000
	EXISTING FACILITY: 2 LANE, 44 FT ROADWAY PROPOSED FACILITY: 2 LANE, 44 FT ROADWAY									
178-1052-01-027 / DRAW	NUECES	$319 / 11	1,108 / 36	48 / 88	5 / 80	0.53 / 96	62	RP	$353,000	$14,723,000
	EXISTING FACILITY: 2 LANE, 20 FT ROADWAY PROPOSED FACILITY: 2 LANE, 40 FT ROADWAY									

The option of adding comments to the eligible projects of the district

The next option allows the user to add comments to the structures in the district. The first line of of the MENU.TEBS input file needs to contain, in the same way as before, the district number, the system and the key word for selecting the option of adding comments to the projects, separated by at least one space. The key word in this case is ADDCO. The following lines for the input file allow the user to input the comments for selected projects. The first field of the comments must include the bridge identification number. Following the bridge identification number, the first part of the comments may follow, separated from the bridge identification number by at least one blank space. This first part of the comments should not exceed 64 characters, or together with the bridge identification number 80 characters, including the separating blank spaces. The next line in the file allows for the input of the second part of the comments, that can be up to 80 characters. Summarizing, each block of comments, for one project, is comprised by two lines in the input file. One contains the bridge identification and up to 64 characters of comments and the second up to 80 characters of comments. Fig A.20. depicts the overall format for the MENU.TEBS input file for this option.

```
17   ON   ADDCO

198-0540-06-010    COMMENTS UP TO 64 CHARACTERS......

 COMMENTS UP TO EIGHTY CHARACTERS.........

094-0643-05-006    COMMENTS UP TO 64 CHARACTERS......

COMMENTS UP TO EIGHTY CHARACTERS............
```

Fig A.20. Format of the input file for the option of adding comments to the district's eligible bridges.

The final result for each run for this option is a file containing line printer output, including all the projects that have comments as off the last run. The user should route this line printer output to the appropriate device by using the computer system's commands. Sample of this output is shown in Table A.7. It is possible to run this option as many times as desired until the comments are in a satisfactory status.

TABLE A.7. PRINTOUT FOR THE DISTRICT LEVEL REPORTING PROGRAM, ADDCO OPTION

1THIS LIST INCLUDES ALL PROJECTS WITH COMMENTS UP TO THIS LAST RUN. 19:57 WEDNESDAY, AUGUST 16, 1989 1

OBS	BRID	FIRST LINE OF COMMENTS	SECOND LINE OF COMMENTS
1	013-2024-01-003	THIS WAS A PROJECT WITH A LOW SCORE THAT WAS AT THE END OF THE PRIORITIZED LIST	
2	089-1958-01-001	THIS WAS A PROJECT WITH A LOW SCORE THAT WAS AT THE END OF THE PRIORITIZED LIST	
3	089-2342-01-001	THIS WAS A PROJECT WITH A LOW SCORE THAT WAS AT THE END OF THE PRIORITIZED LIST	

The option of creating the final list of district selected projects, to be forwarded to the state level of the system

This option is used to forward the list of district selected projects to the state level of the system. It is the last option to be employed by the district user, within the district level reporting program. At the State level the projects forwarded by the district will be examined and used to compose the final list of projects to be considered for funding. The list generated by the SCORE option, described in a previous paragraph, could and should be used to establish the list of projects to be selected. The user should use the output of the SCORE option to establish the list of projects that fill the allocated budget for the district. The allocated budget for the district is the amount calculated in the program INICO, described in the State level of the system. The allocated budget for the district is the amount presented at the end of Table A.5. for a specific district. It is advised that the list obtained by running the SCORE option be copyed into the MENU.TEBS file as follows.

The first line of the MENU.TEBS file, for this option, contains in the first field the district number, followed by the system, ON or OFF, and followed by the key word for this option. The key word in this case is FINAL. The lines that follow the first line should include the bridge identity numbers (BRID) for all the district selected structures, in the appropriate format and one per line. A sample of the input file is depicted in Fig A.21. In addition the order in which the projects are included in the MENU.TEBS file is important, because it is automatically linked to the district's priority. In this example, this means that the project with BRID 089-1958-01-001 is the first priority of the district. The project with BRID 089-2342-01-001 the second priority, and so on. The effect of this feature can be observed in Table A.8., by examining the district priority field in the printout.

```
16 ON FINAL
089-1958-01-001
089-2342-01-001
013-2024-01-003
205-0994-01-001
```

Fig A.21. Format of the input file for the option of forwarding the final list of selected projects to the state level of the system.

The output of this option is a line printer file that includes a list of the projects to be considered by the state level program FINAL in the assembly of the final state wide list of projects to be funded. This file also exists in the format of a SAS data set that will be accessed by the FINAL state level program, see Fig 4.1, to be described later. The user has to be sure that the cumulative cost of the list does not violate the budget allocation initially apportioned by the state administrators. This can be checked by running the SCORE option with the list used in the FINAL option as an input for the automatically included projects. An example of the output obtained by running the FINAL option is depicted in Table A.8.

TABLE A.8. PRINTOUT FOR THE DISTRICT LEVEL REPORTING PROGRAM, FINAL OPTION

1SAS 20:26 WEDNESDAY, AUGUST 16, 1989 1

DISTRICT-16 ON -STATE SYSTEM FEDERAL AID BRIDGE REPLACEMENT
AND REHABILITATION PROGRAM
DISTRICT SELECTION

DISTRICT	COUNTY	HWY NO	CONT-SECT-STR	TYPE OF WORK	ESTIMATED COST
16	GOLIAD	02043	1958-01-001	REHABILITATE BRIDGE & APPROACHES	$86,000
BRIDGE LOCATION: CABEZA CREEK					
EXISTING FACILITY: 2 LANE, 23.3 FT ROADWAY			PROPOSED FACILITY: 2 LANE, 28 FT ROADWAY		
16	GOLIAD	02442	2342-01-001	REHABILITATE BRIDGE & APPROACHES	$51,000
BRIDGE LOCATION: HORD CREEK					
EXISTING FACILITY: 2 LANE, 26 FT ROADWAY			PROPOSED FACILITY: 2 LANE, 28 FT ROADWAY		
16	BEE	01465	2024-01-003	REHABILITATE BRIDGE & APPROACHES	$85,000
BRIDGE LOCATION: TOTO CREEK					
EXISTING FACILITY: 2 LANE, 26 FT ROADWAY			PROPOSED FACILITY: 2 LANE, 28 FT ROADWAY		
16	SAN PATRICIO	00630	0994-01-001	REPLACE BRIDGE & APPROACHES	$60,000
BRIDGE LOCATION: DRAW					
EXISTING FACILITY: 2 LANE, 19 FT ROADWAY			PROPOSED FACILITY: 2 LANE, 28 FT ROADWAY		
16	KARNES	02509	0100-12-052	REPLACE BRIDGE & APPROACHES	$23,000
BRIDGE LOCATION: DRAIN					
EXISTING FACILITY: 2 LANE, 24 FT ROADWAY			PROPOSED FACILITY: 2 LANE, 28 FT ROADWAY		

TABLE A.8. (continued)

DISTRICT-16 ON -STATE SYSTEM FEDERAL AID BRIDGE REPLACEMENT
AND REHABILITATION PROGRAM
DISTRICT SELECTION

DISTRICT	COUNTY	HWY NO	CONT-SECT-STR	TYPE OF WORK	ESTIMATED COST
16	NUECES	00044	0102-01-030	REHABILITATE BRIDGE & APPROACHES	$26,000
BRIDGE LOCATION: DONIGAN FLAT					
EXISTING FACILITY: 2 LANE, 24 FT ROADWAY			PROPOSED FACILITY: 2 LANE, 36 FT ROADWAY		
16	NUECES	00624	0989-02-003	REHABILITATE BRIDGE & APPROACHES	$38,000
BRIDGE LOCATION: DRAW					
EXISTING FACILITY: 2 LANE, 24 FT ROADWAY			PROPOSED FACILITY: 2 LANE, 40 FT ROADWAY		
16	NUECES	00624	0989-02-004	REHABILITATE BRIDGE & APPROACHES	$53,000
BRIDGE LOCATION: DRAW					
EXISTING FACILITY: 2 LANE, 24 FT ROADWAY			PROPOSED FACILITY: 2 LANE, 40 FT ROADWAY		
16	NUECES	00044	0102-01-003	REHABILITATE BRIDGE & APPROACHES	$58,000
BRIDGE LOCATION: OSO CR					
EXISTING FACILITY: 2 LANE, 23 FT ROADWAY			PROPOSED FACILITY: 2 LANE, 44 FT ROADWAY		
16	SAN PATRICIO	00666	1052-03-029	REHABILITATE BRIDGE & APPROACHES	$18,000
BRIDGE LOCATION: DRAW					
EXISTING FACILITY: 2 LANE, 18 FT ROADWAY			PROPOSED FACILITY: 2 LANE, 40 FT ROADWAY		
16	JIM WELLS	00359	0086-11-028	REHABILITATE BRIDGE & APPROACHES	$70,000
BRIDGE LOCATION: INTERMITTENT CR					
EXISTING FACILITY: 2 LANE, 24 FT ROADWAY			PROPOSED FACILITY: 2 LANE, 44 FT ROADWAY		

TABLE A.8. (continued)

DISTRICT-16 ON -STATE SYSTEM FEDERAL AID BRIDGE REPLACEMENT
AND REHABILITATION PROGRAM
DISTRICT SELECTION

DISTRICT	COUNTY	HWY NO	CONT-SECT-STR	TYPE OF WORK	ESTIMATED COST
16	NUECES	01889	1088-03-002	REHABILITATE BRIDGE & APPROACHES	$40,000
BRIDGE LOCATION: DRAW					
EXISTING FACILITY: 2 LANE, 24 FT ROADWAY			PROPOSED FACILITY: 2 LANE, 40 FT ROADWAY		
16	NUECES	00624	0989-02-008	REPLACE BRIDGE & APPROACHES	$66,000
BRIDGE LOCATION: DRAW					
EXISTING FACILITY: 2 LANE, 28 FT ROADWAY			PROPOSED FACILITY: 2 LANE, 40 FT ROADWAY		
16	NUECES	00666	1052-01-024	REHABILITATE BRIDGE & APPROACHES	$45,000
BRIDGE LOCATION: DRAW					
EXISTING FACILITY: 2 LANE, 20 FT ROADWAY			PROPOSED FACILITY: 2 LANE, 40 FT ROADWAY		
16	NUECES	00181	0101-06-033	REPLACE BRIDGE & APPROACHES	$11,969,000
BRIDGE LOCATION: NUECES BAY CAUSEWAY					
EXISTING FACILITY: 2 LANE, 28 FT ROADWAY			PROPOSED FACILITY: 3 LANE, 56 FT ROADWAY		
16	NUECES	00624	0989-02-005	REHABILITATE BRIDGE & APPROACHES	$32,000
BRIDGE LOCATION: DRAW					
EXISTING FACILITY: 2 LANE, 24 FT ROADWAY			PROPOSED FACILITY: 2 LANE, 40 FT ROADWAY		
16	LIVE OAK	00059	0542-06-015	REHABILITATE BRIDGE & APPROACHES	$70,000
BRIDGE LOCATION: TIMON CREEK					
EXISTING FACILITY: 2 LANE, 26 FT ROADWAY			PROPOSED FACILITY: 2 LANE, 44 FT ROADWAY		

TABLE A.8. (continued)

DISTRICT-16 ON -STATE SYSTEM FEDERAL AID BRIDGE REPLACEMENT
AND REHABILITATION PROGRAM
DISTRICT SELECTION

DISTRICT	COUNTY	HWY NO	CONT-SECT-STR	TYPE OF WORK	ESTIMATED COST
16	KARNES	00181	0100-06-073	REHABILITATE BRIDGE & APPROACHES	$48,000
BRIDGE LOCATION: CREEK					
EXISTING FACILITY: 4 LANE, 40 FT ROADWAY			PROPOSED FACILITY: 4 LANE, 68 FT ROADWAY		
16	NUECES	00666	1052-01-025	REPLACE BRIDGE & APPROACHES	$126,000
BRIDGE LOCATION: DRAW					
EXISTING FACILITY: 2 LANE, 20 FT ROADWAY			PROPOSED FACILITY: 2 LANE, 40 FT ROADWAY		
16	REFUGIO	00077	0371-03-031	REHABILITATE BRIDGE & APPROACHES	$36,000
BRIDGE LOCATION: DRAINAGE					
EXISTING FACILITY: 2 LANE, 40 FT ROADWAY			PROPOSED FACILITY: 2 LANE, 44 FT ROADWAY		
16	NUECES	00624	0989-02-002	REHABILITATE BRIDGE & APPROACHES	$18,000
BRIDGE LOCATION: DRAW					
EXISTING FACILITY: 2 LANE, 24 FT ROADWAY			PROPOSED FACILITY: 2 LANE, 40 FT ROADWAY		
16	JIM WELLS	00281	0255-01-026	REHABILITATE BRIDGE & APPROACHES	$31,000
BRIDGE LOCATION: DRAIN					
EXISTING FACILITY: 2 LANE, 36 FT ROADWAY			PROPOSED FACILITY: 2 LANE, 44 FT ROADWAY		
16	NUECES	01694	1742-01-002	REPLACE BRIDGE & APPROACHES	$70,000
BRIDGE LOCATION: DRAW					
EXISTING FACILITY: 2 LANE, 24 FT ROADWAY			PROPOSED FACILITY: 2 LANE, 40 FT ROADWAY		

TABLE A.8. (continued)

1SAS 20:26 WEDNESDAY, AUGUST 16, 1989 5

DISTRICT-16 ON -STATE SYSTEM FEDERAL AID BRIDGE REPLACEMENT
AND REHABILITATION PROGRAM
DISTRICT SELECTION

DISTRICT	COUNTY	HWY NO	CONT-SECT-STR	TYPE OF WORK	ESTIMATED COST
16	ARANSAS	00881	0507-04-007	REHABILITATE BRIDGE & APPROACHES	$18,000

BRIDGE LOCATION: DRAW

EXISTING FACILITY: 2 LANE, 20 FT ROADWAY PROPOSED FACILITY: 2 LANE, 40 FT ROADWAY

16	NUECES	00763	1093-01-004	REPLACE BRIDGE & APPROACHES	$140,000

BRIDGE LOCATION: DRAW

EXISTING FACILITY: 2 LANE, 24 FT ROADWAY PROPOSED FACILITY: 2 LANE, 40 FT ROADWAY

16	NUECES	00357	1069-01-004	REHABILITATE BRIDGE & APPROACHES	$20,000

BRIDGE LOCATION: DRAIN

EXISTING FACILITY: 2 LANE, 22 FT ROADWAY PROPOSED FACILITY: 0 LANE, 0 FT ROADWAY

16	REFUGIO	00077	0371-02-023	REHABILITATE BRIDGE & APPROACHES	$247,000

BRIDGE LOCATION: MELLON CR

EXISTING FACILITY: 2 LANE, 44 FT ROADWAY PROPOSED FACILITY: 2 LANE, 44 FT ROADWAY

DISTRICT TOTAL OF 27 SELECTED PROJECTS: $13,544,000

TABLE A.8. part 2 (continued)

DISTRICT-16 ON -STATE SYSTEM FEDERAL AID BRIDGE REPLACEMENT
AND REHABILITATION PROGRAM
DISTRICT SELECTION

	ADT	SUFFICIENCY RATINGS	CONDITION RATINGS RDWY	SUPR	SUB	COST/VEH	BRIDGE WIDTH RATIO	TEBS SCORE	DETOUR LENGTH	DISTRICT PRIORITY	DISTRICT ACCUM COST
1958-01-001	21	80	7	8	7	$4,095	0.832		14	1	$86,000
COMMENTS: THIS WAS A PROJECT WITH A LOW SCORE THAT WAS AT THE END OF THE PRIORITIZED LIST											
2342-01-001	278	75	8	8	8	$183	0.929		25	2	$137,000
COMMENTS: THIS WAS A PROJECT WITH A LOW SCORE THAT WAS AT THE END OF THE PRIORITIZED LIST											
2024-01-003	280	78	8	8	8	$304	0.929		11	3	$222,000
COMMENTS: THIS WAS A PROJECT WITH A LOW SCORE THAT WAS AT THE END OF THE PRIORITIZED LIST											
0994-01-001	164	20	6	7	3	$366	0.679		12	4	$282,000
COMMENTS:											
0100-12-052	45	49	8	6	3	$511	0.857		12	5	$305,000
COMMENTS:											

TABLE A.8. part 2 (continued)

DISTRICT-16 ON -STATE SYSTEM FEDERAL AID BRIDGE REPLACEMENT
AND REHABILITATION PROGRAM
DISTRICT SELECTION

	ADT	SUFFICIENCY RATINGS	CONDITION RATINGS RDWY	SUPR	SUB	COST/VEH	BRIDGE WIDTH RATIO	TEBS SCORE	DETOUR LENGTH	DISTRICT PRIORITY	DISTRICT ACCUM COST
0102-01-030	8,886	61	7	8	8	$3	0.545		1	6	$331,000
COMMENTS:											
0989-02-003	3,366	59	6	8	8	$11	0.545		20	7	$369,000
COMMENTS:											
0989-02-004	3,366	57	7	8	6	$16	0.545		20	8	$422,000
COMMENTS:											
0102-01-003	6,835	62	7	8	8	$8	0.523		1	9	$480,000
COMMENTS:											
1052-03-029	1,299	56	7	8	6	$14	0.474		50	10	$498,000
COMMENTS:											
0086-11-028	5,779	68	8	8	8	$12	0.545		1	11	$568,000
COMMENTS:											

TABLE A.8. part 2 (continued)

DISTRICT-16 ON -STATE SYSTEM FEDERAL AID BRIDGE REPLACEMENT
AND REHABILITATION PROGRAM
DISTRICT SELECTION

	ADT	SUFFICIENCY RATINGS	CONDITION RATINGS RDWY	SUPR	SUB	COST/VEH	BRIDGE WIDTH RATIO	TEBS SCORE	DETOUR LENGTH	DISTRICT PRIORITY	DISTRICT ACCUM COST
1088-03-002	5,508	63	7	8	8	$7	0.545		4	12	$608,000
	COMMENTS:										
0989-02-008	2,722	36	8	7	4	$24	0.700		5	13	$674,000
	COMMENTS:										
1052-01-024	1,108	51	6	6	5	$41	0.526		45	14	$719,000
	COMMENTS:										
0101-06-033	13,344	38	6	6	4	$897	0.636		50	15	$12,688,000
	COMMENTS:										
0989-02-005	3,366	61	7	8	7	$10	0.545		20	16	$12,720,000
	COMMENTS:										
0542-06-015	9,330	69	7	7	8	$8	0.591		8	17	$12,790,000
	COMMENTS:										

TABLE A.8. part 2 (continued)

1SAS 20:26 WEDNESDAY, AUGUST 16, 1989 4

DISTRICT-16 ON -STATE SYSTEM FEDERAL AID BRIDGE REPLACEMENT
AND REHABILITATION PROGRAM
DISTRICT SELECTION

	ADT	SUFFICIENCY RATINGS	CONDITION RATINGS RDWY	SUPR	SUB	COST/VEH	BRIDGE WIDTH RATIO	TEBS SCORE	DETOUR LENGTH	DISTRICT PRIORITY	DISTRICT ACCUM COST
0100-06-073	3,366	52	8	6	4	$14	0.909		6	18	$12,838,000
COMMENTS:											
1052-01-025	1,108	48	7	5	5	$114	0.526		45	19	$12,964,000
COMMENTS:											
0371-03-031	7,328	61	8	8	6	$5	0.909		99	20	$13,000,000
COMMENTS:											
0989-02-002	2,722	60	7	8	8	$7	0.600		17	21	$13,018,000
COMMENTS:											
0255-01-026	6,892	64	7	8	8	$4	0.818		99	22	$13,049,000
COMMENTS:											
1742-01-002	861	36	7	7	4	$81	0.632		17	23	$13,119,000
COMMENTS:											

TABLE A.8. part 2 (continued)

DISTRICT-16 ON -STATE SYSTEM FEDERAL AID BRIDGE REPLACEMENT
AND REHABILITATION PROGRAM
DISTRICT SELECTION

	ADT	SUFFICIENCY RATINGS	CONDITION RATINGS RDWY	SUPR	SUB	COST/VEH	BRIDGE WIDTH RATIO	TEBS SCORE	DETOUR LENGTH	DISTRICT PRIORITY	DISTRICT ACCUM COST
0507-04-007	3,496	73	7	8	8	$5	0.455		15	24	$13,137,000
COMMENTS:											
1093-01-004	1,095	36	7	7	4	$128	0.632		14	25	$13,277,000
COMMENTS:											
1069-01-004	2,678	67	7	8	8	$7	0.550		4	26	$13,297,000
COMMENTS:											
0371-02-023	9,207	54	7	5	5	$27	1.000		99	27	$13,544,000
COMMENTS:											

DISTRICT TOTAL OF 27 SELECTED PROJECTS: $13,544,000

THE STATE LEVEL REPORTING MODULE FINAL

The FINAL reporting module has several options available to process the information forwarded by the districts and allow the State level decision maker to assemble the final list of projects to be submitted for contracting. The first screen presents the user with several options and is depicted in Fig A.22. The user will work in a district by district basis with options 1 and 2 of the program. The options 3 and 4 of the program, will only be used when the user has already processed the data for all the districts in the State and has the final list of projects to be forwarded for bidding and contracting on a district by district basis.

```
  Command ===>
THIS IS THE MAIN MENU OF THE FINAL MODULE. THE OBJECTIVE OF THIS
MODULE IS TO ALLOW THE DECISION MAKER AT THE STATE LEVEL OF THE
SYSTEM TO TAKE THE DISTRICTS INPUT INTO ACCOUNT. THE DATA SETS OF
THE DISTRICTS FINAL SELECTION NEED TO BE AVAILABLE FOR THE USER TO
MODIFY OR ACCEPT THEM.BELLOW THE USER SHOULD SELECT THE OPTION OF
THEMENU THE DISTRICT AND THE SYSTEM. FOR OPTIONS 3 AND 4 THERE IS
NO NEED TO SPECIFY A DISTRICT.

                       |OPTIONS:|

   1- BROWSE THROUGH AND PRINT THE DISTRICTS SELECTION.

   2- ADD OR DELETE PROJECTS TO THE DISTRICT SELECTION,PRINT REPORT.

   3- ASSEMBLE THE FINAL LIST OF PROJECTS FOR ALL THE DISTRICTS.

   4- UPDATE THE PREVIOUSLY SELECTED LIST OF PROJECTS.

   OPTION: ____________          IS THERE AVAILABLE DATA FOR
                                 THE DISTRICT YOU ARE WILLING TO
   SYSTEM: ____________          RUN IN OPTIONS 1 AND 2 OF THE MENU?

   DISTRICT: ____________             ANSWER: ___
```

Fig A.22. First screen for the program FINAL presenting several menu options.

The option of browsing through the districts selections

The first option allows the user to browse through the districts selections and also print them. To use this option move the cursor to the OPTION field and type the number 1 or leave the default value 1 as it is. Move the cursor to the SYSTEM field and change the default value, ON to OFF, if necessary. Move the cursor to the DISTRICT field and type the district number that is being processed. Please note that if the district under processing has not forwarded any selections, the user needs to create the selections from scratch. This is accomplished by answering NO to the question whether data is available for the district that is being processed. Type END in the command line when satisfied with the selections presented by the screen, followed by the return key. After some processing time the screen depicted in Fig A.23. will pop-up in the terminal's screen, where one of the projects selected by the district under processing will be displayed.

The user is able to display the other projects selected by the specific district by typing the numbers 2, 3 and so forth in the command line and hitting the return key. These numbers correspond to the priority assigned by the districts to their projects. Each project will be displayed in a separate screen, identified by an observation number. A specific project can be displayed by typing the observation number in the command line.

If a specific project, with a specific BRID, needs to be displayed, the user should type the command IF BRID= XXX-XXXX-XX-XXX, where XXX-XXXX-XX-XXX is the specified BRID of the project to be displayed. If the project with the specified BRID is included in the district selection, it will be appear in the screen. After satisfied with browsing through the district's selection type END in the command line, followed by the return key to proceed with the execution. After some processing time the system prompt will appear in the screen. The user should look for the output file presented in Table A.9. This output looks exactly as the output obtained in table A-8 by running the FINAL option of the district level reporting module. It will include a list of the district's selection, ranked by the district priority.

```
Command==>
=====THIS IS THE DISTRICT LEVEL SELECTION OF PROJECTS==========
DATA FOR STRUCTURE WITH BRID= 089-1958-01-001  DISTRICT= 16
COUNTY: GOULIAD  BRIDGE: CABEZA CREEK        8506
               LOCATION
===================================  DECK: 7     ROADWAY WIDTH
|ATTR|     VALUE        |PERCENTILES|   SUB: 7     EXISTING: 23.3
|====|==================|===========|  SUPER: 8     PROPOSED:    28
|CPV |          $4,095 |          1 |
|ADT |              21 |          0 |
|SR  |              80 |          1 |
|BWR |           0.832 |         29 | DETOUR LENGTH: 14
|DSS |               7 |         46 |
|====|==================|===========| COST: $86,000

  TYPE OF WORK: REHABILITATE BRIDGE & APPROACHES
 ===================DISTRICT INPUT==============================

 DISTRICT PRIORITY: 1

COMMENTS: ________________________________________________________
```

Fig A.23. Browsing through one district's selection

TABLE A.9. PRINT A DISTRICT'S SELECTION AT THE STATE LEVEL

1SAS 12:03 THURSDAY, AUGUST 17, 1989 1

DISTRICT-16 ON -STATE SYSTEM FEDERAL AID BRIDGE REPLACEMENT
AND REHABILITATION PROGRAM
DISTRICT SELECTION

DISTRICT	COUNTY	HWY NO	CONT-SECT-STR	TYPE OF WORK	ESTIMATED COST
16	GOLIAD	02043	1958-01-001	REHABILITATE BRIDGE & APPROACHES	$86,000
BRIDGE LOCATION: CABEZA CREEK					
EXISTING FACILITY: 2 LANE, 23.3 FT ROADWAY			PROPOSED FACILITY: 2 LANE, 28 FT ROADWAY		
16	GOLIAD	02442	2342-01-001	REHABILITATE BRIDGE & APPROACHES	$51,000
BRIDGE LOCATION: HORD CREEK					
EXISTING FACILITY: 2 LANE, 26 FT ROADWAY			PROPOSED FACILITY: 2 LANE, 28 FT ROADWAY		
16	BEE	01465	2024-01-003	REHABILITATE BRIDGE & APPROACHES	$85,000
BRIDGE LOCATION: TOTO CREEK					
EXISTING FACILITY: 2 LANE, 26 FT ROADWAY			PROPOSED FACILITY: 2 LANE, 28 FT ROADWAY		
16	SAN PATRICIO	00630	0994-01-001	REPLACE BRIDGE & APPROACHES	$60,000
BRIDGE LOCATION: DRAW					
EXISTING FACILITY: 2 LANE, 19 FT ROADWAY			PROPOSED FACILITY: 2 LANE, 28 FT ROADWAY		
16	KARNES	02509	0100-12-052	REPLACE BRIDGE & APPROACHES	$23,000
BRIDGE LOCATION: DRAIN					
EXISTING FACILITY: 2 LANE, 24 FT ROADWAY			PROPOSED FACILITY: 2 LANE, 28 FT ROADWAY		

TABLE A.9. (continued)

1SAS   12:03 THURSDAY, AUGUST 17, 1989   2

DISTRICT-16 ON -STATE SYSTEM FEDERAL AID BRIDGE REPLACEMENT
AND REHABILITATION PROGRAM
DISTRICT SELECTION

DISTRICT	COUNTY	HWY NO	CONT-SECT-STR	TYPE OF WORK	ESTIMATED COST
16	NUECES	00044	0102-01-030	REHABILITATE BRIDGE & APPROACHES	$26,000
BRIDGE LOCATION: DONIGAN FLAT					
EXISTING FACILITY: 2 LANE, 24 FT ROADWAY			PROPOSED FACILITY: 2 LANE, 36 FT ROADWAY		
16	NUECES	00624	0989-02-003	REHABILITATE BRIDGE & APPROACHES	$38,000
BRIDGE LOCATION: DRAW					
EXISTING FACILITY: 2 LANE, 24 FT ROADWAY			PROPOSED FACILITY: 2 LANE, 40 FT ROADWAY		
16	NUECES	00624	0989-02-004	REHABILITATE BRIDGE & APPROACHES	$53,000
BRIDGE LOCATION: DRAW					
EXISTING FACILITY: 2 LANE, 24 FT ROADWAY			PROPOSED FACILITY: 2 LANE, 40 FT ROADWAY		
16	NUECES	00044	0102-01-003	REHABILITATE BRIDGE & APPROACHES	$58,000
BRIDGE LOCATION: OSO CR					
EXISTING FACILITY: 2 LANE, 23 FT ROADWAY			PROPOSED FACILITY: 2 LANE, 44 FT ROADWAY		
16	SAN PATRICIO	00666	1052-03-029	REHABILITATE BRIDGE & APPROACHES	$18,000
BRIDGE LOCATION: DRAW					
EXISTING FACILITY: 2 LANE, 18 FT ROADWAY			PROPOSED FACILITY: 2 LANE, 40 FT ROADWAY		
16	JIM WELLS	00359	0086-11-028	REHABILITATE BRIDGE & APPROACHES	$70,000
BRIDGE LOCATION: INTERMITTENT CR					
EXISTING FACILITY: 2 LANE, 24 FT ROADWAY			PROPOSED FACILITY: 2 LANE, 44 FT ROADWAY		

TABLE A.9. (continued)

DISTRICT-16 ON -STATE SYSTEM FEDERAL AID BRIDGE REPLACEMENT
AND REHABILITATION PROGRAM
DISTRICT SELECTION

DISTRICT	COUNTY	HWY NO	CONT-SECT-STR	TYPE OF WORK	ESTIMATED COST
16	NUECES	01889	1088-03-002	REHABILITATE BRIDGE & APPROACHES	$40,000
BRIDGE LOCATION: DRAW					
EXISTING FACILITY: 2 LANE, 24 FT ROADWAY			PROPOSED FACILITY: 2 LANE, 40 FT ROADWAY		
16	NUECES	00624	0989-02-008	REPLACE BRIDGE & APPROACHES	$66,000
BRIDGE LOCATION: DRAW					
EXISTING FACILITY: 2 LANE, 28 FT ROADWAY			PROPOSED FACILITY: 2 LANE, 40 FT ROADWAY		
16	NUECES	00666	1052-01-024	REHABILITATE BRIDGE & APPROACHES	$45,000
BRIDGE LOCATION: DRAW					
EXISTING FACILITY: 2 LANE, 20 FT ROADWAY			PROPOSED FACILITY: 2 LANE, 40 FT ROADWAY		
16	NUECES	00181	0101-06-033	REPLACE BRIDGE & APPROACHES	$11,969,000
BRIDGE LOCATION: NUECES BAY CAUSEWAY					
EXISTING FACILITY: 2 LANE, 28 FT ROADWAY			PROPOSED FACILITY: 3 LANE, 56 FT ROADWAY		
16	NUECES	00624	0989-02-005	REHABILITATE BRIDGE & APPROACHES	$32,000
BRIDGE LOCATION: DRAW					
EXISTING FACILITY: 2 LANE, 24 FT ROADWAY			PROPOSED FACILITY: 2 LANE, 40 FT ROADWAY		
16	LIVE OAK	00059	0542-06-015	REHABILITATE BRIDGE & APPROACHES	$70,000
BRIDGE LOCATION: TIMON CREEK					
EXISTING FACILITY: 2 LANE, 26 FT ROADWAY			PROPOSED FACILITY: 2 LANE, 44 FT ROADWAY		

TABLE A.9. (continued)

1SAS 12:03 THURSDAY, AUGUST 17, 1989 4

DISTRICT-16 ON -STATE SYSTEM FEDERAL AID BRIDGE REPLACEMENT
AND REHABILITATION PROGRAM
DISTRICT SELECTION

DISTRICT	COUNTY	HWY NO	CONT-SECT-STR	TYPE OF WORK	ESTIMATED COST
16	KARNES	00181	0100-06-073	REHABILITATE BRIDGE & APPROACHES	$48,000
BRIDGE LOCATION: CREEK					
EXISTING FACILITY: 4 LANE, 40 FT ROADWAY			PROPOSED FACILITY: 4 LANE, 68 FT ROADWAY		
16	NUECES	00666	1052-01-025	REPLACE BRIDGE & APPROACHES	$126,000
BRIDGE LOCATION: DRAW					
EXISTING FACILITY: 2 LANE, 20 FT ROADWAY			PROPOSED FACILITY: 2 LANE, 40 FT ROADWAY		
16	REFUGIO	00077	0371-03-031	REHABILITATE BRIDGE & APPROACHES	$36,000
BRIDGE LOCATION: DRAINAGE					
EXISTING FACILITY: 2 LANE, 40 FT ROADWAY			PROPOSED FACILITY: 2 LANE, 44 FT ROADWAY		
16	NUECES	00624	0989-02-002	REHABILITATE BRIDGE & APPROACHES	$18,000
BRIDGE LOCATION: DRAW					
EXISTING FACILITY: 2 LANE, 24 FT ROADWAY			PROPOSED FACILITY: 2 LANE, 40 FT ROADWAY		
16	JIM WELLS	00281	0255-01-026	REHABILITATE BRIDGE & APPROACHES	$31,000
BRIDGE LOCATION: DRAIN					
EXISTING FACILITY: 2 LANE, 36 FT ROADWAY			PROPOSED FACILITY: 2 LANE, 44 FT ROADWAY		
16	NUECES	01694	1742-01-002	REPLACE BRIDGE & APPROACHES	$70,000
BRIDGE LOCATION: DRAW					
EXISTING FACILITY: 2 LANE, 24 FT ROADWAY			PROPOSED FACILITY: 2 LANE, 40 FT ROADWAY		

TABLE A.9. (continued)

DISTRICT-16 ON -STATE SYSTEM FEDERAL AID BRIDGE REPLACEMENT
AND REHABILITATION PROGRAM
DISTRICT SELECTION

DISTRICT	COUNTY	HWY NO	CONT-SECT-STR	TYPE OF WORK	ESTIMATED COST
16	ARANSAS	00881	0507-04-007	REHABILITATE BRIDGE & APPROACHES	$18,000
BRIDGE LOCATION: DRAW					
EXISTING FACILITY: 2 LANE, 20 FT ROADWAY			PROPOSED FACILITY: 2 LANE, 40 FT ROADWAY		
16	NUECES	00763	1093-01-004	REPLACE BRIDGE & APPROACHES	$140,000
BRIDGE LOCATION: DRAW					
EXISTING FACILITY: 2 LANE, 24 FT ROADWAY			PROPOSED FACILITY: 2 LANE, 40 FT ROADWAY		
16	NUECES	00357	1069-01-004	REHABILITATE BRIDGE & APPROACHES	$20,000
BRIDGE LOCATION: DRAIN					
EXISTING FACILITY: 2 LANE, 22 FT ROADWAY			PROPOSED FACILITY: 0 LANE, 0 FT ROADWAY		
16	REFUGIO	00077	0371-02-023	REHABILITATE BRIDGE & APPROACHES	$247,000
BRIDGE LOCATION: MELLON CR					
EXISTING FACILITY: 2 LANE, 44 FT ROADWAY			PROPOSED FACILITY: 2 LANE, 44 FT ROADWAY		
			DISTRICT TOTAL OF 27 SELECTED PROJECTS:		$13,544,000

TABLE A.9. part 2 (continued)

1SAS 12:03 THURSDAY, AUGUST 17, 1989 1

DISTRICT-16 ON -STATE SYSTEM FEDERAL AID BRIDGE REPLACEMENT
AND REHABILITATION PROGRAM
DISTRICT SELECTION

	ADT	SUFFICIENCY RATINGS	CONDITION RATINGS RDWY	SUPR	SUB	COST/VEH	BRIDGE WIDTH RATIO	TEBS SCORE	DETOUR LENGTH	DISTRICT PRIORITY	DISTRICT ACCUM COST
1958-01-001	21	80	7	8	7	$4,095	0.832		14	1	$86,000
COMMENTS: THIS WAS A PROJECT WITH A LOW SCORE THAT WAS AT THE END OF THE PRIORITIZED LIST											
2342-01-001	278	75	8	8	8	$183	0.929		25	2	$137,000
COMMENTS: THIS WAS A PROJECT WITH A LOW SCORE THAT WAS AT THE END OF THE PRIORITIZED LIST											
2024-01-003	280	78	8	8	8	$304	0.929		11	3	$222,000
COMMENTS: THIS WAS A PROJECT WITH A LOW SCORE THAT WAS AT THE END OF THE PRIORITIZED LIST											
0994-01-001	164	20	6	7	3	$366	0.679		12	4	$282,000
COMMENTS: M M											
0100-12-052	45	49	8	6	3	$511	0.857		12	5	$305,000
COMMENTS: M M											

TABLE A.9. part 2 (continued)

DISTRICT-16 ON -STATE SYSTEM FEDERAL AID BRIDGE REPLACEMENT
AND REHABILITATION PROGRAM
DISTRICT SELECTION

	ADT	SUFFICIENCY RATINGS	CONDITION RATINGS RDWY	SUPR	SUB	COST/VEH	BRIDGE WIDTH RATIO	TEBS SCORE	DETOUR LENGTH	DISTRICT PRIORITY	DISTRICT ACCUM COST
0102-01-030	8,886	61	7	8	8	$3	0.545		1	6	$331,000
	COMMENTS: M M										
0989-02-003	3,366	59	6	8	8	$11	0.545		20	7	$369,000
	COMMENTS: M M										
0989-02-004	3,366	57	7	8	6	$16	0.545		20	8	$422,000
	COMMENTS: M M										
0102-01-003	6,835	62	7	8	8	$8	0.523		1	9	$480,000
	COMMENTS: M M										
1052-03-029	1,299	56	7	8	6	$14	0.474		50	10	$498,000
	COMMENTS: M M										
0086-11-028	5,779	68	8	8	8	$12	0.545		1	11	$568,000
	COMMENTS: M M										

TABLE A.9. part 2 (continued)

1SAS 12:03 THURSDAY, AUGUST 17, 1989 3

DISTRICT-16 ON -STATE SYSTEM FEDERAL AID BRIDGE REPLACEMENT
AND REHABILITATION PROGRAM
DISTRICT SELECTION

	ADT	SUFFICIENCY RATINGS	CONDITION RATINGS RDWY	SUPR	SUB	COST/VEH	BRIDGE WIDTH RATIO	TEBS SCORE	DETOUR LENGTH	DISTRICT PRIORITY	DISTRICT ACCUM COST
1088-03-002	5,508	63	7	8	8	$7	0.545		4	12	$608,000
COMMENTS: M M											
0989-02-008	2,722	36	8	7	4	$24	0.700		5	13	$674,000
COMMENTS: M M											
1052-01-024	1,108	51	6	6	5	$41	0.526		45	14	$719,000
COMMENTS: M M											
0101-06-033	13,344	38	6	6	4	$897	0.636		50	15	$12,688,000
COMMENTS: M M											
0989-02-005	3,366	61	7	8	7	$10	0.545		20	16	$12,720,000
COMMENTS: M M											
0542-06-015	9,330	69	7	7	8	$8	0.591		8	17	$12,790,000
COMMENTS: M M											

TABLE A.9. part 2 (continued)

DISTRICT-16 ON -STATE SYSTEM FEDERAL AID BRIDGE REPLACEMENT
AND REHABILITATION PROGRAM
DISTRICT SELECTION

	ADT	SUFFICIENCY RATINGS	CONDITION RATINGS RDWY	SUPR	SUB	COST/VEH	BRIDGE WIDTH RATIO	TEBS SCORE	DETOUR LENGTH	DISTRICT PRIORITY	DISTRICT ACCUM COST
0100-06-073	3,366	52	8	6	4	$14	0.909		6	18	$12,838,000
COMMENTS: M M											
1052-01-025	1,108	48	7	5	5	$114	0.526		45	19	$12,964,000
COMMENTS: M M											
0371-03-031	7,328	61	8	8	6	$5	0.909		99	20	$13,000,000
COMMENTS: M M											
0989-02-002	2,722	60	7	8	8	$7	0.600		17	21	$13,018,000
COMMENTS: M M											
0255-01-026	6,892	64	7	8	8	$4	0.818		99	22	$13,049,000
COMMENTS: M M											
1742-01-002	861	36	7	7	4	$81	0.632		17	23	$13,119,000
COMMENTS: M M											

TABLE A.9. part 2 (continued)

DISTRICT-16 ON -STATE SYSTEM FEDERAL AID BRIDGE REPLACEMENT
AND REHABILITATION PROGRAM
DISTRICT SELECTION

	ADT	SUFFICIENCY RATINGS	CONDITION RATINGS RDWY	SUPR	SUB	COST/VEH	BRIDGE WIDTH RATIO	TEBS SCORE	DETOUR LENGTH	DISTRICT PRIORITY	DISTRICT ACCUM COST
0507-04-007	3,496	73	7	8	8	$5	0.455		15	24	$13,137,000
COMMENTS: M M											
1093-01-004	1,095	36	7	7	4	$128	0.632		14	25	$13,277,000
COMMENTS: M M											
1069-01-004	2,678	67	7	8	8	$7	0.550		4	26	$13,297,000
COMMENTS: M M											
0371-02-023	9,207	54	7	5	5	$27	1.000		99	27	$13,544,000
COMMENTS: M M											

DISTRICT TOTAL OF 27 SELECTED PROJECTS: $13,544,000

If no data is available for the district because no list of district selections was forwarded, type NO in the appropriate field of the screen presented in Fig A.22. and the screen displayed in Fig A.24. will be presented, type END in the command line to accept it and refer to the instructions in a coming paragraph to create a district selection at the state level, starting from scratch.

```
Command ===>



                THIS DISTRICT DOES NOT HAVE DATA AVAILABLE.

                THE USER CAN ADD THE SELECTION FOR THIS

                DISTRICT USING OPTION 2 OF THE MENU AND

                ANSWERING 'NO', AS WITH THIS OPTION,

                FOR THE QUESTION ABOUT AVAILABILITY OF DATA.
```

Fig A.24 Screen displayed if the option NO is selected in Fig A.22. for availability of data.

The option of adding or deleting projects to the district's selections

To use this option submit the FINAL program for processing in the usual way processing jobs are submitted to your computer system. The screen depicted in

Fig A.22. will be presented in the computer terminal screen. Select option 2, the appropriate system ON or OFF and the appropriate district number. Make sure data from the district selections is available for processing. Type END in the command line followed by the return key when satisfied with all the inputs. The screen depicted in Fig A.25. will appear in the computer's terminal.

```
Command===>
==THIS SCREEN ALLOWS YOU TO ADD PROJECTS BY THE BRID OR DELETE==
DATA FOR STRUCTURE WITH BRID= 196-0371-02-023  DISTRICT= 16
COUNTY: REFUGIO  BRIDGE: MELLON CR          8611
               LOCATION
===================================  DECK: 7      ROADWAY WIDTH
|ATTR|    VALUE        |PERCENTILES|  SUB: 5      EXISTING: 44
|====|=================|===========| SUPER: 5     PROPOSED: 44
|CPV |             $27 |         1 |
|ADT |           9,207 |         0 |
|SR  |              54 |         1 |
|BWR |               1 |        29 | DETOUR LENGTH: 99
|DSS |               5 |        46 |
|====|=================|===========| COST: $247,000

  TYPE OF WORK: REHABILITATE BRIDGE & APPROACHES
 ===================DISTRICT INPUT=================================

 DISTRICT PRIORITY: 27

COMMENTS: ________________________________________________________
```

Fig A.25 Adding or deleting projects to the district's selections.

To add a project to the district's selection, type ADD in the command line, followed by the return key. A screen with blank fields will be presented, like the one in Fig A.26. Move the cursor to the BRID field and type the BRID number, in the appropriate format, for the project whose addition is needed. There is no need to fill the other fields.

```
Command===>
==THIS SCREEN ALLOWS YOU TO ADD PROJECTS BY THE BRID OR DELETE THEM=
DATA FOR STRUCTURE WITH BRID= _______________    DISTRICT= __
COUNTY: ____________       BRIDGE: __________________________________
                        LOCATION
 ===================================    DECK: ___      ROADWAY WIDTH
 |ATTR|     VALUE      |PERCENTILES|  SUB: ___     EXISTING: ____
 |====|================|===========|  SUPER: ___   PROPOSED: ____
 |CPV |  ______________ |  _______  |
 |ADT |  ______________ |  _______  |
 |SR  |  ______________ |  _______  |
 |BWR |  ______________ |  _______  |       DETOUR LENGTH: ______
 |DSS |  ______________ |  _______  |
 |====|================|===========|       COST: _______________

 TYPE OF WORK: ________________________________
===================DISTRICT INPUT=================================

DISTRICT PRIORITY: ____

COMMENTS: ___________________________________________________
```

Fig A.26. Adding a project to the district's selection.

If there is a desire to delete a specific project from the district's selection type the command IF BRID = [Desired BRID] in the command line and the desired project will be displayed in the terminal screen. Use the list printed in option one, browsing through the district's selection, to choose the projects for deletion, if any. With the project to be deleted displayed in the computer terminal screen, type the command DELETE in the command line, followed by the return key. The screen should look like the screen presented in Fig A.26. with all the fields empty. In SAS jargon this means that all the variables were set to missing. It is possible to browse through the modified list by typing the observation number in the command line, 1 through the total number of observations in the district list. The observations will include both district selections and state level additions, but would not include the state level deletions. When the list is adequate, type END in the command line, followed by the return key to proceed.

The next screen will allow the user to browse trough the district's list that he modified in the last screen. The screen depicted in Fig A.27. will be displayed in the computer terminal's screen. It is possible to use the IF BRID= command, as usual, to locate a project with a specific BRID. When END is typed in the command line, followed by the return key, the execution will proceed and an output file will be generated which is presented in Table A.10. If the user is not happy with the current status of the district's selections, it is possible to submit FINAL for processing again. Choose option 2 of the main menu, presented in Fig A.22., and modify the district selections again. This process can be repeated until the user is happy with the selections.

```
Command===>
====THIS SCREEN ALLOWS YOU TO CHECK THE MODIFICATIONS JUST MADE==
DATA FOR STRUCTURE WITH BRID= 089-1958-01-001  DISTRICT= 16
COUNTY: GOULIAD  BRIDGE: CABEZA CREEK        8506
               LOCATION
===================================   DECK: 7     ROADWAY WIDTH
|ATTR|     VALUE      |PERCENTILES|    SUB: 7     EXISTING: 23.3
|====|================|===========|  SUPER: 8     PROPOSED:    28
|CPV |          $4,095 |          1 |
|ADT |              21 |          0 |
|SR  |              80 |          1 |
|BWR |           0.832 |         29 | DETOUR LENGTH: 14
|DSS |               7 |         46 |
|====|================|===========| COST: $86,000

  TYPE OF WORK: REHABILITATE BRIDGE & APPROACHES
 ===================DISTRICT INPUT===========================

 DISTRICT PRIORITY: 1

COMMENTS: ________________________________________________
```

Fig A.27. Browsing through the modifications made to the district's selections.

TABLE A.10. OPTION MODIFY A DISTRICT'S SELECTION

1SAS 14:50 THURSDAY, AUGUST 17, 1989 1

DISTRICT-16 ON -STATE SYSTEM FEDERAL AID BRIDGE REPLACEMENT
AND REHABILITATION PROGRAM
FINAL LIST OF PROJECTS

DISTRICT	COUNTY	HWY NO	CONT-SECT-STR	TYPE OF WORK	ESTIMATED COST
16	NUECES	00666	1052-01-026	REPLACE BRIDGE & APPROACHES	$808,000
BRIDGE LOCATION: DRAW					
EXISTING FACILITY: 2 LANE, 20 FT ROADWAY			PROPOSED FACILITY: 2 LANE, 40 FT ROADWAY		
16	GOLIAD	02043	1958-01-001	REHABILITATE BRIDGE & APPROACHES	$86,000
BRIDGE LOCATION: CABEZA CREEK					
EXISTING FACILITY: 2 LANE, 23.3 FT ROADWAY			PROPOSED FACILITY: 2 LANE, 28 FT ROADWAY		
16	GOLIAD	02442	2342-01-001	REHABILITATE BRIDGE & APPROACHES	$51,000
BRIDGE LOCATION: HORD CREEK					
EXISTING FACILITY: 2 LANE, 26 FT ROADWAY			PROPOSED FACILITY: 2 LANE, 28 FT ROADWAY		
16	BEE	01465	2024-01-003	REHABILITATE BRIDGE & APPROACHES	$85,000
BRIDGE LOCATION: TOTO CREEK					
EXISTING FACILITY: 2 LANE, 26 FT ROADWAY			PROPOSED FACILITY: 2 LANE, 28 FT ROADWAY		
16	SAN PATRICIO	00630	0994-01-001	REPLACE BRIDGE & APPROACHES	$60,000
BRIDGE LOCATION: DRAW					
EXISTING FACILITY: 2 LANE, 19 FT ROADWAY			PROPOSED FACILITY: 2 LANE, 28 FT ROADWAY		

TABLE A.10. (continued)

DISTRICT-16 ON -STATE SYSTEM FEDERAL AID BRIDGE REPLACEMENT
AND REHABILITATION PROGRAM
FINAL LIST OF PROJECTS

DISTRICT	COUNTY	HWY NO	CONT-SECT-STR	TYPE OF WORK	ESTIMATED COST
16	KARNES	02509	0100-12-052	REPLACE BRIDGE & APPROACHES	$23,000
BRIDGE LOCATION: DRAIN					
EXISTING FACILITY: 2 LANE, 24 FT ROADWAY			PROPOSED FACILITY: 2 LANE, 28 FT ROADWAY		
16	NUECES	00044	0102-01-030	REHABILITATE BRIDGE & APPROACHES	$26,000
BRIDGE LOCATION: DONIGAN FLAT					
EXISTING FACILITY: 2 LANE, 24 FT ROADWAY			PROPOSED FACILITY: 2 LANE, 36 FT ROADWAY		
16	NUECES	00624	0989-02-003	REHABILITATE BRIDGE & APPROACHES	$38,000
BRIDGE LOCATION: DRAW					
EXISTING FACILITY: 2 LANE, 24 FT ROADWAY			PROPOSED FACILITY: 2 LANE, 40 FT ROADWAY		
16	NUECES	00624	0989-02-004	REHABILITATE BRIDGE & APPROACHES	$53,000
BRIDGE LOCATION: DRAW					
EXISTING FACILITY: 2 LANE, 24 FT ROADWAY			PROPOSED FACILITY: 2 LANE, 40 FT ROADWAY		
16	NUECES	00044	0102-01-003	REHABILITATE BRIDGE & APPROACHES	$58,000
BRIDGE LOCATION: OSO CR					
EXISTING FACILITY: 2 LANE, 23 FT ROADWAY			PROPOSED FACILITY: 2 LANE, 44 FT ROADWAY		
16	SAN PATRICIO	00666	1052-03-029	REHABILITATE BRIDGE & APPROACHES	$18,000
BRIDGE LOCATION: DRAW					
EXISTING FACILITY: 2 LANE, 18 FT ROADWAY			PROPOSED FACILITY: 2 LANE, 40 FT ROADWAY		

TABLE A.10. (continued)

DISTRICT-16 ON -STATE SYSTEM FEDERAL AID BRIDGE REPLACEMENT
AND REHABILITATION PROGRAM
FINAL LIST OF PROJECTS

DISTRICT	COUNTY	HWY NO	CONT-SECT-STR	TYPE OF WORK	ESTIMATED COST
16	JIM WELLS	00359	0086-11-028	REHABILITATE BRIDGE & APPROACHES	$70,000
BRIDGE LOCATION: INTERMITTENT CR					
EXISTING FACILITY: 2 LANE, 24 FT ROADWAY			PROPOSED FACILITY: 2 LANE, 44 FT ROADWAY		
16	NUECES	01889	1088-03-002	REHABILITATE BRIDGE & APPROACHES	$40,000
BRIDGE LOCATION: DRAW					
EXISTING FACILITY: 2 LANE, 24 FT ROADWAY			PROPOSED FACILITY: 2 LANE, 40 FT ROADWAY		
16	NUECES	00624	0989-02-008	REPLACE BRIDGE & APPROACHES	$66,000
BRIDGE LOCATION: DRAW					
EXISTING FACILITY: 2 LANE, 28 FT ROADWAY			PROPOSED FACILITY: 2 LANE, 40 FT ROADWAY		
16	NUECES	00666	1052-01-024	REHABILITATE BRIDGE & APPROACHES	$45,000
BRIDGE LOCATION: DRAW					
EXISTING FACILITY: 2 LANE, 20 FT ROADWAY			PROPOSED FACILITY: 2 LANE, 40 FT ROADWAY		
16	NUECES	00181	0101-06-033	REPLACE BRIDGE & APPROACHES	$11,969,000
BRIDGE LOCATION: NUECES BAY CAUSEWAY					
EXISTING FACILITY: 2 LANE, 28 FT ROADWAY			PROPOSED FACILITY: 3 LANE, 56 FT ROADWAY		
16	NUECES	00624	0989-02-005	REHABILITATE BRIDGE & APPROACHES	$32,000
BRIDGE LOCATION: DRAW					
EXISTING FACILITY: 2 LANE, 24 FT ROADWAY			PROPOSED FACILITY: 2 LANE, 40 FT ROADWAY		

TABLE A.10. (continued)

1SAS 14:50 THURSDAY, AUGUST 17, 1989 4

DISTRICT-16 ON -STATE SYSTEM FEDERAL AID BRIDGE REPLACEMENT
AND REHABILITATION PROGRAM
FINAL LIST OF PROJECTS

DISTRICT	COUNTY	HWY NO	CONT-SECT-STR	TYPE OF WORK	ESTIMATED COST
16	ARANSAS	00881	0507-04-007	REHABILITATE BRIDGE & APPROACHES	$18,000

BRIDGE LOCATION: DRAW

EXISTING FACILITY: 2 LANE, 20 FT ROADWAY PROPOSED FACILITY: 2 LANE, 40 FT ROADWAY

DISTRICT TOTAL OF 18 SELECTED PROJECTS: $13,546,000

TABLE A.10. part 2 (continued)

DISTRICT-16 ON -STATE SYSTEM FEDERAL AID BRIDGE REPLACEMENT
AND REHABILITATION PROGRAM
FINAL LIST OF PROJECTS

	ADT	SUFFICIENCY RATINGS	CONDITION RATINGS RDWY	SUPR	SUB	COST/VEH	BRIDGE WIDTH RATIO	TEBS SCORE	DETOUR LENGTH	DISTRICT PRIORITY	DISTRICT ACCUM COST
1052-01-026	1,108	33	6	4	5	$729	0.526		45	M	$808,000
COMMENTS: STATE LEVEL SELECTION											
1958-01-001	21	80	7	8	7	$4,095	0.832		14	1	$894,000
COMMENTS: THIS WAS A PROJECT WITH A LOW SCORE THAT WAS AT THE END OF THE PRIORITIZED LIST											
2342-01-001	278	75	8	8	8	$183	0.929		25	2	$945,000
COMMENTS: THIS WAS A PROJECT WITH A LOW SCORE THAT WAS AT THE END OF THE PRIORITIZED LIST											
2024-01-003	280	78	8	8	8	$304	0.929		11	3	$1,030,000
COMMENTS: THIS WAS A PROJECT WITH A LOW SCORE THAT WAS AT THE END OF THE PRIORITIZED LIST											
0994-01-001	164	20	6	7	3	$366	0.679		12	4	$1,090,000
COMMENTS:											

TABLE A.10. part 2 (continued)

DISTRICT-16 ON -STATE SYSTEM FEDERAL AID BRIDGE REPLACEMENT
AND REHABILITATION PROGRAM
FINAL LIST OF PROJECTS

	ADT	SUFFICIENCY RATINGS	CONDITION RATINGS RDWY	SUPR	SUB	COST/VEH	BRIDGE WIDTH RATIO	TEBS SCORE	DETOUR LENGTH	DISTRICT PRIORITY	DISTRICT ACCUM COST	
0100-12-052	45	49	8	6	3	$511	0.857		12	5	$1,113,000	COMMENTS:
0102-01-030	8,886	61	7	8	8	$3	0.545		1	6	$1,139,000	COMMENTS:
0989-02-003	3,366	59	6	8	8	$11	0.545		20	7	$1,177,000	COMMENTS:
0989-02-004	3,366	57	7	8	6	$16	0.545		20	8	$1,230,000	COMMENTS:
0102-01-003	6,835	62	7	8	8	$8	0.523		1	9	$1,288,000	COMMENTS:
1052-03-029	1,299	56	7	8	6	$14	0.474		50	10	$1,306,000	COMMENTS:

TABLE A.10. part 2 (continued)

DISTRICT-16 ON -STATE SYSTEM FEDERAL AID BRIDGE REPLACEMENT
AND REHABILITATION PROGRAM
FINAL LIST OF PROJECTS

	ADT	SUFFICIENCY RATINGS	CONDITION RATINGS RDWY	SUPR	SUB	COST/VEH	BRIDGE WIDTH RATIO	TEBS SCORE	DETOUR LENGTH	DISTRICT PRIORITY	DISTRICT ACCUM COST
0086-11-028	5,779	68	8	8	8	$12	0.545		1	11	$1,376,000
COMMENTS:											
1088-03-002	5,508	63	7	8	8	$7	0.545		4	12	$1,416,000
COMMENTS:											
0989-02-008	2,722	36	8	7	4	$24	0.700		5	13	$1,482,000
COMMENTS:											
1052-01-024	1,108	51	6	6	5	$41	0.526		45	14	$1,527,000
COMMENTS:											
0101-06-033	13,344	38	6	6	4	$897	0.636		50	15	$13,496,000
COMMENTS:											
0989-02-005	3,366	61	7	8	7	$10	0.545		20	16	$13,528,000
COMMENTS:											

TABLE A.10. part 2 (continued)

DISTRICT-16 ON -STATE SYSTEM FEDERAL AID BRIDGE REPLACEMENT
AND REHABILITATION PROGRAM
FINAL LIST OF PROJECTS

	ADT	SUFFICIENCY RATINGS	CONDITION RATINGS RDWY	SUPR	SUB	COST/VEH	BRIDGE WIDTH RATIO	TEBS SCORE	DETOUR LENGTH	DISTRICT PRIORITY	DISTRICT ACCUM COST
0507-04-007	3,496	73	7	8	8	$5	0.455		15	24	$13,546,000

COMMENTS:

DISTRICT TOTAL OF 18 SELECTED PROJECTS: $13,546,000

The option of generating the district's selection at the state level for districts that did not send any selections for the state level of the system

This is a variation of option 2 of the main menu displayed in Fig A.22., where the user is able to generate the district selection, for a specific district, starting with no district selections. In this case no selection from the specific district will be available to start with and modify using option two. The user should fill NO, in the screen depicted in Fig A.22., for the field that asks whether data is available for the district under processing. Fig A.22. will pop-up in the terminal's screen after running the FINAL program the usual way. Next, the user will be prompted with the screen presented in Fig A.28., with all the appropriate fields in blank. Type the BRID of the first project to be included, in the BRID field, in the appropriate format. There is no need to fill the rest of the fields. Type ADD in the command line, followed by a return to get another blank field screen and type the BRID of the next project to be added. Repeat the process until all the list of projects to be incorporated in the district selection is included.

```
Command==>
=THIS SCREEN ALLOWS TO CREATE THE DISTRICT SELECTION FROM SCRATCH=
DATA FOR STRUCTURE WITH BRID= _______________   DISTRICT= __
COUNTY: ____________   BRIDGE: _____________________________
                     LOCATION
 ===================================  DECK: ___     ROADWAY WIDTH
 |ATTR|     VALUE     |PERCENTILES| SUB: ___    EXISTING: ____
 |====|===============|===========| SUPER: ___  PROPOSED: ____
 |CPV | ______________ | _______  |
 |ADT | ______________ | _______  |
 |SR  | ______________ | _______  |
 |BWR | ______________ | _______  |      DETOUR LENGTH: ______
 |DSS | ______________ | _______  |
 |====|===============|===========|      COST: _____________

 TYPE OF WORK: ________________________________
===================DISTRICT INPUT============================

DISTRICT PRIORITY: ____

COMMENTS: __________________________________________________
```

Fig A.28. Creating a district selection for districts that did not send a file with their selections for the State level of the system

Type END in the command line followed by a return when ready to proceed and no more projects are to be included in the selection. Next the program will allow the user to browse through the selections just made by displaying the screen depicted in Fig A.29.

```
Command==>
===THIS SCREEN ALLOWS YOU TO CHECK THE MODIFICATIONS JUST MADE==
DATA FOR STRUCTURE WITH BRID= 045-0027-01-001  DISTRICT= 13
COUNTY: COLORADO  BRIDGE: COLORADO RIVER    NNN2    8603
                LOCATION
===================================  DECK: 7    ROADWAY WIDTH
|ATTR|     VALUE       |PERCENTILES|   SUB: 6    EXISTING: 22
|====|=================|===========|  SUPER: 7    PROPOSED: 44
|CPV |            $203 |       18  |
|ADT |           3,321 |       56  |
|SR  |              61 |       29  |
|BWR |             0.5 |       98  | DETOUR LENGTH: 2
|DSS |               6 |       71  |
|====|=================|===========| COST: $674,000

 TYPE OF WORK: REHABILITATE BRIDGE & APPROACHES
 ===================DISTRICT INPUT==============================

 DISTRICT PRIORITY: __              STATE LEVEL SELECTION

COMMENTS: ______________________________________________________
```

Fig A.29. Browsing trough the selections just made

Type the numbers 1, through the maximum number of projects selected for the district in the command line to display the projects just selected one at a time. The IF BRID= ... option is also available to locate a specific project. When finished browsing type END in the command line, followed by a return. The program will print an output file with the selections just made. This output is presented in Table A.11. The user can use this option as many times as he wishes, until satisfied with the district selections created at the State level.

TABLE A.11. CREATE A DISTRICT SELECTION AT THE STATE LEVEL

1SAS 21:54 THURSDAY, AUGUST 17, 1989 1

DISTRICT-13 ON -STATE SYSTEM FEDERAL AID BRIDGE REPLACEMENT
AND REHABILITATION PROGRAM
FINAL LIST OF PROJECTS

DISTRICT	COUNTY	HWY NO	CONT-SECT-STR	TYPE OF WORK	ESTIMATED COST
13	COLORADO	00090	0027-01-001	REHABILITATE BRIDGE & APPROACHES	$674,000

BRIDGE LOCATION: COLORADO RIVER

EXISTING FACILITY: 2 LANE, 22 FT ROADWAY PROPOSED FACILITY: 2 LANE, 44 FT ROADWAY

13	DEWITT	00087	0143-08-038	REHABILITATE BRIDGE & APPROACHES	$688,000

BRIDGE LOCATION: GUADALUPE RIVER

EXISTING FACILITY: 2 LANE, 24 FT ROADWAY PROPOSED FACILITY: 2 LANE, 44 FT ROADWAY

13	DEWITT	00119	0359-01-002	REHABILITATE BRIDGE & APPROACHES	$228,000

BRIDGE LOCATION: SMITH CREEK

EXISTING FACILITY: 2 LANE, 20 FT ROADWAY PROPOSED FACILITY: 2 LANE, 40 FT ROADWAY

13	FAYETTE	00609	0267-03-019	REHABILITATE BRIDGE & APPROACHES	$20,000

BRIDGE LOCATION: TAYLOR BR.

EXISTING FACILITY: 2 LANE, 23.5 FT ROADWAY PROPOSED FACILITY: 0 LANE, 0 FT ROADWAY

13	GONZALES	00097	0025-07-040	REHABILITATE BRIDGE & APPROACHES	$23,000

BRIDGE LOCATION: DRAW

EXISTING FACILITY: 2 LANE, 20.2 FT ROADWAY PROPOSED FACILITY: 2 LANE, 44 FT ROADWAY

TABLE A.11. (continued)

DISTRICT-13 ON -STATE SYSTEM FEDERAL AID BRIDGE REPLACEMENT
AND REHABILITATION PROGRAM
FINAL LIST OF PROJECTS

DISTRICT	COUNTY	HWY NO	CONT-SECT-STR	TYPE OF WORK	ESTIMATED COST
13	GONZALES	00097	0025-07-041	REHABILITATE BRIDGE & APPROACHES	$26,000
BRIDGE LOCATION: CLEAR FORK CREEK					
EXISTING FACILITY: 2 LANE, 20.3 FT ROADWAY			PROPOSED FACILITY: 2 LANE, 44 FT ROADWAY		
13	JACKSON	0N065	8065-13-004	REPLACE BRIDGE & APPROACHES	$20,000
BRIDGE LOCATION: POST OAK BRANCH					
EXISTING FACILITY: 1 LANE, 17 FT ROADWAY			PROPOSED FACILITY: 2 LANE, 18 FT ROADWAY		
13	LAVACA	00532	1007-03-018	REHABILITATE BRIDGE & APPROACHES	$60,000
BRIDGE LOCATION: S. FK LAVACA RIVER					
EXISTING FACILITY: 2 LANE, 20 FT ROADWAY			PROPOSED FACILITY: 2 LANE, 40 FT ROADWAY		
13	VICTORIA	0N256	8256-13-001	REHABILITATE BRIDGE & APPROACHES	$9,000
BRIDGE LOCATION: DRAIN					
EXISTING FACILITY: 1 LANE, 18.4 FT ROADWAY			PROPOSED FACILITY: 2 LANE, 18 FT ROADWAY		
13	WHARTON	00183	0089-10-039	REHABILITATE BRIDGE & APPROACHES	$992,000
BRIDGE LOCATION: COLORADO RIVER					
EXISTING FACILITY: 2 LANE, 20 FT ROADWAY			PROPOSED FACILITY: 2 LANE, 44 FT ROADWAY		
13	WHARTON	0N113	8113-13-001	REPLACE BRIDGE & APPROACHES	$34,000
BRIDGE LOCATION: TRES PALACIOS CREEK					
EXISTING FACILITY: 2 LANE, 23.4 FT ROADWAY			PROPOSED FACILITY: 2 LANE, 28 FT ROADWAY		
			DISTRICT TOTAL OF 11 SELECTED PROJECTS:		$2,774,000

TABLE A.11. part 2 (continued)

DISTRICT-13 ON -STATE SYSTEM FEDERAL AID BRIDGE REPLACEMENT
AND REHABILITATION PROGRAM
FINAL LIST OF PROJECTS

	ADT	SUFFICIENCY RATINGS	CONDITION RATINGS RDWY	SUPR	SUB	COST/VEH	BRIDGE WIDTH RATIO	TEBS SCORE	DETOUR LENGTH	DISTRICT PRIORITY	DISTRICT ACCUM COST
0027-01-001	3,321	61	7	6	7	$203	0.500		2		$674,000
COMMENTS:											
0143-08-038	5,140	61	7	7	7	$134	0.545		5		$1,362,000
COMMENTS:											
0359-01-002	992	64	7	7	7	$230	0.526		20		$1,590,000
COMMENTS:											
0267-03-019	4,054	76	8	8	8	$5	0.534		0		$1,610,000
COMMENTS:											
0025-07-040	3,048	58	6	6	6	$8	0.459		16		$1,633,000
COMMENTS:											

TABLE A.11. part 2 (continued)

DISTRICT-13 ON -STATE SYSTEM FEDERAL AID BRIDGE REPLACEMENT
AND REHABILITATION PROGRAM
FINAL LIST OF PROJECTS

	ADT	SUFFICIENCY RATINGS	CONDITION RATINGS RDWY	SUPR	SUB	COST/VEH	BRIDGE WIDTH RATIO	TEBS SCORE	DETOUR LENGTH	DISTRICT PRIORITY	DISTRICT ACCUM COST
0025-07-041	3,048	58	6	6	7	$9	0.461		16		$1,659,000
COMMENTS:											
8065-13-004	400	37	7	8	5	$50	0.500		0		$1,679,000
COMMENTS:											
1007-03-018	814	53	8	8	7	$74	0.526		5		$1,739,000
COMMENTS:											
8256-13-001	600	78	7	8	8	$15	0.541		7		$1,748,000
COMMENTS:											
0089-10-039	2,387	59	6	6	7	$416	0.500		1		$2,740,000
COMMENTS:											
8113-13-001	3,600	20	7	8	5	$9	0.532		2		$2,774,000
COMMENTS:											

DISTRICT TOTAL OF 11 SELECTED PROJECTS: $2,774,000

The option of assembling the final statewide project selection list

Once the decision maker is satisfied with the selections for all the districts state wide it is possible to use option 3, as depicted in Fig A.22., to assemble the final list of projects to be submitted for bidding and contracting. The user should submit the FINAL program for processing the usual way and when the screen depicted in Fig A.22. pops-up choose option 3. This is achieved by typing 3 in the OPTION field. Choose the appropriate system ON or OFF by making the appropriate modification in the SYSTEM field. Use the arrow and the tab key to move around the screen and make the changes. When satisfied with the contents of the fields type END in the command line, followed by the return key. The next screen will prompt the user to answer which districts are to be included in the composition of the final list of selected projects. This screen is presented in Fig A.30.

Use the arrow and the tab keys to move around the screen and make the appropriate changes. When satisfied with the inputs type END in the command line, followed by the return key to proceed. The program will run for a while and will print an output file including a list of all the projects to be submitted for bidding and contracting. If any changes are needed in the selections, the user should go back to the previous options, to modify the selected projects in a district by district basis. A sample of the output generated by this option is presented in Table A.12.

Command==>
IN THIS SCREEN THE USER SHOULD INPUT YES FOR THE DISTRICTS THAT HAVE PROJECTS INCLUDED IN THE FINAL SELECTION LIST. FOR THE ONES THAT DO NOT HAVE ANY PROJECTS SELECTED THE USER SHOULD INPUT NO

DISTR	INCLUDE?	DISTR	INCLUDE?	DISTR	INCLUDE?	DISTR	INCLUDE?
1	YES	8	YES	15	YES	23	YES
2	YES	9	YES	16	YES	24	YES
3	YES	10	YES	17	YES	25	YES
4	YES	11	YES	18	YES		
5	YES	12	YES	19	YES		
6	YES	13	YES	20	YES		
7	YES	14	YES	21	YES		

THIS SELECTION
IS FOR
THE

1988-1992

PROGRAM

Fig A.30. Assembling the final list of projects to be submitted for contracting

TABLE A.12. PRINTOUT OF THE FINAL STATEWIDE SELECTION

1SAS 22:13 THURSDAY, AUGUST 17, 1989 1

1988-1992 ON -STATE SYSTEM FEDERAL AID BRIDGE REPLACEMENT
AND REHABILITATION PROGRAM
FINAL LIST OF PROJECTS TO BE SUBMITTED FOR CONTRACTING

DISTRICT-HDQRTRS	COUNTY	HWY NO	CONT-SECT-STR	TYPE OF WORK	ESTIMATED COST
13 YOAKUM	COLORADO	00090	0027-01-001	REHABILITATE BRIDGE & APPROACHES	$674,000
BRIDGE LOCATION: COLORADO RIVER					
EXISTING FACILITY: 2 LANE, 22 FT ROADWAY			PROPOSED FACILITY: 2 LANE, 44 FT ROADWAY		
13 YOAKUM	DEWITT	00087	0143-08-038	REHABILITATE BRIDGE & APPROACHES	$688,000
BRIDGE LOCATION: GUADALUPE RIVER					
EXISTING FACILITY: 2 LANE, 24 FT ROADWAY			PROPOSED FACILITY: 2 LANE, 44 FT ROADWAY		
13 YOAKUM	DEWITT	00119	0359-01-002	REHABILITATE BRIDGE & APPROACHES	$228,000
BRIDGE LOCATION: SMITH CREEK					
EXISTING FACILITY: 2 LANE, 20 FT ROADWAY			PROPOSED FACILITY: 2 LANE, 40 FT ROADWAY		
13 YOAKUM	FAYETTE	00609	0267-03-019	REHABILITATE BRIDGE & APPROACHES	$20,000
BRIDGE LOCATION: TAYLOR BR.					
EXISTING FACILITY: 2 LANE, 23.5 FT ROADWAY			PROPOSED FACILITY: 0 LANE, 0 FT ROADWAY		
13 YOAKUM	GONZALES	00097	0025-07-040	REHABILITATE BRIDGE & APPROACHES	$23,000
BRIDGE LOCATION: DRAW					
EXISTING FACILITY: 2 LANE, 20.2 FT ROADWAY			PROPOSED FACILITY: 2 LANE, 44 FT ROADWAY		
13 YOAKUM	GONZALES	00097	0025-07-041	REHABILITATE BRIDGE & APPROACHES	$26,000
BRIDGE LOCATION: CLEAR FORK CREEK					
EXISTING FACILITY: 2 LANE, 20.3 FT ROADWAY			PROPOSED FACILITY: 2 LANE, 44 FT ROADWAY		

TABLE A.11. (continued)

1SAS 22:13 THURSDAY, AUGUST 17, 1989 2

1988-1992 ON -STATE SYSTEM FEDERAL AID BRIDGE REPLACEMENT
AND REHABILITATION PROGRAM
FINAL LIST OF PROJECTS TO BE SUBMITTED FOR CONTRACTING

DISTRICT-HDQRTRS	COUNTY	HWY NO	CONT-SECT-STR	TYPE OF WORK	ESTIMATED COST
13 YOAKUM	JACKSON	0N065	8065-13-004	REPLACE BRIDGE & APPROACHES	$20,000
BRIDGE LOCATION: POST OAK BRANCH					
EXISTING FACILITY: 1 LANE, 17 FT ROADWAY			PROPOSED FACILITY: 2 LANE, 18 FT ROADWAY		
13 YOAKUM	LAVACA	00532	1007-03-018	REHABILITATE BRIDGE & APPROACHES	$60,000
BRIDGE LOCATION: S. FK LAVACA RIVER					
EXISTING FACILITY: 2 LANE, 20 FT ROADWAY			PROPOSED FACILITY: 2 LANE, 40 FT ROADWAY		
13 YOAKUM	VICTORIA	0N256	8256-13-001	REHABILITATE BRIDGE & APPROACHES	$9,000
BRIDGE LOCATION: DRAIN					
EXISTING FACILITY: 1 LANE, 18.4 FT ROADWAY			PROPOSED FACILITY: 2 LANE, 18 FT ROADWAY		
13 YOAKUM	WHARTON	00183	0089-10-039	REHABILITATE BRIDGE & APPROACHES	$992,000
BRIDGE LOCATION: COLORADO RIVER					
EXISTING FACILITY: 2 LANE, 20 FT ROADWAY			PROPOSED FACILITY: 2 LANE, 44 FT ROADWAY		
13 YOAKUM	WHARTON	0N113	8113-13-001	REPLACE BRIDGE & APPROACHES	$34,000
BRIDGE LOCATION: TRES PALACIOS CREEK					
EXISTING FACILITY: 2 LANE, 23.4 FT ROADWAY			PROPOSED FACILITY: 2 LANE, 28 FT ROADWAY		
			DISTRICT TOTAL OF 11	CONSIDERED PROJECTS:	$2,774,000

TABLE A.11. (continued)

1988-1992 ON -STATE SYSTEM FEDERAL AID BRIDGE REPLACEMENT
AND REHABILITATION PROGRAM
FINAL LIST OF PROJECTS TO BE SUBMITTED FOR CONTRACTING

DISTRICT-HDQRTRS	COUNTY	HWY NO	CONT-SECT-STR	TYPE OF WORK	ESTIMATED COST
16 CORPUS CHRISTI	NUECES	00666	1052-01-026	REPLACE BRIDGE & APPROACHES	$808,000
BRIDGE LOCATION: DRAW					
EXISTING FACILITY: 2 LANE, 20 FT ROADWAY			PROPOSED FACILITY: 2 LANE, 40 FT ROADWAY		
16 CORPUS CHRISTI	GOLIAD	02043	1958-01-001	REHABILITATE BRIDGE & APPROACHES	$86,000
BRIDGE LOCATION: CABEZA CREEK					
EXISTING FACILITY: 2 LANE, 23.3 FT ROADWAY			PROPOSED FACILITY: 2 LANE, 28 FT ROADWAY		
16 CORPUS CHRISTI	GOLIAD	02442	2342-01-001	REHABILITATE BRIDGE & APPROACHES	$51,000
BRIDGE LOCATION: HORD CREEK					
EXISTING FACILITY: 2 LANE, 26 FT ROADWAY			PROPOSED FACILITY: 2 LANE, 28 FT ROADWAY		
16 CORPUS CHRISTI	BEE	01465	2024-01-003	REHABILITATE BRIDGE & APPROACHES	$85,000
BRIDGE LOCATION: TOTO CREEK					
EXISTING FACILITY: 2 LANE, 26 FT ROADWAY			PROPOSED FACILITY: 2 LANE, 28 FT ROADWAY		
16 CORPUS CHRISTI	SAN PATRICIO	00630	0994-01-001	REPLACE BRIDGE & APPROACHES	$60,000
BRIDGE LOCATION: DRAW					
EXISTING FACILITY: 2 LANE, 19 FT ROADWAY			PROPOSED FACILITY: 2 LANE, 28 FT ROADWAY		
16 CORPUS CHRISTI	KARNES	02509	0100-12-052	REPLACE BRIDGE & APPROACHES	$23,000
BRIDGE LOCATION: DRAIN					
EXISTING FACILITY: 2 LANE, 24 FT ROADWAY			PROPOSED FACILITY: 2 LANE, 28 FT ROADWAY		

TABLE A.11. (continued)

1988-1992 ON -STATE SYSTEM FEDERAL AID BRIDGE REPLACEMENT
AND REHABILITATION PROGRAM
FINAL LIST OF PROJECTS TO BE SUBMITTED FOR CONTRACTING

DISTRICT-HDQRTRS	COUNTY	HWY NO	CONT-SECT-STR	TYPE OF WORK	ESTIMATED COST
16 CORPUS CHRISTI	NUECES	00044	0102-01-030	REHABILITATE BRIDGE & APPROACHES	$26,000
BRIDGE LOCATION: DONIGAN FLAT					
EXISTING FACILITY: 2 LANE, 24 FT ROADWAY			PROPOSED FACILITY: 2 LANE, 36 FT ROADWAY		
16 CORPUS CHRISTI	NUECES	00624	0989-02-003	REHABILITATE BRIDGE & APPROACHES	$38,000
BRIDGE LOCATION: DRAW					
EXISTING FACILITY: 2 LANE, 24 FT ROADWAY			PROPOSED FACILITY: 2 LANE, 40 FT ROADWAY		
16 CORPUS CHRISTI	NUECES	00624	0989-02-004	REHABILITATE BRIDGE & APPROACHES	$53,000
BRIDGE LOCATION: DRAW					
EXISTING FACILITY: 2 LANE, 24 FT ROADWAY			PROPOSED FACILITY: 2 LANE, 40 FT ROADWAY		
16 CORPUS CHRISTI	NUECES	00044	0102-01-003	REHABILITATE BRIDGE & APPROACHES	$58,000
BRIDGE LOCATION: OSO CR					
EXISTING FACILITY: 2 LANE, 23 FT ROADWAY			PROPOSED FACILITY: 2 LANE, 44 FT ROADWAY		
16 CORPUS CHRISTI	SAN PATRICIO	00666	1052-03-029	REHABILITATE BRIDGE & APPROACHES	$18,000
BRIDGE LOCATION: DRAW					
EXISTING FACILITY: 2 LANE, 18 FT ROADWAY			PROPOSED FACILITY: 2 LANE, 40 FT ROADWAY		
16 CORPUS CHRISTI	JIM WELLS	00359	0086-11-028	REHABILITATE BRIDGE & APPROACHES	$70,000
BRIDGE LOCATION: INTERMITTENT CR					
EXISTING FACILITY: 2 LANE, 24 FT ROADWAY			PROPOSED FACILITY: 2 LANE, 44 FT ROADWAY		

TABLE A.11. (continued)

1SAS 22:13 THURSDAY, AUGUST 17, 1989 5

1988-1992 ON -STATE SYSTEM FEDERAL AID BRIDGE REPLACEMENT
AND REHABILITATION PROGRAM
FINAL LIST OF PROJECTS TO BE SUBMITTED FOR CONTRACTING

DISTRICT-HDQRTRS	COUNTY	HWY NO	CONT-SECT-STR	TYPE OF WORK	ESTIMATED COST
16 CORPUS CHRISTI	NUECES	01889	1088-03-002	REHABILITATE BRIDGE & APPROACHES	$40,000
BRIDGE LOCATION: DRAW					
EXISTING FACILITY: 2 LANE, 24 FT ROADWAY			PROPOSED FACILITY: 2 LANE, 40 FT ROADWAY		
16 CORPUS CHRISTI	NUECES	00624	0989-02-008	REPLACE BRIDGE & APPROACHES	$66,000
BRIDGE LOCATION: DRAW					
EXISTING FACILITY: 2 LANE, 28 FT ROADWAY			PROPOSED FACILITY: 2 LANE, 40 FT ROADWAY		
16 CORPUS CHRISTI	NUECES	00666	1052-01-024	REHABILITATE BRIDGE & APPROACHES	$45,000
BRIDGE LOCATION: DRAW					
EXISTING FACILITY: 2 LANE, 20 FT ROADWAY			PROPOSED FACILITY: 2 LANE, 40 FT ROADWAY		
16 CORPUS CHRISTI	NUECES	00181	0101-06-033	REPLACE BRIDGE & APPROACHES	$11,969,000
BRIDGE LOCATION: NUECES BAY CAUSEWAY					
EXISTING FACILITY: 2 LANE, 28 FT ROADWAY			PROPOSED FACILITY: 3 LANE, 56 FT ROADWAY		
16 CORPUS CHRISTI	NUECES	00624	0989-02-005	REHABILITATE BRIDGE & APPROACHES	$32,000
BRIDGE LOCATION: DRAW					
EXISTING FACILITY: 2 LANE, 24 FT ROADWAY			PROPOSED FACILITY: 2 LANE, 40 FT ROADWAY		
16 CORPUS CHRISTI	ARANSAS	00881	0507-04-007	REHABILITATE BRIDGE & APPROACHES	$18,000
BRIDGE LOCATION: DRAW					
EXISTING FACILITY: 2 LANE, 20 FT ROADWAY			PROPOSED FACILITY: 2 LANE, 40 FT ROADWAY		

DISTRICT TOTAL OF 18 CONSIDERED PROJECTS: $13,546,000
STATE TOTAL OF 29 SELECTED PROJECTS: $16,320,000

TABLE A.12. part 2 (continued)

1988-1992 ON -STATE SYSTEM FEDERAL AID BRIDGE REPLACEMENT
AND REHABILITATION PROGRAM
FINAL LIST OF PROJECTS TO BE SUBMITTED FOR CONTRACTING

	ADT	SUFFICIENCY RATINGS	CONDITION RATINGS RDWY	SUPR	SUB	COST/VEH	BRIDGE WIDTH RATIO	TEBS SCORE	DETOUR LENGTH	DISTRICT PRIORITY	DISTRICT ACCUM COST
0027-01-001	3,321	61	7	6	7	$203	0.500		2	M	$674,000
COMMENTS: STATE LEVEL SELECTION											
0143-08-038	5,140	61	7	7	7	$134	0.545		5	M	$1,362,000
COMMENTS: STATE LEVEL SELECTION											
0359-01-002	992	64	7	7	7	$230	0.526		20	M	$1,590,000
COMMENTS: STATE LEVEL SELECTION											
0267-03-019	4,054	76	8	8	8	$5	0.534		0	M	$1,610,000
COMMENTS: STATE LEVEL SELECTION											
0025-07-040	3,048	58	6	6	6	$8	0.459		16	M	$1,633,000
COMMENTS: STATE LEVEL SELECTION											
0025-07-041	3,048	58	6	6	7	$9	0.461		16	M	$1,659,000
COMMENTS: STATE LEVEL SELECTION											

TABLE A.11. part 2 (continued)

1SAS 22:13 THURSDAY, AUGUST 17, 1989 2

1988-1992 ON -STATE SYSTEM FEDERAL AID BRIDGE REPLACEMENT
AND REHABILITATION PROGRAM
FINAL LIST OF PROJECTS TO BE SUBMITTED FOR CONTRACTING

	ADT	SUFFICIENCY RATINGS	CONDITION RATINGS RDWY	SUPR	SUB	COST/VEH	BRIDGE WIDTH RATIO	TEBS SCORE	DETOUR LENGTH	DISTRICT PRIORITY	DISTRICT ACCUM COST
8065-13-004	400	37	7	8	5	$50	0.500		0	M	$1,679,000
COMMENTS: STATE LEVEL SELECTION											
1007-03-018	814	53	8	8	7	$74	0.526		5	M	$1,739,000
COMMENTS: STATE LEVEL SELECTION											
8256-13-001	600	78	7	8	8	$15	0.541		7	M	$1,748,000
COMMENTS: STATE LEVEL SELECTION											
0089-10-039	2,387	59	6	6	7	$416	0.500		1	M	$2,740,000
COMMENTS: STATE LEVEL SELECTION											
8113-13-001	3,600	20	7	8	5	$9	0.532		2	M	$2,774,000
COMMENTS: STATE LEVEL SELECTION											

DISTRICT TOTAL OF 11 SELECTED PROJECTS: $2,774,000

TABLE A.11. part 2 (continued)

1988-1992 ON -STATE SYSTEM FEDERAL AID BRIDGE REPLACEMENT
AND REHABILITATION PROGRAM
FINAL LIST OF PROJECTS TO BE SUBMITTED FOR CONTRACTING

	ADT	SUFFICIENCY RATINGS	CONDITION RATINGS RDWY	SUPR	SUB	COST/VEH	BRIDGE WIDTH RATIO	TEBS SCORE	DETOUR LENGTH	DISTRICT PRIORITY	DISTRICT ACCUM COST
1052-01-026	1,108	33	6	4	5	$729	0.526		45	M	$808,000
COMMENTS: STATE LEVEL SELECTION											
1958-01-001	21	80	7	8	7	$4,095	0.832		14	1	$894,000
COMMENTS: THIS WAS A PROJECT WITH A LOW SCORE THAT WAS AT THE END OF THE PRIORITIZED LIST											
2342-01-001	278	75	8	8	8	$183	0.929		25	2	$945,000
COMMENTS: THIS WAS A PROJECT WITH A LOW SCORE THAT WAS AT THE END OF THE PRIORITIZED LIST											
2024-01-003	280	78	8	8	8	$304	0.929		11	3	$1,030,000
COMMENTS: THIS WAS A PROJECT WITH A LOW SCORE THAT WAS AT THE END OF THE PRIORITIZED LIST											
0994-01-001	164	20	6	7	3	$366	0.679		12	4	$1,090,000
COMMENTS:											
0100-12-052	45	49	8	6	3	$511	0.857		12	5	$1,113,000
COMMENTS:											

1988-1992 ON -STATE SYSTEM FEDERAL AID BRIDGE REPLACEMENT
AND REHABILITATION PROGRAM
FINAL LIST OF PROJECTS TO BE SUBMITTED FOR CONTRACTING

	ADT	SUFFICIENCY RATINGS	CONDITION RATINGS RDWY	SUPR	SUB	COST/VEH	BRIDGE WIDTH RATIO	TEBS SCORE	DETOUR LENGTH	DISTRICT PRIORITY	DISTRICT ACCUM COST
0102-01-030	8,886	61	7	8	8	$3	0.545		1	6	$1,139,000
COMMENTS:											
0989-02-003	3,366	59	6	8	8	$11	0.545		20	7	$1,177,000
COMMENTS:											
0989-02-004	3,366	57	7	8	6	$16	0.545		20	8	$1,230,000
COMMENTS:											
0102-01-003	6,835	62	7	8	8	$8	0.523		1	9	$1,288,000
COMMENTS:											
1052-03-029	1,299	56	7	8	6	$14	0.474		50	10	$1,306,000
COMMENTS:											
0086-11-028	5,779	68	8	8	8	$12	0.545		1	11	$1,376,000
COMMENTS:											

TABLE A.11. part 2 (continued)

1988-1992 ON -STATE SYSTEM FEDERAL AID BRIDGE REPLACEMENT
AND REHABILITATION PROGRAM
FINAL LIST OF PROJECTS TO BE SUBMITTED FOR CONTRACTING

	ADT	SUFFICIENCY RATINGS	CONDITION RATINGS RDWY	SUPR	SUB	COST/VEH	BRIDGE WIDTH RATIO	TEBS SCORE	DETOUR LENGTH	DISTRICT PRIORITY	DISTRICT ACCUM COST
1088-03-002	5,508	63	7	8	8	$7	0.545		4	12	$1,416,000
COMMENTS:											
0989-02-008	2,722	36	8	7	4	$24	0.700		5	13	$1,482,000
COMMENTS:											
1052-01-024	1,108	51	6	6	5	$41	0.526		45	14	$1,527,000
COMMENTS:											
0101-06-033	13,344	38	6	6	4	$897	0.636		50	15	$13,496,000
COMMENTS:											
0989-02-005	3,366	61	7	8	7	$10	0.545		20	16	$13,528,000
COMMENTS:											
0507-04-007	3,496	73	7	8	8	$5	0.455		15	24	$13,546,000
COMMENTS:											

DISTRICT TOTAL OF 18 SELECTED PROJECTS: $13,546,000
STATE TOTAL OF 29 CONSIDERED PROJECTS: $16,320,000

The option of updating the data set of previously selected projects

The last option available in the program FINAL, is to update the previously selected projects set. It is recommended that the user only makes use of this option when he or she is definitely sure that the list submitted for bidding and contracting is not going to be modified any more. The program gives a last chance for the user to make up his mind after this option is run, by creating a back up of the file that contains the previously selected projects. This file has an extension BUP and needs to be renamed in case the user wants to change his mind after running this option. To run this option select option 4 in the screen depicted in Fig A.22.. The appropriate system, ON or OFF, needs also to be selected. After option 4 is run, the previously selected list of projects will be updated and the system is ready for a new budget allocation, closing the loop depicted in Fig 4.1.

THE PROGRAM PREV

The purpose of the program PREV is to allow the user to browse through and modify the previously selected project list. It is an utility provided with the TBSS system in order to provide an easy and user friendly way of making the data management of the previously selected project list. This program is not an active node in the TBSS system depicted in Fig 4.1, but provides useful file management features to handle the previously selected list of projects. It provides the user with the possibility of adding and deleting projects to the previously selected project list. To run PREV, submit it for processing in the usual way for your computer system. The screen depicted in Fig A.31. will be presented in the computer's terminal.

Command ===>

THIS MODULE IS DESIGNED TO ALLOW THE USER TO ADD OR DELETE ANY PROJECTS THAT HE DOES NOT OR DOES WANT TO BE INCLUDED IN THE LIST OF PREVIOUSLY SELECTED PROJECTS FROM PAST ALLOCATION PROGRAMS. THIS LIST IS DELETED FROM FURTHER CONSIDERATION DURING THE RUN OF THE TEBS SYSTEM.

PLEASE ANSWER THE QUESTION FOR WHAT SYSTEM IS THIS RUN.

ANSWER: _______

Fig A.31. The first screen of the PREV computer program

Select the appropriate system, ON or OFF, type END in the command line, followed by the return key after doing so. The next screen, Fig A.32., allows the user to browse through the list of previously selected projects. Type numbers in the command line, from 1 to the number of observations included in the set, to display projects one at a time. To display a specific project, type the command IF BRID=.XXX-XXXX-XX-XXX in the command line. To add a project to the list type ADD in the command line to get a unfilled screen, type the BRID which needs to be added to the previously selected list in the BRID field. To delete a project make it display in the screen with the IF BRID=.XXX-XXXX-XX-XXX command and type DELETE in the command line, followed by the return key. When over with the additions and deletions type END in the command line. The program prints a report of the current status of the previously considered project list as presented in Table A.13.

Command ===>

THE USER CAN USE THE COMMANDS ADD AND DELETE IN THE COMMAND LINE TO ADD
OR DELETE PROJECTS TO THE PREVIOUSLY SELECTED PROJECT LIST.
TO ADD FILL THE FIELD BRID WITH BRID NUMBER AFTER TYPING ADD IN THE
COMMAND LINE, THEN HIT RETURN.
TYPE DELETE AND HIT RETURN TO DELETE A DISPLAYED PROJECT.
THE CURRENT STATUS OF THE LIST, AFTER THE MODIFICATIONS, IS PRINTED
IN THE FILE 'PREV.LISTING'.

BRID: 075-0174-04-037

PROGRAM YEAR: 1979

DISTRICT : 1

Fig A.32. Screen for modifying the previously selected project list.

TABLE A.13. PRINTOUT FOR THE STATE LEVEL PROGRAM PREV

1THIS IS THE PRESENT STATUS OF THE LIST OF PROJECTS NOT TO BE CONSIDERED 12:31 MONDAY, AUGUST 21, 1989 1

OBS	BRID	DIST	YEAR
1	075-0174-04-037	1	1979
2	075-0174-04-038	1	1979
3	075-0690-01-008	1	1979
4	075-0690-01-010	1	1979
5	092-0729-01-021	1	1979
6	092-0729-01-022	1	1979
7	092-0729-01-023	1	1979
8	092-0729-01-024	1	1979
9	092-0729-01-025	1	1979
10	117-0009-07-370	1	1979
11	117-0009-07-371	1	1979
12	117-1496-02-008	1	1979
13	139-0749-02-035	1	1979
14	194-0189-03-052	1	1979
15	194-0189-03-053	1	1979
16	112-0385-03-022	2	1979
17	220-0747-03-044	2	1979
18	249-0352-02-032	2	1979
19	039-0224-01-022	3	1979
20	039-0224-01-023	3	1979
21	039-0391-02-064	3	1979
22	049-1357-01-002	3	1979
23	224-1076-01-012	3	1979
24	224-1076-01-013	3	1979
25	188-0090-06-020	4	1979
26	188-0090-06-021	4	1979
27	188-0168-10-018	4	1979
28	188-0168-10-029	4	1979
29	188-0168-10-038	4	1979
30	188-0168-10-127	4	1979
31	191-0168-09-039	4	1979
32	191-0168-09-041	4	1979
33	191-0168-09-042	4	1979
34	191-0168-09-051	4	1979
35	191-0168-09-052	4	1979
36	078-0740-02-001	5	1979
37	078-0740-02-002	5	1979
38	078-1128-01-002	5	1979
39	096-0563-05-003	5	1979
40	052-0866-03-002	6	1979
41	186-0292-06-022	6	1979
42	048-0035-02-009	7	1979
43	200-0035-01-001	7	1979
44	216-3462-01-003	7	1979
45	226-0070-01-041	7	1979
46	226-0070-01-042	7	1979
47	233-0412-05-025	7	1979
48	017-0558-03-047	8	1979
49	017-3276-01-007	8	1979
50	105-0360-02-026	8	1979
51	132-1361-02-003	8	1979
52	208-1532-02-003	8	1979
53	221-0054-01-063	8	1979
54	221-0054-01-064	8	1979

APPENDIX B
COMPUTER PROGRAM SOURCE CODES

SOURCE CODE FOR THE PROGRAM SURE
(SUFFICIENCY RATING EVALUATOR)

```
/*
                              S U R E 5

              SUFFICIENCY RATING EVALUATOR PROGRAM

                            VERSION 5.0


                           WRITTEN BY:
                        JEANNETTE M. GARCIA
                           UPDATED BY:
                          TONY TASCIONE
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                                ON:  MAY  1986
                      LAST UPDATED:  APRIL 89


     SURE5 IS THE FIRST PROGRAM IN A TWO PART SERIES OF SAS PROGRAMS
DEVELOPED AND WRITTEN TO COMPUTERIZE THE TEXAS SDHPT BRIDGE PROJECT
SELECTION PROCESS. THIS PROGRAM WAS DEVELOPED UNDER CTR RESEARCH
PROJECT
439.  FOR MORE INFORMATION ABOUT THIS PROGRAM OR THE OTHER IN THE
SERIES,
REFER TO CTR REPORT 439-1,439-4.

    SURE5 IS A SAS PROGRAM TO CHECK FOR DEFICIENCY/OBSOLECENCE,
CALCULATE
SUFFICIENCY RATING SCORES AND DETERMINE ELIGIBILITY ON THE SDHPT-
FORMATTED ON-SYSTEM BRINSAP (BRIDGE INVENTORY INSPECTION AND
APPRAISAL
PROGRAM) DATA TAPE.  ALL THE ALGORITHMS IN THIS PROGRAM ARE BASED ON
THE
SDHPT BRINSAP MANUAL OF PROCEDURES. THE FINAL RESULT IS A SAS DATA
SET
WITH THE FEDERALLY ELEGIBLE BRIDGES.THE RESULTING SAS DATA SET IS
USED BY
 THE NEXT PROGRAM, FREQ , TO CALCULATE THE FREQUENCY PERCENTILES FOR
THE ATTRIBUTES USED IN THE PROGRAMS INICO AND DDF.
     DEVELOPED AND WRITTEN IN SAS (STATISTICAL ANALYSIS SYSTEM)
VERSION 5 (RELEASE 5.08) FOR THE IBM 3081-D RUNNING UNDER VM/SP.


A NOTE ON MISSING OR ILLEGAL DATA:
---------------------------------


     THIS PROGRAM WILL ESTIMATE THE SUFFICIENCY RATING (SR)
VALUE WHEN ANY VALUE INVOLVED IN THE SR CALCULATION IS MISSING OR
ILLEGAL.  THE SPECIFIC COMPONENT OR SUBINDEX REQUIRING THE MISSING
OR ILLEGAL DATA IS`MADE AS LARGE AS POSSIBLE IN ORDER TO GENERATE
```

```
A CONSERVATIVE SR VALUE.


INPUT AND OUTPUT:
----------------

   INPUT:  BRINSAP ON-SYSTEM DATA TAPE IN SDHPT FORMAT.  FOR SDHPT
FORMAT
           REFER TO CTR REPORT 439-1 OR TO THE SDHPT BRIDGE DIVISION.
           TAPE SPECIFICATIONS:  9-TRACK, 1600 BPI, UNLABELED,
EBCDIC,
           510 CHARACTERS/RECORD, 5100 RECORDS/BLOCK, FIXED BLOCK
LENGTH.
           NOTE:  IF TAPE SPECS ARE CHANGED, THEN THE SYSTEM FILE
           DEFINITIONS MUST BE CHANGED TO BE CONSISTENT WITH THE TAPE
           SPECS.

   OUTPUT: THE PROGRAM PRODUCES TWO OUTPUTS:  A REPORT OUTPUT FILE
AND
           (SURE2 LISTING) AND THE ELIGIBLE DATA SET OUTPUT FILE
           (ELIGIBLE BRINSAP).  THE REPORT FILE CONTAINS A LIST OF
ALL
           THE DATA ITEMS FOR THOSE BRIDGE RECORDS CONTAINING MISSING
           OR ILLEGAL DATA.  THE ELIGIBLE DATA SET OUTPUT FILE IS A
           PERMANENT SAS DATA SET CONTAINING ALL THE BRIDGES ELIGIBLE
FOR
           FEDERAL FUNDING.  THE ELIGIBLE FILE IS IN SAS FORMAT AND
CAN
           ONLY BE READ BY SAS.

THE SECOND VERSION OF SURE
--------------------------
IN THE SECOND VERSION OF SURE THE INPUTS TAKEN FROM THE BRINSAP TAPES
HAVE BEEN INCREASED.  THIS INCREASE OF VARIABLES IS REQUIRED TO
COMPLETE
THE TWO-LEVEL CLOSED-LOOP SELECTION PROCESS PROPOSED IN CTR RESEARCH
REPORT 439-3.  THAT SELECTION PROCESS REQUIRES ADDITIONAL VARIABLES
TO
CALCULATE NEW INDICES AND TO FACILITATE USE OF A REPORTING PROGRAM.


*/
/*********************************************************************
***/
/*   CMS SYSTEM COMMANDS:  INPUT/OUTPUT FILE DEFINITIONS
*/
/*********************************************************************
***/

CMS FI INOF TAP1 SL 1 (RECFM FB LRECL 510 BLOCK 5100;
CMS FI INON TAP1 SL 2 (RECFM FB LRECL 510 BLOCK 5100;
CMS FI BRINSAP DISK ELIGON BRINS A;
CMS FI BRINSAP DISK ELIGOF BRINSAP A;
CMS FI DATA DISK SURE4 DATA A;
```

```
DATA INITIAL;INPUT FALSE;CARDS;
.
 PROC FSEDIT DATA=INITIAL SCREEN=TEBS.SUREINI;
DATA SYS;   LENGTH ONOF $ 3;
INPUT ONOF $;
CARDS;
ON
 PROC FSEDIT DATA=SYS SCREEN=TEBS.SURESYS;
%GLOBAL ANSW;
DATA ANS;SET SYS;CALL SYMPUT('ANSW',ONOF);RETURN;
%MACRO CHOOS;
   %IF &ANSW=OFF %THEN %DO; INFILE INOF;%END;
   %IF &ANSW=ON  %THEN %DO; INFILE INON;%END;
%MEND CHOOS;

/*********************************************************************
***/

OPTIONS REPLACE CENTER INVALIDDATA=I MISSING=M        ;

DATA SRDATA;

/*   DROP ALL TEMPORARY VARIABLES   */
  DROP TS2 A B C D E F G H I J K AI AIT GH AB COUNT DIG1 DIG2 X Y;

/*LENGTH EST $ 1;*/
  MISSING M;
  LABEL DIST='DISTRICT'                          STRUCT='STRUCTURE'
        RSTR='ROUTE:STRUCT.:FUNCT.' SR='SUFF.:RATING'
        DODRSN='DOD ROAD:SECTION NO.' BDL='BYPASS:DETOUR:LENGTH'
        LOS='LANES:OVER:STRUCT.' LUS='LANES:UNDER:STRUCT.'
        AWIDTH='APPROACH:WIDTH' TS='TYPE:SERVICE'
MST='MAIN:SPAN:TYPE'
        ROWI='ROADWAY:WIDTH' VCO='VERT.:CLEAR.:OVER'
        DECO='DECK:COND.' SSCO='SUPER-:STRUCT.:COND.'
        SUBCO='SUB-:STRUCT.:COND.' INVRA='INV.:RATING'
        SCO='STRUCT.:COND.' DEGE='DECK:GEOM.'
        UCVL='UNDER:CLEAR.:VERT.& LAT.'
        WA='WATER:ADEQ.' AR='APPR.:ROADWAY' TYWO='TYPE:WORK'
        PRW='PROP.:ROADWAY:WIDTH' PNL='PROP.:NO. OF:LANES'
        COPRI='COST OF:PROP.:IMPROV.' TRASA='TRAFFIC:SAFETY'
        ORBDL='OR:BYPASS:LENGTH' ORADT='OR:ADT'
        W_ADT='ADT'  W_BDL='BYPASS:DETOUR:LENGTH'
        FX='BRIDGE LOCATION' RNUM='HWY NO.' BPI='BRIDGE PRIORITY
INDEX'
        CPCO='CHANNEL COND. RATING' ARCO='APPR. RDWY. COND. RATING'
        RWCO='RETAINING WALL COND. RATING'
        ESRLI='ESTIMATED REMAINING LIFE' SLC='SAFE LOAD CONDITION';

   %CHOOS;

  INPUT DIST 1-2 COUNTY $ 3-5 CONTROL $ 6-9 SECTION $ 10-11
        STRUCT $ 17-19 CITY 26-29 RNUM $ 34-38 RSTR 40 FX $ 41-83
        SURA $ 160-163 DODRSN $ 164-168
```

```
          BDL 191-192 YB 216-217 LOS 220-221 LUS 222-223 ADT 224-229
          AWIDTH 233-235 TS 251-252 MST 253-256 CULVERT 265-266
          STRLEN 297-302
          ROWI 309-312 .1 VCO 317-320 DECO 343 SSCO 344 SUBCO 345
          CPCO 346 ARCO 353 RWCO 347 ESRLI 348-349
          INVRA 354-356  SCO 357 DEGE 358 UCVL 359 SLC 360 WA 361
          AR 362 TYWO 366-368 LOI 369-374 PRW 376-379 PNL 380-381
          COPRI 393-397 TRASA $ 398-401 ORBDL 453-454 ORADT 460-465
          BPI $ 491-494;
/*   CREATE UNIQUE BRIDGE ID NUMBER    */

    LENGTH BRID $ 16;
    BRID = TRIM(LEFT(COUNTY)) || ('-') || TRIM(LEFT(CONTROL)) || ('-
')
    || TRIM(LEFT(SECTION)) || ('-') || TRIM(LEFT(STRUCT));

   /* CREATE FLAG VARIABLE TO INDENTIFY PREVIOUSLY SELECTED
      PROJECTS THAT WERE DELETED FROM THE BRINSAP TAPE AND NEED TO BE
      DELETED FROM THE LIST OF PREVIOUSLY SELECTED PROJECTS.THIS
VARIABLE
      IS USED BY THE PROGRAM FREQ.  */

      UPDA='UP';

/*********************************************************************
***/
/*    CHECK FOR MISSING AND ILLEGAL DATA
*/
/*********************************************************************
***/

  SR_EST = ' ';

/*   CHECK FOR MISSING AND ILLEGAL VALUES IN NUMERIC VARIABLES   */

  IF (RSTR<=.Z) OR (LOS<=.Z) OR (LUS<=.Z) OR (TS<=.Z) OR (ROWI<=.Z)
OR
     (VCO<=.Z) OR (INVRA<=.Z) OR (CULVERT=.I) OR (AWIDTH=.I) OR
     (MST=.I) OR (DECO<=.I) OR (SSCO<=.I) OR (SUBCO<=.I) OR (SCO<=.I)
OR
     (DEGE<=.I) OR (UCVL<=.I) OR (WA<=.I) OR (AR<=.I)
  THEN SR_EST = '*';

/*   SET WORKING ADT AND BDL VARIABLES (W_ADT AND W_BDL) DEPENDING ON
     WHICH IS THE INVENTORY ROUTE
*/

  IF (RSTR = 3) OR (RSTR = 4)
    THEN DO;
         IF (ORADT<=.Z) OR (ORBDL<=.Z) THEN SR_EST = '*';
         W_ADT = ORADT;
         W_BDL = ORBDL;
         END;
    ELSE DO;
```

```
        IF (ADT<=.Z) OR (BDL<=.Z) THEN SR_EST = '*';
        W_ADT = ADT;
        W_BDL = BDL;
        END;

/*   CHECK FOR MISSING VALUES IN CHARACTER VARIABLES   */

  IF (DODRSN='    ') OR (TRASA='    ') THEN SR_EST = '*';


/*********************************************************************
***/
/*   CHECK FOR "STRUCTURAL DEFICIENCY" (DEF=1) OR
*/
/*   "FUNCTIONAL OBSOLESCENCE" (OBS=1)
*/
/*********************************************************************
***/


  /*   INITIALIZE DO & SPCL   */

  DEF = 0;   OBS = 0;   SPCL = 0;

/*   EXTRACT LAST (SECOND) DIGIT OF TS VARIABLE   */

  TS2 = TS - INT(TS/10)*10;

/*   STRUCTURALLY DEFICIENT   */

  IF (0 <= DECO <= 4) OR (0 <= SSCO <= 4) OR (0 <= SUBCO <= 4) OR
     (0 <= SCO <= 2)
    THEN DEF = 1;
    ELSE IF ((TS2 = 0) OR (5 <= TS2 <= 9)) AND (0 <= WA <= 2)
           THEN DEF = 1;


/*   FUNCTIONALLY OBSOLETE   */

  IF (0 <= DEGE <= 3) THEN
    IF    ((   0 <= W_ADT <=   250)  AND (ROWI < 20)) OR
          (( 250 < W_ADT <=   750)  AND (ROWI < 22)) OR
          (( 750 < W_ADT <=  2700)  AND (ROWI < 24)) OR
          ((2700 < W_ADT <=  5000)  AND (ROWI < 30)) OR
          ((5000 < W_ADT <=  9000)  AND (ROWI < 44)) OR
          ((9000 < W_ADT <= 35000)  AND (ROWI < 56))
    THEN OBS = 1;
    ELSE IF W_ADT > 35000 THEN SPCL = 1;
         ELSE;
  ELSE IF ((0 <= UCVL <= 3) AND
           (TS2=0 OR TS2=1 OR TS2=2 OR TS2=4 OR TS2=6 OR TS2=7 OR
TS2=8))
          OR (0 <= AR <= 3)
```

```
        THEN OBS = 1;
        ELSE IF ((WA = 3) AND ((TS2 = 0) OR (5 <= TS2 <= 9))) OR (SCO
= 3)
             THEN OBS = 1;


/**********************************************************************
***/
/*   CALCULATE S1 - STRUCTURAL ADEQUACY AND SAFETY
*/
/**********************************************************************
***/

  S1 = 0;   /*   INITIALIZE S1   */


/*** CALCULATE  A  -  REDUCTION FOR DETERIORATION ***/

  IF (0 <= SSCO <= 2) OR (0 <= SUBCO <= 2) THEN A = 55;
  ELSE IF (SSCO = 3) OR (SUBCO = 3) THEN A = 40;
       ELSE IF (SSCO = 4) OR (SUBCO = 4) THEN A = 25;
            ELSE IF (SSCO = 5) OR (SUBCO = 5) THEN A = 10;
                 ELSE IF (SSCO >= 6) THEN A = 0;
                      ELSE A = 0;

/*** CALCULATE  I  -  REDUCTION FOR LOAD CAPACITY ***/

/*   CALCULATE AIT -  ADJUSTED INVENTORY TONNAGE    */

/*   EXTRACT FIRST DIGIT (TYPE OF LOADING) FROM VARIABLE INVRA   */

   DIG1 = INT(INVRA/100);
   IF DIG1 = 1 THEN AIT = (INVRA-100)*1.56;
   ELSE IF DIG1 = 2 THEN AIT = (INVRA-200)*1.00;
        ELSE IF DIG1 = 3 THEN AIT = (INVRA-300)*1.56;
             ELSE IF DIG1 = 4 THEN AIT = (INVRA-400)*1.00;
                  ELSE IF DIG1 = 5 THEN AIT = (INVRA-500)*1.21;
                       ELSE IF DIG1 = 6 THEN AIT = (INVRA-600)*1.21;
                       ELSE IF DIG1 = 9 THEN AIT = (INVRA-900)*1.0;
                            ELSE IF (DIG1 = 7) OR (DIG1 = 8)
                                   THEN DO; SR=999.9; GOTO SKIP; END;
                                   ELSE DO; AIT = 36; SR_EST = '*';
END;


   IF (36 - AIT) > 0 THEN I = (36 - AIT)**1.5 * 0.2778;
                     ELSE I = 0;
   AI = A + I;
   IF (AI > 55) THEN AI = 55;

/*   CALCULATE S1   */

   S1 = 55 - AI;
```

```
/*********************************************************************
***/
/*   CALCULATE S2 - SERVICEABILITY AND FUNCTIONAL OBSOLESCENCE
*/
/*********************************************************************
***/

  /*   INITIALIZE S2  AND TEMPORARY VARIABLES   */

  S2 = 0;
  A = .;  I = .;


/*** CALCULATE  J  -  RATING REDUCTIONS ***/

/*   CALCULATE  A   */

  IF  (0 <= DECO <= 3) THEN A = 5;
  ELSE IF DECO = 4 THEN A = 3;
       ELSE IF DECO = 5 THEN A = 1;
            ELSE IF (DECO >= 6) THEN A = 0;
                 ELSE A = 0;

/*   CALCULATE  B   */

  IF (0 <= SCO <= 3) THEN B = 4;
  ELSE IF SCO = 4 THEN B = 2;
       ELSE IF SCO = 5 THEN B = 1;
            ELSE IF (SCO >= 6) THEN B = 0;
                 ELSE B = 0;

/*   CALCULATE  C   */

  IF (0 <= DEGE <= 3) THEN C = 4;
  ELSE IF DEGE = 4 THEN C = 2;
       ELSE IF DEGE = 5 THEN C = 1;
            ELSE IF (DEGE >= 6) THEN C = 0;
                 ELSE C = 0;

/*   CALCULATE  D   */

  IF (0 <= UCVL <= 3) THEN D = 4;
  ELSE IF UCVL = 4 THEN D = 2;
       ELSE IF UCVL = 5 THEN D = 1;
            ELSE IF (UCVL >= 6) THEN D = 0;
                 ELSE D = 0;

/*   CALCULATE  E   */

  IF (0 <= WA <= 3) THEN E = 4;
  ELSE IF WA = 4 THEN E = 2;
       ELSE IF WA = 5 THEN E = 1;
            ELSE IF (WA >= 6) THEN E = 0;
```

```
                  ELSE E = 0;

/*   CALCULATE   F    */

  IF (0 <= AR <= 3) THEN F = 4;
  ELSE IF AR = 4 THEN F = 2;
       ELSE IF AR = 5 THEN F = 1;
            ELSE IF (AR >= 6) THEN F = 0;
                 ELSE F = 0;

  J = A + B + C + D + E + F;
  IF J > 13 THEN J = 13;

/*** CALCULATE   G & H  -  "WIDTH OF ROADWAY" INSUFFICIENCY ***/

/*   CALCULATE   X    */

  IF (RSTR NE 1) AND (RSTR NE 2) AND (RSTR NE 3) AND (RSTR NE 4) AND
     (RSTR NE 8)
    THEN DO; SR=999.9; GOTO SKIP; END;  /*   BRIDGE N/A    */
    ELSE IF LOS > 0 THEN X = W_ADT/LOS;
                    ELSE X = 0;

/*   IF ADT OR ORADT ARE MISSING THEN X = 0    */
  IF X < 0 THEN X = 0;


/*   CALCULATE   G    */

  IF (CULVERT = 0) OR (CULVERT=.) THEN
    IF (ROWI > 0) AND (AWIDTH > 0) THEN
      IF (ROWI+2) < AWIDTH  THEN G = 5;
      ELSE  G = 0;
    ELSE G = 0;
  ELSE G = 0;

/*   CALCULATE   H    */

  IF (ROWI > 0) AND (LOS > 0) THEN Y = ROWI/LOS;
                              ELSE Y = 0;

  IF (LOS = 1)
    THEN IF (0 < Y < 14)  THEN H = 15;
         ELSE IF (14 <= Y < 18) THEN H = ((18-Y)*15)/4;
              ELSE H = 0;


/*   NOTE:  IF ONE OF THE FOLLOWING FOUR CONDITIONS ARE MET, NO LANE
     WIDTH REDUCTIONS ARE ALLOWED.
*/

    ELSE IF ((LOS = 2) AND (Y >= 16)) OR
            ((LOS = 3) AND (Y >= 15)) OR
            ((LOS = 4) AND (Y >= 14)) OR
```

```
            ((LOS >= 5) AND (Y >= 12))
           THEN H = 0;
           ELSE IF (0 <= X <= 50)
                  THEN IF (0 < Y < 9) THEN H = 7.5;
                       ELSE H = 0;
                  ELSE IF (50 < X <= 125)
                         THEN IF (0 < Y < 10) THEN H = 15;
                         ELSE IF (10 <= Y < 13) THEN H = (15*(13-
Y))/3;
                              ELSE H = 0;
                       ELSE IF (125 < X <= 375)
                              THEN IF (0 < Y < 11) THEN H = 15;
                                   ELSE IF (11 <= Y < 14)
                                          THEN H = (15*(14-Y))/3;
                                          ELSE H = 0;
                              ELSE IF (375 < X <= 1350)
                                     THEN IF (0 < Y < 12) THEN H =
15;
                                          ELSE IF (12 <= Y < 16)
                                                 THEN H=(15*(16-
Y))/4;
                                                 ELSE H = 0;
                                     ELSE IF (X > 1350)
                                            THEN IF (0 <= Y < 15)
                                                  THEN H = 15;
                                                  ELSE IF (15 <= Y <
16)
                                                        THEN
H=15*(16-Y);
                                                        ELSE H = 0;
                                            ELSE H = 0;

  GH = G + H;
  IF GH > 15 THEN GH = 15;


/*** CALCULATE  I  -  "VERTICAL CLEARANCE" INSUFFICIENCY ***/

  IF (DODRSN = '00000') THEN
    IF (VCO >= 1400)
      THEN I = 0;
      ELSE I = 2;
  ELSE IF (DODRSN NE '     ')
         THEN IF (VCO >= 1600)    /*   DEFENSE ROAD    */
                THEN I = 0;
                ELSE I = 2;
         ELSE I = 0;

  IF VCO < 0 THEN I = 0;   /*   IF VCO IS MISSING THEN I = 0    */

/*   CALCULATE S2   */

  S2 = 30 - (J + GH + I);
```

```
/**********************************************************************
***/
/*   CALCULATE S3 - ESSENTIALITY
*/
/**********************************************************************
***/


  /*   INITIALIZE S3  AND TEMPORARY VARIABLES   */

  S3 = 0;
  A = .;  B = .;


/*** CALCULATE  A  -  PUBLIC USE ***/

  K = (S1 + S2) / 85;

  IF (RSTR NE 1) AND (RSTR NE 2) AND (RSTR NE 3) AND (RSTR NE 4) AND
      (RSTR NE 8)
    THEN DO; SR=999.9; GOTO SKIP; END;  /*   BRIDGE N/A   */
    ELSE IF K > 0
           THEN A = (W_ADT*W_BDL*15)/(200000*K);
           ELSE IF K = 0 THEN A = 15;
                        ELSE A = 0;

/*   IF ADT OR BDL ARE MISSING THEN A = 0   */
  IF A < 0 THEN A = 0;

/*** CALCULATE  B  -  MILITARY USE ***/

  IF (DODRSN = '00000')
    THEN B = 0;
    ELSE IF (DODRSN NE '     ')
           THEN B = 2;
           ELSE B = 0;

/*   CALCULATE  S3   */

  AB = A + B;
  IF AB > 15 THEN AB = 15;
  S3 = 15 - AB;


/**********************************************************************
***/
/*   CALCULATE S4 - SPECIAL REDUCTIONS
*/
/**********************************************************************
***/
```

```
/*   INITIALIZE S4 AND TEMPORARY VARIABLES   */

  S4 = 0;
  A = .;   B = .;   C = .;   DIG1 = .;


/*   NOTE:  CALCULATE S4 ONLY IF (S1+S2+S3) >= 50   */

  IF (S1 + S2 + S3) < 50
    THEN DO;
         S4 = 0;
         GOTO SKIPS4;
         END;


/*** CALCULATE  A  -  "DETOUR LENGTH" REDUCTION ***/

  IF (RSTR NE 1) AND (RSTR NE 2) AND (RSTR NE 3) AND (RSTR NE 4) AND
     (RSTR NE 8)
    THEN DO; SR=999.9; GOTO SKIP; END;  /*   BRIDGE N/A   */
    ELSE A = (W_BDL**4) * 5.205 * (10**(-8));

  IF A < 0 THEN A = 0;    /* IF BDL OR ORBDL ARE MISSING THEN A = 0
*/
          ELSE IF A > 5 THEN A = 5;       /*   SET MAX TO 5   */

/*** CALCULATE  B  -  "STRUCTURE TYPE" REDUCTION ***/

/*   EXTRACT FIRST AND SECOND DIGITS OF VARIABLE MST   */

  DIG1 = INT(MST/1000);
  DIG2 = INT(MST/100) - DIG1*10;

  IF (DIG1 = 7) OR (DIG1 = 8) OR (2 <= DIG2 <= 7)
    THEN B = 5;
    ELSE B = 0;

/*** CALCULATE  C  -  "HIGHWAY SAFETY" REDUCTION ***/

/*   COUNT THE NUMBER OF 0'S IN THE VARIABLE TRASA   */

  COUNT = 0;
  DO I=1 TO 4;
    IF SUBSTR(TRASA,I,1)='0' THEN COUNT=COUNT + 1;
  END;
  IF COUNT = 2 THEN C = 1;
  ELSE IF COUNT = 3 THEN C = 2;
       ELSE IF COUNT = 4 THEN C = 3;
            ELSE C = 0;

/*   CALCULATE S4   */

  S4 = A + B + C;
```

```
  SKIPS4: ;

/*********************************************************************
***/
/*   CALCULATE SUFFICIENCY RATING
*/
/*********************************************************************
***/

  IF (SR NE 999.9) THEN SR = S1 + S2 + S3 - S4;
  IF (SR < 0) THEN SR = 888.8;
  SR=ROUND(SR,.1);


 SKIP:  RUN;      /*   END OF SRDATA DATA STEP   */

/*********************************************************************
***/
/*   DETERMINE ELIGIBILITY
*/
/*********************************************************************
***/
%MACRO CHOOS2;
       %IF &ANSW=OFF %THEN %DO; DATA TEBS.ELIGOF;%END;
       %IF &ANSW=ON %THEN %DO; DATA TEBS.ELIGON;%END;
%MEND CHOOS2;

       %CHOOS2;

  SET SRDATA;

/*   INITIALIZE ELIG AND WT VARIABLES    */

     ELIG = 0;
     WT = '  ';

/*   SCREEN BRIDGES TO SELECT THOSE WHICH ARE ELIGIBLE FOR
     FOR REPLACEMENT (WT='RP') OR REHABILITATION (WT='RH').

     DEF=1 --> BRIDGE IS DEFICIENT;  OBS=1 --> BRIDGE IS OBSOLETE
*/

    IF (DEF = 1)  OR  (OBS = 1)  THEN
      IF (SR <= 80)  AND  (SR >= 50)
        THEN DO;
             ELIG = 1;
             WT = 'RH';
             END;
        ELSE IF (SR < 50)
               THEN DO;
                    ELIG = 1;
                    WT = 'RP';
                    END;
```

```
/*   SELECT ONLY THOSE BRIDGES WHICH ARE ELIGIBLE   */

   IF  ELIG = 0   THEN DELETE;

RUN;

/*********************************************************************
***/
/*   PRINT LIST OF ELIGIBLE BRIDGES
*/
/*********************************************************************
***/
/*
PROC SORT                                  ;
  BY DIST ;

TITLE1 'SUFFICIENCY RATING EVALUATION PROGRAM - VERSION 1.0';
TITLE2 '  ';
TITLE3 'ELIGIBLE BRIDGES';
TITLE4 'SORTED BY DISTRICT';
TITLE5 ' ';
TITLE6 'M - MISSING  DATA     I -ILLEGAL DATA';
TITLE5 ' ';

PROC PRINT                      ;
*/

/*********************************************************************
***/
/*   GENERATE AND PRINT LIST OF BRIDGES WITH MISSING OR ILLEGAL DATA
*/
/*********************************************************************
***/
/*
DATA MISSILL;
  SET SRDATA;
  IF SR_EST = '*';
RUN;

TITLE1 'SUFFICIENCY RATING EVALUATION PROGRAM - VERSION 1.0';
TITLE2 ' ';
TITLE3 'BRIDGE RECORDS WITH MISSING OR ILLEGAL DATA';
TITLE4 'SORTED BY DISTRICT';
TITLE5 ' ';
TITLE6 'M - MISSING DATA     I - ILLEGAL DATA';
TITLE7 ' ';

PROC PRINT;
  VAR DIST COUNTY CONTROL SECTION STRUCT RSTR W_ADT DECO SSCO SUBCO
ROWI
      SCO WA DEGE UCVL AR TS TYWO INVRA LOS LUS CULVERT AWIDTH PNL
      PRW W_BDL DODRSN VCO MST TRASA SR;
  BY DIST NOTSORTED;  PAGEBY DIST;       */
```

SOURCE CODE FOR THE PROGRAM SURE/PC
(SUFFICIENCY RATING EVALUATOR PC)

```
/*
                          S U R E pc

              SUFFICIENCY RATING EVALUATOR PROGRAM

                         VERSION 4.0


                        WRITTEN BY:
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                        UPDATED BY:
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                          ON:  MAY  1986
                LAST UPDATED:  MAY 89
    ADAPTED FOR PERSONAL COMPUTER USE BY JOSE WEISSMANN ON MAY 89

     SURE4 IS THE FIRST PROGRAM IN A TWO PART SERIES OF SAS PROGRAMS
DEVELOPED AND WRITTEN TO COMPUTERIZE THE TEXAS SDHPT BRIDGE PROJECT
SELECTION PROCESS. THIS PROGRAM WAS DEVELOPED UNDER CTR RESEARCH
PROJECT
439.  FOR MORE INFORMATION ABOUT THIS PROGRAM OR THE OTHER IN THE
SERIES,
REFER TO CTR REPORT 439-1,439-4.

    SURE4 IS A SAS PROGRAM TO CHECK FOR DEFICIENCY/OBSOLECENCE,
CALCULATE
SUFFICIENCY RATING SCORES AND DETERMINE ELIGIBILITY ON THE SDHPT-
FORMATTED ON-SYSTEM BRINSAP (BRIDGE INVENTORY INSPECTION AND
APPRAISAL
PROGRAM) DATA TAPE.  ALL THE ALGORITHMS IN THIS PROGRAM ARE BASED ON
THE
SDHPT BRINSAP MANUAL OF PROCEDURES. THE FINAL RESULT IS A SAS DATA
SET
WITH THE FEDERALLY ELEGIBLE BRIDGES.THE RESULTING SAS DATA SET IS
USED BY
 THE NEXT PROGRAM, FREQ , TO CALCULATE THE FREQUENCY PERCENTILES FOR
THE ATTRIBUTES USED IN THE PROGRAMS INICO AND DDF.
     DEVELOPED AND WRITTEN IN SAS (STATISTICAL ANALYSIS SYSTEM)
VERSION 5 (RELEASE 5.08) FOR THE IBM 3081-D RUNNING UNDER VM/SP.


A NOTE ON MISSING OR ILLEGAL DATA:
---------------------------------


     THIS PROGRAM WILL ESTIMATE THE SUFFICIENCY RATING (SR)
VALUE WHEN ANY VALUE INVOLVED IN THE SR CALCULATION IS MISSING OR
ILLEGAL.  THE SPECIFIC COMPONENT OR SUBINDEX REQUIRING THE MISSING
OR ILLEGAL DATA IS MADE AS LARGE AS POSSIBLE IN ORDER TO GENERATE
```

```
A CONSERVATIVE SR VALUE.


INPUT AND OUTPUT:
----------------

   INPUT:  THE INPUT TEXT FILES SUDAT.OF AND SUDAT.ON NEED TO BE
AVAILABLE IN THE HARD-DISK OF THE PERSONAL COMPUTER. DEPENDING OF THE
AVAILABLE HARD-DISK SPACE THE FILES NEED TO BE SPLITTED AND PROCESSED
ONE AT A TIME.

   OUTPUT: THE PROGRAM PRODUCES TWO OUTPUTS:  A REPORT OUTPUT FILE
AND
           (SURE2 LISTING) AND THE ELIGIBLE DATA SET OUTPUT FILE
           (ELIGIBLE BRINSAP).  THE REPORT FILE CONTAINS A LIST OF
ALL
           THE DATA ITEMS FOR THOSE BRIDGE RECORDS CONTAINING MISSING
           OR ILLEGAL DATA.  THE ELIGIBLE DATA SET OUTPUT FILE IS A
           PERMANENT SAS DATA SET CONTAINING ALL THE BRIDGES ELIGIBLE
FOR
           FEDERAL FUNDING.  THE ELIGIBLE FILE IS IN SAS FORMAT AND
CAN
           ONLY BE READ BY SAS.

THE SECOND VERSION OF SURE
--------------------------
IN THE SECOND VERSION OF SURE THE INPUTS TAKEN FROM THE BRINSAP TAPES
HAVE BEEN INCREASED.  THIS INCREASE OF VARIABLES IS REQUIRED TO
COMPLETE
THE TWO-LEVEL CLOSED-LOOP SELECTION PROCESS PROPOSED IN CTR RESEARCH
REPORT 439-3.  THAT SELECTION PROCESS REQUIRES ADDITIONAL VARIABLES
TO
CALCULATE NEW INDICES AND TO FACILITATE USE OF A REPORTING PROGRAM.


*/
/*********************************************************************
***/
/*                          INPUT/OUTPUT FILE DEFINITIONS
*/
/*********************************************************************
***/

filename INOF 'd:\JOSEW\sudat.of';
filename INON 'd:\JOSEW\sudat.on';
libname out 'd:\JOSEW' ;
DATA INITIAL;INPUT FALSE;CARDS;
.
   PROC FSEDIT DATA=INITIAL SCREEN=out.SUREINI    ;
DATA SYS;   LENGTH ONOF $ 3;
INPUT ONOF $;
CARDS;
ON
    PROC FSEDIT DATA=SYS SCREEN=out.SURESYS;
```

```
%GLOBAL ANSW;
DATA ANS;SET SYS;CALL SYMPUT('ANSW',ONOF);RETURN;
%MACRO CHOOS;
   %IF &ANSW=OFF %THEN %DO; INFILE INOF;%END;
   %IF &ANSW=ON  %THEN %DO; INFILE INON;%END;
%MEND CHOOS;

/*********************************************************************
***/

OPTIONS REPLACE /* CENTER  MISSING='M' */ obs=MAX                ;

DATA SRDATA;

/*   DROP ALL TEMPORARY VARIABLES   */
  DROP TS2 A B C D E F G H I J K AI AIT GH AB COUNT DIG1 DIG2 X Y;

/*LENGTH EST $ 1;*/
        MISSING  M ;
/*  LABEL DIST='DISTRICT'                          STRUCT='STRUCTURE'
        RSTR='ROUTE:STRUCT.:FUNCT.' SR='SUFF.:RATING'
        DODRSN='DOD ROAD:SECTION NO.' BDL='BYPASS:DETOUR:LENGTH'
        LOS='LANES:OVER:STRUCT.' LUS='LANES:UNDER:STRUCT.'
        AWIDTH='APPROACH:WIDTH' TS='TYPE:SERVICE'
MST='MAIN:SPAN:TYPE'
        ROWI='ROADWAY:WIDTH' VCO='VERT.:CLEAR.:OVER'
        DECO='DECK:COND.' SSCO='SUPER-:STRUCT.:COND.'
        SUBCO='SUB-:STRUCT.:COND.' INVRA='INV.:RATING'
        SCO='STRUCT.:COND.' DEGE='DECK:GEOM.'
        UCVL='UNDER:CLEAR.:VERT.& LAT.'
        WA='WATER:ADEQ.' AR='APPR.:ROADWAY' TYWO='TYPE:WORK'
        PRW='PROP.:ROADWAY:WIDTH' PNL='PROP.:NO. OF:LANES'
        COPRI='COST:OF:PROP.:IMPROV.' TRASA='TRAFFIC:SAFETY'
        ORBDL='OR:BYPASS:LENGTH' ORADT='OR:ADT'
        W_ADT='ADT'   W_BDL='BYPASS:DETOUR:LENGTH'
        FX='BRIDGE LOCATION' RNUM='HWY NO.' BPI='BRIDGE PRIORITY
INDEX'
        CPCO='CHANNEL COND. RATING' ARCO='APPR. RDWY. COND. RATING'
        RWCO='RETAINING WALL COND. RATING'
        ESRLI='ESTIMATED REMAINING LIFE' SLC='SAFE LOAD CONDITION';
*/

   %CHOOS;

  inPUT DIST COUNTY $4. CONTROL $ 5. SECTION $ 3.
        STRUCT $ 4. CITY  RNUM $ 6. RSTR FX $ 44.
        SURA $ 5. DODRSN $ 6.
        BDL YB LOS LUS ADT
        AWIDTH TS MST CULVERT
        STRLEN
        ROWI VCO DECO SSCO SUBCO
        CPCO ARCO RWCO ESRLI
        INVRA SCO DEGE UCVL SLC WA
        AR TYWO LOI PRW  PNL
```

```
       COPRI  TRASA $ 5. ORBDL ORADT
       BPI $ 5.;
    if rnum='XXXXX ' THEN RNUM  ='     ';
    if SURA='XXXX ' THEN SURA='     ';
    IF DODRSN='XXXXX ' THEN DODRSN='      ';
    IF TRASA='XXXX ' THEN TRASA='     ';
    IF BPI='XXXX ' THEN BPI='     ';
/*  CREATE UNIQUE BRIDGE ID NUMBER     */
    LENGTH BRID $ 16;
    BRID = TRIM(LEFT(COUNTY)) || ('-') || TRIM(LEFT(CONTROL)) || ('-
')
     || TRIM(LEFT(SECTION)) || ('-') || TRIM(LEFT(STRUCT));
   /* CREATE FLAG VARIABLE TO INDENTIFY PREVIOUSLY SELECTED
      PROJECTS THAT WERE DELETED FROM THE BRINSAP TAPE AND NEED TO BE
      DELETED FROM THE LIST OF PREVIOUSLY SELECTED PROJECTS.THIS
VARIABLE
      IS USED BY THE PROGRAM FREQ.  */

      UPDA='UP';

/*********************************************************************
***/
/*    CHECK FOR MISSING AND ILLEGAL DATA
*/
/*********************************************************************
**/

  SR_EST = ' ';

/*   CHECK FOR MISSING AND ILLEGAL VALUES IN NUMERIC VARIABLES   */

  IF (RSTR<=.Z) OR (LOS<=.Z) OR (LUS<=.Z) OR (TS<=.Z) OR (ROWI<=.Z)
OR
     (VCO<=.Z) OR (INVRA<=.Z) OR (CULVERT=.I) OR (AWIDTH=.I) OR
     (MST=.I) OR (DECO<=.I) OR (SSCO<=.I) OR (SUBCO<=.I) OR (SCO<=.I)
OR
     (DEGE<=.I) OR (UCVL<=.I) OR (WA<=.I) OR (AR<=.I)
  THEN SR_EST = '*';

/*   SET WORKING ADT AND BDL VARIABLES (W_ADT AND W_BDL) DEPENDING ON
     WHICH IS THE INVENTORY ROUTE
*/

  IF (RSTR = 3) OR (RSTR = 4)
    THEN DO;
         IF (ORADT<=.Z) OR (ORBDL<=.Z) THEN SR_EST = '*';
         W_ADT = ORADT;
         W_BDL = ORBDL;
         END;
    ELSE DO;
         IF (ADT<=.Z) OR (BDL<=.Z) THEN SR_EST = '*';
         W_ADT = ADT;
         W_BDL = BDL;
         END;
```

```
/*   CHECK FOR MISSING VALUES IN CHARACTER VARIABLES   */

  IF (DODRSN='      ') OR (TRASA='    ') THEN SR_EST = '*';


/*****************************************************************
***/
/*   CHECK FOR "STRUCTURAL DEFICIENCY" (DEF=1) OR
*/
/*   "FUNCTIONAL OBSOLESCENCE" (OBS=1)
*/
/*****************************************************************
***/


  /*   INITIALIZE DO & SPCL   */

  DEF = 0;   OBS = 0;   SPCL = 0;

/*   EXTRACT LAST (SECOND) DIGIT OF TS VARIABLE   */

  TS2 = TS - INT(TS/10)*10;

/*   STRUCTURALLY DEFICIENT   */

  IF (0 <= DECO <= 4) OR (0 <= SSCO <= 4) OR (0 <= SUBCO <= 4) OR
     (0 <= SCO <= 2)
    THEN DEF = 1;
    ELSE IF ((TS2 = 0) OR (5 <= TS2 <= 9)) AND (0 <= WA <= 2)
           THEN DEF = 1;
 /*   FUNCTIONALLY OBSOLETE   */

  IF (0 <= DEGE <= 3) THEN  DO;
    IF    ((   0 <= W_ADT <=   250)  AND (ROWI < 20)) OR
          (( 250 < W_ADT <=   750)  AND (ROWI < 22)) OR
          (( 750 < W_ADT <=  2700)  AND (ROWI < 24)) OR
          ((2700 < W_ADT <=  5000)  AND (ROWI < 30)) OR
          ((5000 < W_ADT <=  9000)  AND (ROWI < 44)) OR
          ((9000 < W_ADT <= 35000)  AND (ROWI < 56))
    THEN OBS = 1;
    ELSE IF W_ADT > 35000 THEN SPCL = 1;
      /* ELSE; */      END;
IF (DEGE>3) THEN DO;
/*  ELSE*/ IF ((0 <= UCVL <= 3) AND
             (TS2=0 OR TS2=1 OR TS2=2 OR TS2=4 OR TS2=6 OR TS2=7 OR
TS2=8))
           OR (0 <= AR <= 3)
        THEN OBS = 1;
        ELSE IF ((WA = 3) AND ((TS2 = 0) OR (5 <= TS2 <= 9))) OR (SCO
= 3)
             THEN OBS = 1;
                    END;
```

```
/**********************************************************************
***/
/*   CALCULATE S1 - STRUCTURAL ADEQUACY AND SAFETY
*/
/**********************************************************************
***/

  S1 = 0;    /*   INITIALIZE S1    */


/*** CALCULATE  A  -  REDUCTION FOR DETERIORATION ***/

  IF (0 <= SSCO <= 2) OR (0 <= SUBCO <= 2) THEN A = 55;
  ELSE IF (SSCO = 3) OR (SUBCO = 3) THEN A = 40;
       ELSE IF (SSCO = 4) OR (SUBCO = 4) THEN A = 25;
            ELSE IF (SSCO = 5) OR (SUBCO = 5) THEN A = 10;
                 ELSE IF (SSCO >= 6) THEN A = 0;
                      ELSE A = 0;

/*** CALCULATE  I  -  REDUCTION FOR LOAD CAPACITY ***/

/*   CALCULATE AIT -  ADJUSTED INVENTORY TONNAGE   */

/*   EXTRACT FIRST DIGIT (TYPE OF LOADING) FROM VARIABLE INVRA   */

   DIG1 = INT(INVRA/100);
   IF DIG1 = 1 THEN AIT = (INVRA-100)*1.56;
   ELSE IF DIG1 = 2 THEN AIT = (INVRA-200)*1.00;
        ELSE IF DIG1 = 3 THEN AIT = (INVRA-300)*1.56;
             ELSE IF DIG1 = 4 THEN AIT = (INVRA-400)*1.00;
                  ELSE IF DIG1 = 5 THEN AIT = (INVRA-500)*1.21;
                       ELSE IF DIG1 = 6 THEN AIT = (INVRA-600)*1.21;
                       ELSE IF DIG1 = 9 THEN AIT = (INVRA-900)*1.0;
                            ELSE IF (DIG1 = 7) OR (DIG1 = 8)
                                   THEN DO; SR=999.9; GOTO SKIP; END;
                                   ELSE DO; AIT = 36; SR_EST = '*';
END;


   IF (36 - AIT) > 0 THEN I = (36 - AIT)**1.5 * 0.2778;
                     ELSE I = 0;
   AI = A + I;
   IF (AI > 55) THEN AI = 55;

/*   CALCULATE S1   */

   S1 = 55 - AI;


/**********************************************************************
***/
/*   CALCULATE S2 - SERVICEABILITY AND FUNCTIONAL OBSOLESCENCE
*/
```

```
/**********************************************************************
***/

  /*   INITIALIZE S2  AND TEMPORARY VARIABLES   */

  S2 = 0;
  A = .;  I = .;


/*** CALCULATE  J  -  RATING REDUCTIONS ***/

/*   CALCULATE  A   */

  IF  (0 <= DECO <= 3) THEN A = 5;
  ELSE IF DECO = 4 THEN A = 3;
       ELSE IF DECO = 5 THEN A = 1;
            ELSE IF (DECO >= 6) THEN A = 0;
                 ELSE A = 0;

/*   CALCULATE  B   */

  IF (0 <= SCO <= 3) THEN B = 4;
  ELSE IF SCO = 4 THEN B = 2;
       ELSE IF SCO = 5 THEN B = 1;
            ELSE IF (SCO >= 6) THEN B = 0;
                 ELSE B = 0;

/*   CALCULATE  C   */

  IF (0 <= DEGE <= 3) THEN C = 4;
  ELSE IF DEGE = 4 THEN C = 2;
       ELSE IF DEGE = 5 THEN C = 1;
            ELSE IF (DEGE >= 6) THEN C = 0;
                 ELSE C = 0;

/*   CALCULATE  D   */

  IF (0 <= UCVL <= 3) THEN D = 4;
  ELSE IF UCVL = 4 THEN D = 2;
       ELSE IF UCVL = 5 THEN D = 1;
            ELSE IF (UCVL >= 6) THEN D = 0;
                 ELSE D = 0;

/*   CALCULATE  E   */

  IF (0 <= WA <= 3) THEN E = 4;
  ELSE IF WA = 4 THEN E = 2;
       ELSE IF WA = 5 THEN E = 1;
            ELSE IF (WA >= 6) THEN E = 0;
                 ELSE E = 0;

/*   CALCULATE  F   */

  IF (0 <= AR <= 3) THEN F = 4;
```

```
  ELSE IF AR = 4 THEN F = 2;
       ELSE IF AR = 5 THEN F = 1;
            ELSE IF (AR >= 6) THEN F = 0;
                 ELSE F = 0;

  J = A + B + C + D + E + F;
  IF J > 13 THEN J = 13;

/*** CALCULATE  G & H  -  "WIDTH OF ROADWAY" INSUFFICIENCY ***/

/*   CALCULATE  X   */

  IF (RSTR NE 1) AND (RSTR NE 2) AND (RSTR NE 3) AND (RSTR NE 4) AND
     (RSTR NE 8)
    THEN DO; SR=999.9; GOTO SKIP; END;  /*   BRIDGE N/A   */
    ELSE IF LOS > 0 THEN X = W_ADT/LOS;
                    ELSE X = 0;

/*   IF ADT OR ORADT ARE MISSING THEN X = 0   */
  IF X < 0 THEN X = 0;


/*   CALCULATE  G   */

/* IF (CULVERT = 0) OR (CULVERT=.) THEN
    IF (ROWI > 0) AND (AWIDTH > 0) THEN
      IF (ROWI+2) < AWIDTH  THEN G = 5;
      ELSE  G = 0;
    ELSE G = 0;
  ELSE G = 0; */
  /* Micro computer patch for G */
g=0;
     IF((CULVERT = 0) OR (CULVERT='M')) and
       ((ROWI > 0) AND (AWIDTH > 0)) and
         ((ROWI+2) < AWIDTH)  THEN G = 5;



/*   CALCULATE  H   */
IF (ROWI > 0) AND (LOS>0) THEN Y=ROWI/LOS;
   ELSE Y=0;

  IF (LOS = 1)
    THEN IF (0 < Y < 14)  THEN H = 15;
         ELSE IF (14 <= Y < 18) THEN H = ((18-Y)*15)/4;
              ELSE H = 0   ;
IF NOT (LOS=1) THEN do;IF ((LOS = 2) AND (Y >= 16)) OR
            ((LOS = 3) AND (Y >= 15)) OR
            ((LOS = 4) AND (Y >= 14)) OR
            ((LOS >= 5) AND (Y >= 12))
          THEN H = 0     ;
          ELSE     IF (0 <= X <= 50)
                 THEN IF (0 < Y < 9) THEN H = 7.5;
                      ELSE H = 0   ;
```

```
IF not (((LOS = 2) AND (Y >= 16)) OR
            ((LOS = 3) AND (Y >= 15)) OR
            ((LOS = 4) AND (Y >= 14)) OR
            ((LOS >= 5) AND (Y >= 12)))
                  and
       (50<x<=125) then          IF (0 < Y < 10) THEN H = 15   ;
                             ELSE IF (10 <= Y < 13) THEN H = (15*(13-
Y))/3;
                                  ELSE H = 0    ;
  IF not (((LOS = 2) AND (Y >= 16)) OR
            ((LOS = 3) AND (Y >= 15)) OR
            ((LOS = 4) AND (Y >= 14)) OR
            ((LOS >= 5) AND (Y >= 12)))   and
                                   (125 < X <= 375)
                                  THEN IF (0 < Y < 11) THEN H = 15;
                                       ELSE IF (11 <= Y < 14)
                                              THEN H = (15*(14-Y))/3;
                                              ELSE H = 0   ;
 IF not (((LOS = 2) AND (Y >= 16)) OR
            ((LOS = 3) AND (Y >= 15)) OR
            ((LOS = 4) AND (Y >= 14)) OR
            ((LOS >= 5) AND (Y >= 12)))   and
                                          (375 < X <= 1350)
                                         THEN IF (0 < Y < 12) THEN H =
15;
                                              ELSE IF (12 <= Y < 16)
                                                     THEN H=(15*(16-
Y))/4;
                                                     ELSE H = 0   ;
IF not (((LOS = 2) AND (Y >= 16)) OR
            ((LOS = 3) AND (Y >= 15)) OR
            ((LOS = 4) AND (Y >= 14)) OR
            ((LOS >= 5) AND (Y >= 12)))   and
                                                (X > 1350)
                                               THEN IF (0 <= Y < 15)
                                                    THEN H = 15   ;
                                                    ELSE IF (15 <= Y <
16)
                                                          THEN
H=15*(16-Y);
                                                          ELSE H = 0
;
                                   /*       ELSE H = 0    ;*/ end;

  GH = G + H;
  IF GH > 15 THEN GH = 15;


/*** CALCULATE  I  -  "VERTICAL CLEARANCE" INSUFFICIENCY ***/

  IF (DODRSN = '00000') THEN
    IF (VCO >= 1400)
      THEN I = 0;
      ELSE I = 2;
```

```
  ELSE IF (DODRSN NE '      ')
         THEN IF (VCO >= 1600)     /*   DEFENSE ROAD   */
                THEN I = 0;
                ELSE I = 2;
         ELSE I = 0;

  IF VCO < 0 THEN I = 0;    /*   IF VCO IS MISSING THEN I = 0   */

/*   CALCULATE S2   */

  S2 = 30 - (J + GH + I);

/*********************************************************************
***/
/*   CALCULATE S3 - ESSENTIALITY
*/
/*********************************************************************
***/


  /*   INITIALIZE S3  AND TEMPORARY VARIABLES   */

  S3 = 0;
  A = .;  B = .;


/*** CALCULATE  A  -  PUBLIC USE ***/

  K = (S1 + S2) / 85;

  IF (RSTR NE 1) AND (RSTR NE 2) AND (RSTR NE 3) AND (RSTR NE 4) AND
     (RSTR NE 8)
    THEN DO; SR=999.9; GOTO SKIP; END;  /*   BRIDGE N/A   */
    ELSE IF K > 0
           THEN A = (W_ADT*W_BDL*15)/(200000*K);
           ELSE IF K = 0 THEN A = 15;
                          ELSE A = 0;

/*   IF ADT OR BDL ARE MISSING THEN A = 0   */
  IF A < 0 THEN A = 0;

/*** CALCULATE  B  -  MILITARY USE ***/

  IF (DODRSN = '00000')
    THEN B = 0;
    ELSE IF (DODRSN NE '      ')
           THEN B = 2;
           ELSE B = 0;

/*   CALCULATE  S3   */

  AB = A + B;
  IF AB > 15 THEN AB = 15;
  S3 = 15 - AB;
```

```
/**********************************************************************
***/
/*   CALCULATE S4 - SPECIAL REDUCTIONS
*/
/**********************************************************************
***/

/*   INITIALIZE S4 AND TEMPORARY VARIABLES   */

  S4 = 0;
  A = .;   B = .;   C = .;   DIG1 = .;

/*   NOTE:  CALCULATE S4 ONLY IF (S1+S2+S3) >= 50   */

  IF (S1 + S2 + S3) < 50
    THEN DO;
         S4 = 0;
         GOTO SKIPS4;
         END;

/*** CALCULATE  A  -  "DETOUR LENGTH" REDUCTION ***/

  IF (RSTR NE 1) AND (RSTR NE 2) AND (RSTR NE 3) AND (RSTR NE 4) AND
     (RSTR NE 8)
    THEN DO; SR=999.9; GOTO SKIP; END;  /*   BRIDGE N/A   */
    ELSE A = (W_BDL**4) * 5.205 * (10**(-8));

  IF A < 0 THEN A = 0;    /* IF BDL OR ORBDL ARE MISSING THEN A = 0
*/
           ELSE IF A > 5 THEN A = 5;      /*   SET MAX TO 5   */

/*** CALCULATE  B  -  "STRUCTURE TYPE" REDUCTION ***/

/*   EXTRACT FIRST AND SECOND DIGITS OF VARIABLE MST   */

  DIG1 = INT(MST/1000);
  DIG2 = INT(MST/100) - DIG1*10;

  IF (DIG1 = 7) OR (DIG1 = 8) OR (2 <= DIG2 <= 7)
    THEN B = 5;
    ELSE B = 0;

/*** CALCULATE  C  -  "HIGHWAY SAFETY" REDUCTION ***/

/*   COUNT THE NUMBER OF 0'S IN THE VARIABLE TRASA   */

  COUNT = 0;
  DO I=1 TO 4;
```

```
    IF SUBSTR(TRASA,I,1)='0' THEN COUNT=COUNT + 1;
  END;
  IF COUNT = 2 THEN C = 1;
  ELSE IF COUNT = 3 THEN C = 2;
       ELSE IF COUNT = 4 THEN C = 3;
            ELSE C = 0;

/*   CALCULATE S4   */

  S4 = A + B + C;

  SKIPS4: ;

/*********************************************************************
***/
/*   CALCULATE SUFFICIENCY RATING
*/
/*********************************************************************
***/

  IF (SR NE 999.9) THEN SR = S1 + S2 + S3 - S4;
  IF (SR < 0) THEN SR = 888.8;
  SR=ROUND(SR,.1);


 SKIP:  RUN;      /*   END OF SRDATA DATA STEP   */
/*********************************************************************
***/
/*   DETERMINE ELIGIBILITY
*/
/*********************************************************************
***/
%MACRO CHOOS2;
       %IF &ANSW=OFF %THEN %DO; DATA out.ELIGOF;%END;
       %IF &ANSW=ON %THEN %DO; DATA out.ELIGON;%END;
%MEND CHOOS2;
       %CHOOS2;
  SET SRDATA;

/*   INITIALIZE ELIG AND WT VARIABLES    */

     ELIG = 0;
     WT = '  ';

/*   SCREEN BRIDGES TO SELECT THOSE WHICH ARE ELIGIBLE FOR
     FOR REPLACEMENT (WT='RP') OR REHABILITATION (WT='RH').

     DEF=1 --> BRIDGE IS DEFICIENT;  OBS=1 --> BRIDGE IS OBSOLETE
*/

    IF (DEF = 1)  OR  (OBS = 1)  THEN
      IF (SR <= 80)  AND  (SR >= 50)
        THEN DO;
             ELIG = 1;
```

```
                WT = 'RH';
                END;
           ELSE IF (SR < 50)
                  THEN DO;
                       ELIG = 1;
                       WT = 'RP';
                       END;

/*   SELECT ONLY THOSE BRIDGES WHICH ARE ELIGIBLE   */

   IF  ELIG = 0   THEN DELETE;

RUN;
```

SOURCE CODE FOR THE PROGRAM FREQ (FREQUENCIES)

```
/*
THIS PROGRAM CALCULATES THE PERCENTILE SCALING VALUES FOR THE
ATTRIBUTES THAT ARE NECESSARY FOR RUNNING THE PROGRAMS DDF AND INICO.
IT CREATES TWO DATASETS QDATON TEBS OR QDATOF TEBS DEPENDING OF THE
CHOICE OF EITHER ON OR OFF SYSTEMS. ONCE IT IS RUN IT REPLACES THE
EXISTING DATA SET ON THE DISK.IT PROMPTS THE USER WITH SCREENS FOR
THE CHOICE OF EITHER ON OR OFF SYSTEM. IT ALSO PERFORMS THE
MANAGEMENT OF THE PREVIOUSLY SELECTED PROJECTS DELETING THE ONES THAT
WERE PREVIOUSLY SELECTED IN PAST PROGRAMS IN ORDER TO CALCULATE THE
FREQUENCIES.IT ALSO CHECKS IF THE PREVIOUSLY SELECTED PROJECTS WERE
ALREADY DELETED FROM THE BRINSAP DATA BASE, IN CASE OF A POSITIVE
ANSWER IT ALSO UPDATES THE DATA SET OF THE PREVIOUSLY SELECTED
PROJECTS BY DELETING THESE PROJECTS. FOR MORE DETAILS CONSULT CTR
REPORT 439-4

                      WRITTEN BY : JOSE WEISSMANN
                      ON: MAY 89
      FOR MORE DETAILS REFER TO RESEARCH REPORT 439-4 CTR
CENTER FOR TRANSPORTATION RESEARCH UNIVERSITY OF TEXAS AT AUSTIN 1989
  VARIABLE
  NAME        VARIABLE DESCRIPTION
  --------    --------------------------------------------------------
  CFRH        REHABILITATION COST, IN DOLLARS/SQ. FT.  DEFAULT IS 25.
              USED TO ESTIMATE THE BRIDGE PROJECT COST IF MISSING.
  CFRP        REPLACEMENT COST, IN DOLLARS/SQ. FT.  DEFAULT IS 35.
              USED TO ESTIMATE THE BRIDGE PROJECT COST IF MISSING. */

 /* CMS COMMANDS */
CMS FI BRINS DISK ELIGON BRINS A;
CMS FI BRINSAP DISK ELIGOF BRINSAP A;
CMS FI OUT DISK QDATON OUT A;
CMS FI OUP DISK QDATOF OUP A;
CMS FI DON DISK PREVION DON A;
CMS FI DOF DISK PREVOFF DOF A;
       /*   SAS OPTIONS CHOSEN   */
                      %GLOBAL ANSW ;
OPTIONS REPLACE CENTER MISSING='M' INVALIDDATA=I NOLABEL        ;
DATA INITIAL;INPUT FALSE;CARDS;
.
   PROC FSEDIT DATA=INITIAL SCREEN=TEBS.STATINI;
  DATA SYS;   LENGTH ONOF $ 3;
INPUT ONOF $;
CARDS;
ON
  PROC FSEDIT DATA=SYS SCREEN=TEBS.STATSYS;
DATA ANS; SET SYS;CALL SYMPUT('ANSW',ONOF);RETURN;

   /* MACRO TO UPDATE THE PREVIOUSLY SELECTED DATA SET */
    /* MACRO TO DELETE PREVIOUSLY SELECTED PROJECTS   */
    %MACRO CHOOS;
   %IF &ANSW=OFF %THEN %DO; PROC SORT DATA=TEBS.ELIGOF;
       BY BRID;
       PROC SORT DATA=TEBS.PREVOFF;BY BRID;
```

```
        DATA TEBS.PREVOFF;MERGE TEBS.ELIGOF TEBS.PREVOFF; BY BRID;
        IF FLAG='PREV' AND UPDA='UP';KEEP FLAG BRID DIST YEAR ;
        DATA QDATA; MERGE TEBS.ELIGOF TEBS.PREVOFF; BY BRID;
        IF FLAG='PREV' THEN DELETE;DROP FLAG YEAR ; %END;
    %IF &ANSW=ON %THEN %DO;
        DATA OITO;ROITO='YES';RETURN;
    PROC FSEDIT DATA=OITO SCREEN=TEBS.EIGHT;
        DATA OITO;SET OITO;CALL SYMPUT('RMACR',ROITO);RETURN;
    PROC SORT DATA=TEBS.ELIGON;
        BY BRID;
        PROC SORT DATA=TEBS.PREVION;BY BRID;
        DATA TEBS.PREVION;MERGE TEBS.ELIGON TEBS.PREVION; BY BRID;
        IF FLAG='PREV' AND UPDA='UP';KEEP FLAG BRID DIST YEAR ;
        DATA QDATA; MERGE TEBS.ELIGON TEBS.PREVION; BY BRID;
        IF FLAG='PREV' THEN DELETE;DROP FLAG YEAR ; %END;
        %IF &RMACR=YES %THEN %DO;
          DATA QDATA; SET QDATA;
        A=1;A=INT(CONTROL/1000);IF A=8 THEN DELETE;DROP A; %END;
         %MEND CHOOS;
     DATA QDATA; SET INITIAL;RETURN;
    %CHOOS;

    /*   DATA STEP TO CALCULATE VALUES FOR THE FREQUENCIES */
    DATA QDATA;
   MISSING N D;
      IF _N_=1 THEN SET SYS;
                    SET QDATA;
     KEEP  CFRP CFRH YB BRID
           CPI_EST SCR_EST DSS_EST SR_EST     CPV W_ADT SR DSS BWR
           DIST COUNTY WT ROWI CPI        CPV_EST W_BDL ESRLI DEGE
           UCVL WA SLC SCO CONTROL  SECTION STRUCT RNUM CSS FX LOS PNL
           PRW DECO SSCO SUBCO;

/*   INITIALIZE ESTIMATE FLAGS AND SCORE    */

    CPI_EST = ' ';    CPV_EST = ' ';   DSS_EST = ' ';
    AQ = '  ';        SCR_EST = ' ';CFRH=25;CFRP=35;

/*   CHECK IF THE COST OF PROPOSED IMPROVEMENTS (COPRI) IS MISSING
     AND IF IT IS, ESTIMATE IT DEPENDING ON THE TYPE OF WORK OF THE
     BRIDGE PROJECT.
*/

    IF (COPRI <= 0)
      THEN DO;
           CPI_EST = '*';
           CPV_EST = '*';
           IF TYWO = 371                             /*   REHABILITATION
*/
             THEN IF (LOI > 0) AND (PRW > 0)
                    THEN CPI = LOI * PRW * CFRH;
                    ELSE CPI = 20000;
             ELSE IF (LOI > 0) AND (PRW > 0)     /*   REPLACEMENT
*/
```

```
                    THEN CPI = LOI * PRW * CFRP;
                    ELSE CPI = 20000;
             END;
         ELSE CPI = COPRI * 1000;


/*   GET CONTROL-SECTION-STRUCTURE NUMBER  */
    LENGTH CSS $ 12;
    IF (CONTROL = '    ') OR (SECTION = '  ') OR (STRUCT = '   ')
      THEN  CSS = .N;
ELSE  CSS = (TRIM(LEFT(CONTROL)) || ('-') || TRIM(LEFT(SECTION)) ||
          ('-') || TRIM(LEFT(STRUCT)));

/*   CALCULATE COST PER VEHICLE   */

    IF (W_ADT > 0) THEN CPV = ROUND(CPI/W_ADT);
                   ELSE DO; CPV_EST = '*'; CPV = CPI; END;


/*   CALCULATE THE BRIDGE WIDTH CONDITION.THIS IS AN ATTRIBUTE NOT
USED
     IN THIS VERSION
     BWC = 0  -->  BRIDGE WIDTH IS VERY CRITICAL
     BWC = 1  -->  BRIDGE WIDTH IS NOT CRITICAL

    IF ((W_ADT > 750) AND  (0 < ROWI < 24)) OR
       ((750 >= W_ADT > 400) AND  (0 < ROWI < 22)) OR
       ((W_ADT <= 400)  AND  (0 < ROWI < 20))
      THEN BWC = 0;
      ELSE BWC = 1;                                    */

/*  CALCULATE THE OFF-SYSTEM BRIDGE WIDTH RATIO       */
    IF ONOF='OFF' THEN DO ;
    IF W_ADT<50 THEN BWR=ROWI/24;
    IF W_ADT>=50 AND W_ADT<400 THEN BWR=ROWI/28;
    IF W_ADT>=400 AND W_ADT<750 THEN BWR=ROWI/34;
    IF W_ADT>=750 AND W_ADT<1500 THEN BWR=ROWI/40;
    IF W_ADT>=1500 THEN BWR=ROWI/44;
    IF BWR>1 THEN BWR=1.000;
    BWR=ROUND(BWR,0.001); END;

/*  CALCULATE THE ON-SYSTEM BRIDGE WIDTH RATIO       */
    IF ONOF='ON' THEN DO ;
    IF W_ADT<50 THEN BWR=ROWI/28;
    IF W_ADT>=50 AND W_ADT<400 THEN BWR=ROWI/28;
    IF W_ADT>=400 AND W_ADT<750 THEN BWR=ROWI/34;
    IF W_ADT>=750 AND W_ADT<1500 THEN BWR=ROWI/38;
    IF W_ADT>=1500 AND W_ADT<3000 THEN BWR=ROWI/40;
    IF W_ADT>=3000 THEN BWR=ROWI/44;
    IF BWR>1 THEN BWR=1.000;
    BWR=ROUND(BWR,0.001);END;

/*   CALCULATE MINIMUM OF DECK, SUBSTRUCTURE, SUPERSTRUCTURE
CONDITION */
```

```
    IF (DECO<=.Z) OR (SSCO<=.Z) OR (SUBCO<=.Z) OR (CPCO<=.Z)
      THEN  DSS_EST='*';

    IF (DECO<=.Z) THEN W_DECO=0;
                  ELSE W_DECO=DECO;
    IF (SSCO<=.Z) THEN W_SSCO=0;
                  ELSE W_SSCO=SSCO;
    IF (SUBCO<=.Z) THEN W_SUBCO=0;
                   ELSE W_SUBCO=SUBCO;
    IF (CPCO<=.Z) THEN W_CPCO=9;
                   ELSE W_CPCO=CPCO;
    DSS = MIN(W_DECO,W_SUBCO,W_SSCO,W_CPCO);

SR=ROUND(SR);

/*    CALCULATE STRUCTURAL SAFETY INDEX.THIS ATTRIBUTE IS NOT USED IN
      THIS VERSION; /*

/* IF SUBCO>.I THEN SUBWT=9; ELSE SUBWT=0;
IF SSCO>.I THEN SSWT=9; ELSE SSWT=0;
IF DECO>.I THEN DKWT=8; ELSE DKWT=0;
IF CPCO>.I THEN CPWT=5; ELSE CPWT=0;
IF ARCO>.I THEN ARWT=5; ELSE ARWT=0;
IF RWCO>.I THEN RWWT=4; ELSE RWWT=0;

SUMWT=SUBWT+SSWT+DKWT+CPWT+ARWT+RWWT;

SUBWT=SUBWT/SUMWT;
SSWT=SSWT/SUMWT;
DKWT=DKWT/SUMWT;
CPWT=CPWT/SUMWT;
ARWT=ARWT/SUMWT;
RWWT=RWWT/SUMWT;

IF SUBCO=9 OR SUBCO=8 OR SUBCO=7 THEN SUBCOM=3;
   ELSE IF SUBCO=6 OR SUBCO=5 THEN SUBCOM=2;
   ELSE IF SUBCO=4 OR SUBCO=3 THEN SUBCOM=1;
   ELSE SUBCOM=0;


IF SSCO=9 OR SSCO=8 OR SSCO=7 THEN SSCOM=3;
   ELSE IF SSCO=6 OR SSCO=5 THEN SSCOM=2;
   ELSE IF SSCO=4 OR SSCO=3 THEN SSCOM=1;
   ELSE SSCOM=0;


IF DECO=9 OR DECO=8 OR DECO=7 THEN DECOM=3;
   ELSE IF DECO=6 OR DECO=5 THEN DECOM=2;
   ELSE IF DECO=4 OR DECO=3 THEN DECOM=1;
   ELSE DECOM=0;


IF CPCO=9 OR CPCO=8 OR CPCO=7 THEN CPCOM=3;
```

```
   ELSE IF CPCO=6 OR CPCO=5 THEN CPCOM=2;
   ELSE IF CPCO=4 OR CPCO=3 THEN CPCOM=1;
   ELSE CPCOM=0;


IF ARCO=9 OR ARCO=8 OR ARCO=7 THEN ARCOM=3;
   ELSE IF ARCO=6 OR ARCO=5 THEN ARCOM=2;
   ELSE IF ARCO=4 OR ARCO=3 THEN ARCOM=1;
   ELSE ARCOM=0;


IF RWCO=9 OR RWCO=8 OR RWCO=7 THEN RWCOM=3;
   ELSE IF RWCO=6 OR RWCO=5 THEN RWCOM=2;
   ELSE IF RWCO=4 OR RWCO=3 THEN RWCOM=1;
   ELSE RWCOM=0;


SSI=ROUND(SUBWT*SUBCOM + SSWT*SSCOM + DKWT*DECOM + CPWT*CPCOM +
          ARWT*ARCOM + RWWT*RWCOM)*3;   */


/* CALCULATE THE GEOMETRIC SAFETY INDEX THIS ATTRIBUTE IS NOT USED IN
   THIS VERSION ;

/* IF TRASA<=.I THEN TRGR=1;
   ELSE DO;
    D1=INT(TRASA/1000);
    D2=INT((TRASA-(1000*D1))/100);
    D3=INT((TRASA-(1000*D1)-(100*D2))/10);
    D4=INT(TRASA-(1000*D1)-(100*D2)-(10*D3));

     TRGR=(D1+D2+D3+D4)*9/4;
   END;

ROWI=ROUND(ROWI);

IF ROWI>=AWIDTH THEN TRWD=9;
   ELSE TRWD=0;

GSI=ROUND(0.375*DEGE + 0.0475*AR + 0.5475*TRGR + 0.0475*TRWD);

OUTPUT;   */



/*   DETERMINE THE FREQUENCIES FOR THE ELIGIBLE SET    */

PROC FREQ DATA=QDATA;
     TABLES CPV / OUT=CPVP NOPRINT;
     TABLES W_ADT /OUT=W_ADTP NOPRINT;
     TABLES SR  / OUT=SRP NOPRINT;
     TABLES DSS / OUT=DSSP NOPRINT;
     TABLES BWR / OUT=BWRP NOPRINT;
```

```
  /* TABLES SSI / OUT=SSIP NOPRINT;
     TABLES GSI / OUT=GSIP NOPRINT;
     TABLES W_BDL / OUT=BDLP NOPRINT;
     TABLES CPI / OUT=CPIP NOPRINT;
     TABLES SCO / OUT=SCOP NOPRINT;
     TABLES DEGE / OUT=DEGEP NOPRINT;
     TABLES SLC / OUT=SLCP NOPRINT;
     TABLES WA / OUT=WAP NOPRINT;
     TABLES UCVL / OUT=UCVLP NOPRINT;
     TABLES ESRLI / OUT=ESRLIP NOPRINT;  */


/*   ASSIGN PERCENTILE VALUES TO THE FREQUENCIES       */

DATA TEBS.CPVP; SET CPVP;
DATA CPVP;
     SET CPVP;
     DROP COUNT PERCENT PERCTOT;
     CPVPTL=ROUND(100-PERCTOT);
     PERCTOT + PERCENT;
RETURN;
DATA TEBS.W_ADTP; SET W_ADTP;
DATA W_ADTP;
     SET W_ADTP;
     DROP COUNT PERCENT PERCTOT;
     PERCTOT + PERCENT;
     ADTPTL=ROUND(PERCTOT);
RETURN;
DATA TEBS.SRP; SET SRP;
DATA SRP;
     SET SRP;
     DROP COUNT PERCENT PERCTOT;
     SRPTL=ROUND(100-PERCTOT);
     PERCTOT + PERCENT;
RETURN;
DATA TEBS.DSSP; SET DSSP;
DATA DSSP;
     SET DSSP;
     DROP COUNT PERCENT PERCTOT;
     DSSPTL=ROUND(100-PERCTOT);
     PERCTOT + PERCENT;
RETURN;
DATA TEBS.BWRP;SET BWRP;

DATA BWRP;
     SET BWRP;
     DROP COUNT PERCENT PERCTOT;
     BWRPTL=ROUND(100-PERCTOT);
     PERCTOT + PERCENT;
RETURN;

/* DATA SSIP;
     SET SSIP;
     DROP COUNT PERCENT PERCTOT;
```

```
     SSIPTL=ROUND(100-PERCTOT);
     PERCTOT + PERCENT;
RETURN;

DATA GSIP;
     SET GSIP;
     DROP COUNT PERCENT PERCTOT;
     GSIPTL=ROUND(100-PERCTOT);
     PERCTOT + PERCENT;
RETURN;

DATA BDLP;
     SET BDLP;
     DROP COUNT PERCENT PERCTOT;
     BDLPTL=ROUND(PERCTOT);
     PERCTOT + PERCENT;
RETURN;

DATA CPIP;
     SET CPIP;
     DROP COUNT PERCENT PERCTOT;
     CPIPTL=ROUND(100-PERCTOT);
     PERCTOT + PERCENT;
RETURN;

DATA SCOP;
     SET SCOP;
     DROP COUNT PERCENT PERCTOT;
     SCOPTL=ROUND(100-PERCTOT);
     PERCTOT + PERCENT;
RETURN;

DATA DEGEP;
     SET DEGEP;
     DROP COUNT PERCENT PERCTOT;
     DEGEPTL=ROUND(100-PERCTOT);
     PERCTOT + PERCENT;
RETURN;

DATA UCVLP;
     SET UCVLP;
     DROP COUNT PERCENT PERCTOT;
     UCVLPTL=ROUND(100-PERCTOT);
     IF UCVL<=.Z THEN UCVLPTL=0;
     PERCTOT + PERCENT;
RETURN;

DATA SLCP;
     SET SLCP;
     DROP COUNT PERCENT PERCTOT;
     SLCPTL=ROUND(100-PERCTOT);
     PERCTOT + PERCENT;
RETURN;
```

```
DATA WAP;
     SET WAP;
     DROP COUNT PERCENT PERCTOT;
     WAPTL=ROUND(100-PERCTOT);
     IF WA<=.Z THEN WAPTL=0;
     PERCTOT + PERCENT;
RETURN;

DATA ESRLIP;
     SET ESRLIP;
     DROP COUNT PERCENT PERCTOT;
     ESRLIPTL=ROUND(100-PERCTOT);
     PERCTOT + PERCENT;
RETURN;    */

/*   MERGE THE PERCENTILES FOR EACH OF THE VARIABLES INTO THE WORKING
     DATA SET.
*/

PROC SORT DATA=QDATA;
     BY CPV;
PROC SORT DATA=CPVP;
     BY CPV;
DATA QDATA;
     MERGE QDATA CPVP;
     BY CPV;

PROC SORT DATA=QDATA;
     BY W_ADT;
PROC SORT DATA=W_ADTP;
     BY W_ADT;
DATA QDATA;
     MERGE QDATA W_ADTP;
     BY W_ADT;

PROC SORT DATA=QDATA;
     BY SR;
PROC SORT DATA=SRP;
     BY SR;
DATA QDATA;
     MERGE QDATA SRP;
     BY SR;

PROC SORT DATA=QDATA;
     BY DSS;
PROC SORT DATA=DSSP;
     BY DSS;
DATA QDATA;
     MERGE QDATA DSSP;
     BY DSS;


PROC SORT DATA=QDATA;
     BY BWR;
```

```
PROC SORT DATA=BWRP;
     BY BWR;
DATA QDATA;
     MERGE QDATA BWRP;
     BY BWR;
/* IF BWR IS MISSING SET BWRPTL TO 50  */
     IF BWR= . THEN BWRPTL=50;

 /* NEXT STEPS NOT USED IN THIS VERSION */
/* PROC SORT DATA=QDATA;
     BY SSI;
PROC SORT DATA=SSIP;
     BY SSI;
DATA QDATA;
     MERGE QDATA SSIP;
     BY SSI;

PROC SORT DATA=QDATA;
     BY GSI;
PROC SORT DATA=GSIP;
     BY GSI;
DATA QDATA;
     MERGE QDATA GSIP;
     BY GSI;

PROC SORT DATA=QDATA;
     BY W_BDL;
PROC SORT DATA=BDLP;
     BY W_BDL;
DATA QDATA;
     MERGE QDATA BDLP;
     BY W_BDL;

PROC SORT DATA=QDATA;
     BY CPI;
PROC SORT DATA=CPIP;
     BY CPI;
DATA QDATA;
     MERGE QDATA CPIP;
     BY CPI;

PROC SORT DATA=QDATA;
     BY SCO;
PROC SORT DATA=SCOP;
     BY SCO;
DATA QDATA;
     MERGE QDATA SCOP;
     BY SCO;

PROC SORT DATA=QDATA;
     BY DEGE;
PROC SORT DATA=DEGEP;
     BY DEGE;
DATA QDATA;
```

```
     MERGE QDATA DEGEP;
     BY DEGE;

PROC SORT DATA=QDATA;
     BY UCVL;
PROC SORT DATA=UCVLP;
     BY UCVL;
DATA QDATA;
     MERGE QDATA UCVLP;
     BY UCVL;

PROC SORT DATA=QDATA;
     BY SLC;
PROC SORT DATA=SLCP;
     BY SLC;
DATA QDATA;
     MERGE QDATA SLCP;
     BY SLC;

PROC SORT DATA=QDATA;
     BY WA;
PROC SORT DATA=WAP;
     BY WA;
DATA QDATA;
     MERGE QDATA WAP;
     BY WA;

PROC SORT DATA=QDATA;
     BY ESRLI;
PROC SORT DATA=ESRLIP;
     BY ESRLI;
DATA QDATA;
     MERGE QDATA ESRLIP;
     BY ESRLI;          */


/*    CALCULATE SERVICE INDICES  ESSENTIAL SERVICE, COST-EFFECTIVE
    SERVICE, AND FUNCTIONAL SERVICE.
      THIS ATTRIBUTES ARE NOT USED IN THIS VERSION OF THE MODEL */
/* DATA QDATA;
     SET QDATA;
     CRSUME=ADTPTL+BDLPTL;
     CRSUMC=ADTPTL+CPIPTL;
     CRSUMF=SCOPTL+DEGEPTL+UCVLPTL+SLCPTL+WAPTL+ESRLIPTL;
RETURN;

PROC FREQ DATA=QDATA;
     TABLES CRSUME / OUT=ESIP NOPRINT;
     TABLES CRSUMC / OUT=CSIP NOPRINT;
     TABLES CRSUMF / OUT=FSIP NOPRINT;

DATA ESIP;
     SET ESIP;
     KEEP ESI CRSUME;
```

```
     ESI=ROUND(9*(100-PERCTOT)/100,1);
     PERCTOT + PERCENT;
RETURN;

DATA CSIP;
     SET CSIP;
     KEEP CSI CRSUMC;
     CSI=ROUND(9*(100-PERCTOT)/100,1);
     PERCTOT + PERCENT;
RETURN;

DATA FSIP;
     SET FSIP;
     KEEP FSI CRSUMF;
     FSI=ROUND(9*(100-PERCTOT)/100,1);
     PERCTOT + PERCENT;
RETURN;

PROC SORT DATA=ESIP;
     BY CRSUME;
PROC SORT DATA=QDATA;
     BY CRSUME;
DATA QDATA;
     MERGE QDATA ESIP;
     BY CRSUME;

PROC SORT DATA=CSIP;
     BY CRSUMC;
PROC SORT DATA=QDATA;
     BY CRSUMC;
DATA QDATA;
     MERGE QDATA CSIP;
     BY CRSUMC;


PROC SORT DATA=FSIP;
     BY CRSUMF;
PROC SORT DATA=QDATA;
     BY CRSUMF;
DATA QDATA;
     MERGE QDATA FSIP;
     BY CRSUMF;
RETURN;

PROC FREQ DATA=QDATA;
     TABLES ESI / OUT=ESIP2 NOPRINT;

PROC FREQ DATA=QDATA;
     TABLES CSI / OUT=CSIP2 NOPRINT;

PROC FREQ DATA=QDATA;
     TABLES FSI / OUT=FSIP2 NOPRINT;

DATA ESIP2;
```

```
     SET ESIP2;
     KEEP ESI ESIPTL;
     ESIPTL=ROUND(100-PERCTOT);
     PERCTOT + PERCENT;
RETURN;

DATA CSIP2;
     SET CSIP2;
     KEEP CSI CSIPTL;
     CSIPTL=ROUND(100-PERCTOT);
     PERCTOT + PERCENT;
RETURN;

DATA FSIP2;
     SET FSIP2;
     KEEP FSI FSIPTL;
     FSIPTL=ROUND(100-PERCTOT);
     PERCTOT + PERCENT;
RETURN;

PROC SORT DATA=ESIP2;
     BY ESI;
PROC SORT DATA=QDATA;
     BY ESI;
DATA QDATA;
     MERGE QDATA ESIP2;
     BY ESI;

PROC SORT DATA=CSIP2;
     BY CSI;
PROC SORT DATA=QDATA;
     BY CSI;
DATA QDATA;
     MERGE QDATA CSIP2;
     BY CSI;


PROC SORT DATA=FSIP2;
     BY FSI;
PROC SORT DATA=QDATA;
     BY FSI;
DATA QDATA;
     MERGE QDATA FSIP2;
     BY FSI;
RETURN;        */


    /* MACRO FOR OUTPUTING TO THE CORRECT DATA SET */

   %MACRO CHOIC        ;
   %IF &ANSW=ON %THEN %DO;
   DATA TEBS.QDATON;
        SET QDATA;
    KEEP DIST COUNTY RNUM  CSS WT CPI FX LOS ROWI PNL PRW W_ADT SR
```

```
DECO
    SSCO SUBCO CPV  DSS  BWR ADTPTL SRPTL DSSPTL CPVPTL BWRPTL YB
BRID
  /* SSI GSI CSI ESI FSI SSIPTL GSIPTL CSIPTL ESIPTL FSIPTL*/ W_BDL;
    DATA TEBS.DISTON1 TEBS.DISTON2 TEBS.DISTON3 TEBS.DISTON4
TEBS.DISTON5
         TEBS.DISTON6 TEBS.DISTON7 TEBS.DISTON8 TEBS.DISTON9
TEBS.DISTON10
         TEBS.DISTON11 TEBS.DISTON12 TEBS.DISTON13 TEBS.DISTON14
         TEBS.DISTON15 TEBS.DISTON16 TEBS.DISTON17 TEBS.DISTON18
         TEBS.DISTON19 TEBS.DISTON20 TEBS.DISTON21 TEBS.DISTON23
         TEBS.DISTON24 TEBS.DISTON25;  SET QDATA;
    IF DIST=1 THEN OUTPUT TEBS.DISTON1;IF DIST=2 THEN OUTPUT
TEBS.DISTON2;
    IF DIST=3 THEN OUTPUT TEBS.DISTON3;IF DIST=4 THEN OUTPUT
TEBS.DISTON4;
    IF DIST=5 THEN OUTPUT TEBS.DISTON5;IF DIST=6 THEN OUTPUT
TEBS.DISTON6;
    IF DIST=7 THEN OUTPUT TEBS.DISTON7;IF DIST=8 THEN OUTPUT
TEBS.DISTON8;
 IF DIST=9 THEN OUTPUT TEBS.DISTON9;IF DIST=10 THEN OUTPUT
TEBS.DISTON10;
    IF DIST=11 THEN OUTPUT TEBS.DISTON11;
    IF DIST=12 THEN OUTPUT TEBS.DISTON12;
    IF DIST=13 THEN OUTPUT TEBS.DISTON13;
    IF DIST=14 THEN OUTPUT TEBS.DISTON14;
    IF DIST=15 THEN OUTPUT TEBS.DISTON15;
    IF DIST=16 THEN OUTPUT TEBS.DISTON16;
    IF DIST=17 THEN OUTPUT TEBS.DISTON17;
    IF DIST=18 THEN OUTPUT TEBS.DISTON18;
    IF DIST=19 THEN OUTPUT TEBS.DISTON19;
    IF DIST=20 THEN OUTPUT TEBS.DISTON20;
    IF DIST=21 THEN OUTPUT TEBS.DISTON21;
    IF DIST=23 THEN OUTPUT TEBS.DISTON23;
    IF DIST=24 THEN OUTPUT TEBS.DISTON24;
    IF DIST=25 THEN OUTPUT TEBS.DISTON25;
    KEEP DIST COUNTY RNUM  CSS WT CPI FX LOS ROWI PNL PRW W_ADT SR
DECO
    SSCO SUBCO CPV  DSS  BWR ADTPTL SRPTL DSSPTL CPVPTL BWRPTL YB
BRID
    /* SSI GSI CSI ESI FSI SSIPTL GSIPTL CSIPTL ESIPTL FSIPTL*/
W_BDL;
    %END;

   %IF &ANSW=OFF %THEN %DO;
   DATA TEBS.QDATOF;
        SET QDATA;
    KEEP DIST COUNTY RNUM  CSS WT CPI FX LOS ROWI PNL PRW W_ADT SR
DECO
    SSCO SUBCO CPV  DSS  BWR ADTPTL SRPTL DSSPTL CPVPTL BWRPTL YB
BRID
    /* SSI GSI CSI ESI FSI SSIPTL GSIPTL CSIPTL ESIPTL FSIPTL*/
W_BDL;
    DATA TEBS.DISTOF1 TEBS.DISTOF2 TEBS.DISTOF3 TEBS.DISTOF4
```

```
TEBS.DISTOF5
         TEBS.DISTOF6 TEBS.DISTOF7 TEBS.DISTOF8 TEBS.DISTOF9
TEBS.DISTOF10
         TEBS.DISTOF11 TEBS.DISTOF12 TEBS.DISTOF13 TEBS.DISTOF14
         TEBS.DISTOF15 TEBS.DISTOF16 TEBS.DISTOF17 TEBS.DISTOF18
         TEBS.DISTOF19 TEBS.DISTOF20 TEBS.DISTOF21 TEBS.DISTOF23
         TEBS.DISTOF24 TEBS.DISTOF25; SET QDATA;
    IF DIST=1 THEN OUTPUT TEBS.DISTOF1;IF DIST=2 THEN OUTPUT
TEBS.DISTOF2;
    IF DIST=3 THEN OUTPUT TEBS.DISTOF3;IF DIST=4 THEN OUTPUT
TEBS.DISTOF4;
    IF DIST=5 THEN OUTPUT TEBS.DISTOF5;IF DIST=6 THEN OUTPUT
TEBS.DISTOF6;
    IF DIST=7 THEN OUTPUT TEBS.DISTOF7;IF DIST=8 THEN OUTPUT
TEBS.DISTOF8;
 IF DIST=9 THEN OUTPUT TEBS.DISTOF9;IF DIST=10 THEN OUTPUT
TEBS.DISTOF10;
    IF DIST=11 THEN OUTPUT TEBS.DISTOF11;
    IF DIST=12 THEN OUTPUT TEBS.DISTOF12;
    IF DIST=13 THEN OUTPUT TEBS.DISTOF13;
    IF DIST=14 THEN OUTPUT TEBS.DISTOF14;
    IF DIST=15 THEN OUTPUT TEBS.DISTOF15;
    IF DIST=16 THEN OUTPUT TEBS.DISTOF16;
    IF DIST=17 THEN OUTPUT TEBS.DISTOF17;
    IF DIST=18 THEN OUTPUT TEBS.DISTOF18;
    IF DIST=19 THEN OUTPUT TEBS.DISTOF19;
    IF DIST=20 THEN OUTPUT TEBS.DISTOF20;
    IF DIST=21 THEN OUTPUT TEBS.DISTOF21;
    IF DIST=23 THEN OUTPUT TEBS.DISTOF23;
    IF DIST=24 THEN OUTPUT TEBS.DISTOF24;
    IF DIST=25 THEN OUTPUT TEBS.DISTOF25;
    KEEP DIST COUNTY RNUM  CSS WT CPI FX LOS ROWI PNL PRW W_ADT SR
DECO
    SSCO SUBCO CPV  DSS  BWR ADTPTL SRPTL DSSPTL CPVPTL BWRPTL YB
BRID
    /* SSI GSI CSI ESI FSI SSIPTL GSIPTL CSIPTL ESIPTL FSIPTL*/
W_BDL;
    %END;
%MEND CHOIC ;
  PROC SUMMARY DATA=QDATA;
CLASS DIST; VAR CPI;OUTPUT OUT=TABM1 N=CPIC1 SUM=CPIS1;
DATA TABM1;SET TABM1;
IF _TYPE_=0 THEN TOT1=CPIS1;RETAIN TOT1;
CPIP1=(CPIS1/TOT1)*100;
DATA DISLIST;INPUT DIST;CARDS;
1
2
3
4
5
6
7
8
9
```

```
10
11
12
13
14
15
16
17
18
19
20
21
23
24
25
DATA FINAL;MERGE DISLIST TABM1;
           BY DIST;
DATA FINAL;SET FINAL;
IF CPIC1=. THEN DO; CPIC1=0; CPIS1=0;CPIP1=0;TOT1=0;_TYPE_=1;END;

KEEP DIST _TYPE_ CPIC1 CPIS1 CPIP1 TOT1;


OPTIONS PAGESIZE=60            ;


  DATA _NULL_;FILE PRINT HEADER=B;
      IF _N_=1 THEN SET SYS;SET FINAL;
  FORMAT CPIP1 5.2 TOTP 6.2 CPIS1 TOTC DOLLAR14.;
      IF DIST= . THEN DO;TOTN=CPIC1;TOTC=CPIS1;TOTP=CPIP1;

      RETAIN TOTN TOTC TOTP ;DELETE; END;
        IF DIST=1 THEN PUT @44 46*'-' /
            @44 '|' @60 'ELIGIBLE BRIDGES AND COST' @89 '|' /
            @44 46*'-' /
        @44 '|' @47 'DISTRICT' @56 '|' @58 'N' @64 '|' @66 'COST' @81
'|'
        @83 '%' @89 '|' /
        @44 46*'-';

   PUT @44 '|' @47 DIST @56 '|' @58 CPIC1 @64 '|' @66 CPIS1 @81 '|'
       @83 CPIP1 @89 '|' /
       @44 46*'-';
      IF DIST=25 THEN
   PUT  @44 '|' @47 'TOTALS' @56 '|' @58 TOTN @64 '|' @66 TOTC @81
'|'
        @83 TOTP @89 '|' /
         @44 46*'-'; RETURN;
B: PUT @49 ONOF '-STATE SYSTEM FEDERAL AID BRIDGE REPLACEMENT'/
       @54 'AND REHABILITATION PROGRAM'/
       @52 'ELIGIBLE BRIDGES PER DISTRICT STATISTICS' /  ; RETURN;
       %CHOIC  ;
TITLE
'THESE ARE THE TABLES OF THE FREQUENCY PERCENTILES FOR THE
```

```
ATTRIBUTES' ;
DATA TEBS.CPVP;
     SET TEBS.CPVP;
     DROP PERCTOT;
     CPVPTL=ROUND(100-PERCTOT);
     PERCTOT + PERCENT;
RETURN;
PROC PRINT DATA=TEBS.CPVP;
DATA TEBS.W_ADTP;
     SET TEBS.W_ADTP;
     DROP PERCTOT;
     PERCTOT + PERCENT;
     ADTPTL=ROUND(PERCTOT);
RETURN;
PROC PRINT DATA =TEBS.W_ADTP;
DATA TEBS.SRP;
     SET TEBS.SRP;
     DROP PERCTOT;
     SRPTL=ROUND(100-PERCTOT);
     PERCTOT + PERCENT;
RETURN;
PROC PRINT DATA=TEBS.SRP;
DATA TEBS.DSSP;
     SET TEBS.DSSP;
     DROP PERCTOT;
     DSSPTL=ROUND(100-PERCTOT);
     PERCTOT + PERCENT;
RETURN;
PROC PRINT DATA=TEBS.DSSP;

DATA TEBS.BWRP;
     SET TEBS.BWRP;
     DROP PERCTOT;
     BWRPTL=ROUND(100-PERCTOT);
     PERCTOT + PERCENT;
RETURN;
PROC PRINT DATA=TEBS.BWRP;
```

SOURCE CODE FOR THE PROGRAM DDF (DISTRICT DISTRIBUTION FACTORS)

```
/*******************************************************************
SAS PROGRAM TO CALCULATE BUDGET DISTRIBUTION FACTORS. IT NEEDS A SAS
DATA SET WITH THE PROJECT PERCENTILES NAMED QDATON.TEBS OR
QDATOF.TEBS
GENERATED BY THE PROGRAM FREQ.
IT ALSO NEEDS A SAS DATA SET WITH THE DATA DESCRIBING THE TEXAS
DISTRICT MAP IN ORDER TO GENERATE THE APPROPRIATE OUTPUT.NAMED
TEXAS.TEBS IT APPLIES THE WEIGHTED AVERAGE SCORING TECHNIQUE AND
AUTOMATIC QUALIFICATION THRESHOLDS TO APPORTION A PLANNED BUDGET

FOR MORE DETAILS CONSULT RESEARCH REPORT 439-4 CENTER FOR
TRANSPORTATION RESEARCH

                      WRITTEN BY : JOSE WEISSMANN
                      ON: AUGUST 88
      FOR MORE DETAILS REFER TO RESEARCH REPORT 439-4 CTR
CENTER FOR TRANSPORTATION RESEARCH UNIVERSITY OF TEXAS AT AUSTIN 1989

*******************************************************************/
/* CMS FI PROJ DISK TEXAS PROJ Z;
CMS FI OUP DISK QDATON OUP Z;
CMS FI OUT DISK QDATOF OUT J;  */
CMS FI SUM DISK FINAL SUM A;OPTIONS MISSING= M REPLACE;
DATA INITIAL;INPUT FALSE;CARDS;
.
PROC FSEDIT DATA=INITIAL SCREEN=TEBS.INI;
  DATA BUDGET;
FORMAT BUDGET DOLLAR14. ;INFORMAT BUDGET COMMA. ;
INPUT BUDGET ONOF $;CARDS; LENGTH ONOF $ 3;
150,000,000 ON
PROC FSEDIT DATA=BUDGET SCREEN=TEBS.BUDG;
  DATA BUDGET; SET BUDGET; CALL SYMPUT('SYS',ONOF);RETURN;

DATA WEIGHT;
FORMAT WCPV1 WADT1 WSR1 WDSS1 WBWR1
       WCPV2 WADT2 WSR2 WDSS2 WBWR2
       WCPV3 WADT3 WSR3 WDSS3 WBWR3
       WCPV4 WADT4 WSR4 WDSS4 WBWR4
       WCPV5 WADT5 WSR5 WDSS5 WBWR5
       WCPV6 WADT6 WSR6 WDSS6 WBWR6
       WCPV7 WADT7 WSR7 WDSS7 WBWR7 4.2 ;
INPUT WCPV1 WADT1 WSR1 WDSS1 WBWR1
      WCPV2 WADT2 WSR2 WDSS2 WBWR2
      WCPV3 WADT3 WSR3 WDSS3 WBWR3
      WCPV4 WADT4 WSR4 WDSS4 WBWR4
      WCPV5 WADT5 WSR5 WDSS5 WBWR5
      WCPV6 WADT6 WSR6 WDSS6 WBWR6
      WCPV7 WADT7 WSR7 WDSS7 WBWR7;

CARDS;
0.2   0.2   0.2   0.2   0.2
0.2   0.15  0.25  0.2   0.2
0.15  0.15  0.25  0.25  0.2
0.15  0.10  0.25  0.25  0.25
```

```
0.10  0.10  0.30  0.25  0.25
0.10  0.05  0.30  0.30  0.25
0.05  0.05  0.30  0.30  0.30


  PROC FSEDIT DATA=WEIGHT SCREEN=TEBS.WT;

DATA AUTOQ;INPUT ANSW $ AQCPV AQADT AQSR AQDSS AQBWR;CARDS;
NO . . . . .

  PROC FSEDIT DATA=AUTOQ SCREEN=TEBS.AQ;

  /* MACRO TO CHOOSE THE CORRECT DATA SET GENERATED BY THE FREQ
MODULE */
  %MACRO CHOOS;
    %IF &SYS=ON %THEN TEBS.QDATON;
    %IF &SYS=OFF %THEN TEBS.QDATOF;
      %MEND CHOOS;

  DATA QDATA;
 KEEP DIST COUNTY CSS SCORE1 SCORE2 SCORE3 SCORE4 SCORE5 SCORE6
      SCORE7 AQ CPI;
   IF _N_=1 THEN SET WEIGHT;
   IF _N_=1 THEN SET AUTOQ ;
   IF _N_=1 THEN SET BUDGET;
  LENGTH AQ $ 2;
  SET %CHOOS;
  IF ANSW = 'NO' THEN  DO;AQ='1'; GO TO OK ; END;
  IF AQCPV NE . THEN DO;IF CPV<=AQCPV THEN AQ='AQ';END;
  IF AQADT NE . THEN DO;IF W_ADT>=AQADT THEN AQ='AQ';END;
  IF AQSR  NE . THEN DO;IF SR <=AQSR THEN AQ='AQ';END;
  IF AQDSS NE . THEN DO;IF DSS<=AQDSS THEN AQ='AQ';END;
  IF AQBWR NE . THEN DO;IF BWR<=AQBWR THEN AQ='AQ';END;
OK:SCORE1=0.0;
  SCORE1= SCORE1 + WCPV1*CPVPTL
                 + WADT1*ADTPTL
                 + WSR1 *SRPTL
                 + WDSS1*DSSPTL
                 + WBWR1*BWRPTL;

  SCORE2=0.0;
  SCORE2= SCORE2 + WCPV2*CPVPTL
                 + WADT2*ADTPTL
                 + WSR2 *SRPTL
                 + WDSS2*DSSPTL
                 + WBWR2*BWRPTL;

  SCORE3=0.0;
  SCORE3= SCORE3 + WCPV3*CPVPTL
                 + WADT3*ADTPTL
                 + WSR3 *SRPTL
                 + WDSS3*DSSPTL
                 + WBWR3*BWRPTL;
```

```
  SCORE4=0.0;
  SCORE4= SCORE4 + WCPV4*CPVPTL
                 + WADT4*ADTPTL
                 + WSR4 *SRPTL
                 + WDSS4*DSSPTL
                 + WBWR4*BWRPTL;

  SCORE5=0.0;
  SCORE5= SCORE5 + WCPV5*CPVPTL
                 + WADT5*ADTPTL
                 + WSR5 *SRPTL
                 + WDSS5*DSSPTL
                 + WBWR5*BWRPTL;

  SCORE6=0.0;
  SCORE6= SCORE6 + WCPV6*CPVPTL
                 + WADT6*ADTPTL
                 + WSR6 *SRPTL
                 + WDSS6*DSSPTL
                 + WBWR6*BWRPTL;

  SCORE7=0.0;
  SCORE7= SCORE7 + WCPV7*CPVPTL
                 + WADT7*ADTPTL
                 + WSR7 *SRPTL
                 + WDSS7*DSSPTL
                 + WBWR7*BWRPTL;
PROC SORT DATA=QDATA OUT=METH1;
    BY DESCENDING AQ DESCENDING SCORE1;
  /*BY DESCENDING SCORE1;*/
DATA METH1;
    IF _N_=1 THEN SET BUDGET;
    SET METH1;
    ACOST+CPI;
    RETAIN ACOST;
    IF ACOST>BUDGET    THEN DELETE;
RETURN;

  PROC SUMMARY DATA=METH1;
CLASS DIST; VAR CPI;OUTPUT OUT=TABM1 N=CPIC1 SUM=CPIS1;
DATA TABM1;SET TABM1;
IF _TYPE_=0 THEN TOT1=CPIS1;RETAIN TOT1;
CPIP1=(CPIS1/TOT1)*100;

  PROC SUMMARY DATA=METH1;
CLASS DIST; VAR CPI;BY DESCENDING AQ ;
OUTPUT OUT=TAAQ1 N=CPICAQ1 SUM=CPISAQ1;

DATA TAAQ1;
    KEEP DIST _TYPE_ CPICAQ1 CPISAQ1;
    SET TAAQ1;IF AQ='AQ';

PROC SORT DATA=QDATA OUT=METH2;
    BY DESCENDING AQ DESCENDING SCORE2;
```

```
  /*BY DESCENDING SCORE2;*/
DATA METH2;
    IF _N_=1 THEN SET BUDGET;
    SET METH2;
    ACOST+CPI;
    RETAIN ACOST;
    IF ACOST>BUDGET    THEN DELETE;
RETURN;

  PROC SUMMARY DATA=METH2;
CLASS DIST; VAR CPI;OUTPUT OUT=TABM2 N=CPIC2 SUM=CPIS2;
DATA TABM2;SET TABM2;
IF _TYPE_=0 THEN TOT2=CPIS2;RETAIN TOT2;
CPIP2=(CPIS2/TOT2)*100;

  PROC SUMMARY DATA=METH2;
CLASS DIST; VAR CPI;BY DESCENDING AQ ;
OUTPUT OUT=TAAQ2 N=CPICAQ2 SUM=CPISAQ2;

DATA TAAQ2;
    KEEP DIST _TYPE_ CPICAQ2 CPISAQ2;
    SET TAAQ2;IF AQ='AQ';

PROC SORT DATA=QDATA OUT=METH3;
    BY DESCENDING AQ DESCENDING SCORE3;
  /*BY DESCENDING SCORE3;*/
DATA METH3;
    IF _N_=1 THEN SET BUDGET;
    SET METH3;
    ACOST+CPI;
    RETAIN ACOST;
    IF ACOST>BUDGET    THEN DELETE;
RETURN;

  PROC SUMMARY DATA=METH3;
CLASS DIST; VAR CPI;OUTPUT OUT=TABM3 N=CPIC3 SUM=CPIS3;
DATA TABM3;SET TABM3;
IF _TYPE_=0 THEN TOT3=CPIS3;RETAIN TOT3;
CPIP3=(CPIS3/TOT3)*100;

  PROC SUMMARY DATA=METH3;
CLASS DIST; VAR CPI;BY DESCENDING AQ ;
OUTPUT OUT=TAAQ3 N=CPICAQ3 SUM=CPISAQ3;

DATA TAAQ3;
    KEEP DIST _TYPE_ CPICAQ3 CPISAQ3;
    SET TAAQ3;IF AQ='AQ';

PROC SORT DATA=QDATA OUT=METH4;
    BY DESCENDING AQ DESCENDING SCORE4;
 /* BY DESCENDING SCORE4;*/
DATA METH4;
    IF _N_=1 THEN SET BUDGET;
    SET METH4;
```

```
    ACOST+CPI;
    RETAIN ACOST;
    IF ACOST>BUDGET    THEN DELETE;
RETURN;

  PROC SUMMARY DATA=METH4;
CLASS DIST; VAR CPI;OUTPUT OUT=TABM4 N=CPIC4 SUM=CPIS4;
DATA TABM4;SET TABM4;
IF _TYPE_=0 THEN TOT4=CPIS4;RETAIN TOT4;
CPIP4=(CPIS4/TOT4)*100;

  PROC SUMMARY DATA=METH4;
CLASS DIST; VAR CPI;BY DESCENDING AQ ;
OUTPUT OUT=TAAQ4 N=CPICAQ4 SUM=CPISAQ4;

DATA TAAQ4;
    KEEP DIST _TYPE_ CPICAQ4 CPISAQ4;
    SET TAAQ4;IF AQ='AQ';

PROC SORT DATA=QDATA OUT=METH5;
    BY DESCENDING AQ DESCENDING SCORE5;
 /* BY DESCENDING SCORE5; */
DATA METH5;
    IF _N_=1 THEN SET BUDGET;
    SET METH5;
    ACOST+CPI;
    RETAIN ACOST;
    IF ACOST>BUDGET    THEN DELETE;
RETURN;

  PROC SUMMARY DATA=METH5;
CLASS DIST; VAR CPI;OUTPUT OUT=TABM5 N=CPIC5 SUM=CPIS5;
DATA TABM5;SET TABM5;
IF _TYPE_=0 THEN TOT5=CPIS5;RETAIN TOT5;
CPIP5=(CPIS5/TOT5)*100;

  PROC SUMMARY DATA=METH5;
CLASS DIST; VAR CPI;BY DESCENDING AQ ;
OUTPUT OUT=TAAQ5 N=CPICAQ5 SUM=CPISAQ5;

DATA TAAQ5;
    KEEP DIST _TYPE_ CPICAQ5 CPISAQ5;
    SET TAAQ5;IF AQ='AQ';

PROC SORT DATA=QDATA OUT=METH6;
    BY DESCENDING AQ DESCENDING SCORE6;
 /* BY DESCENDING SCORE6;*/
DATA METH6;
    IF _N_=1 THEN SET BUDGET;
    SET METH6;
    ACOST+CPI;
    RETAIN ACOST;
    IF ACOST>BUDGET    THEN DELETE;
RETURN;
```

```
  PROC SUMMARY DATA=METH6;
CLASS DIST; VAR CPI;OUTPUT OUT=TABM6 N=CPIC6 SUM=CPIS6;
DATA TABM6;SET TABM6;
IF _TYPE_=0 THEN TOT6=CPIS6;RETAIN TOT6;
CPIP6=(CPIS6/TOT6)*100;

  PROC SUMMARY DATA=METH6;
CLASS DIST; VAR CPI;BY DESCENDING AQ ;
OUTPUT OUT=TAAQ6 N=CPICAQ6 SUM=CPISAQ6;

DATA TAAQ6;
    KEEP DIST _TYPE_ CPICAQ6 CPISAQ6;
    SET TAAQ6;IF AQ='AQ';


PROC SORT DATA=QDATA OUT=METH7;
    BY DESCENDING AQ DESCENDING SCORE7;
 /* BY DESCENDING SCORE7; */
DATA METH7;
    IF _N_=1 THEN SET BUDGET;
    SET METH7;
    ACOST+CPI;
    RETAIN ACOST;
    IF ACOST>BUDGET    THEN DELETE;
RETURN;

  PROC SUMMARY DATA=METH7;
CLASS DIST; VAR CPI;OUTPUT OUT=TABM7 N=CPIC7 SUM=CPIS7;
DATA TABM7;SET TABM7;
IF _TYPE_=0 THEN TOT7=CPIS7;RETAIN TOT7;
CPIP7=(CPIS7/TOT7)*100;

  PROC SUMMARY DATA=METH7;
CLASS DIST; VAR CPI;BY DESCENDING AQ ;
OUTPUT OUT=TAAQ7 N=CPICAQ7 SUM=CPISAQ7;

DATA TAAQ7;
    KEEP DIST _TYPE_ CPICAQ7 CPISAQ7;
    SET TAAQ7;IF AQ='AQ';

DATA DISLIST;INPUT DIST;CARDS;
1
2
3
4
5
6
7
8
9
10
11
12
```

```
DATA FINAL;MERGE DISLIST TABM1 TABM2 TABM3 TABM4 TABM5 TABM6 TABM7
TAAQ1 TAAQ2 TAAQ3 TAAQ4 TAAQ5 TAAQ6 TAAQ7 ;
           BY DIST;
DATA TEBS.FINAL;SET FINAL;
IF CPIC1=. THEN DO; CPIC1=0; CPIS1=0;CPIP1=0;TOT1=0;_TYPE_=1;END;
IF CPIC2=. THEN DO; CPIC2=0; CPIS2=0;CPIP2=0;TOT2=0;_TYPE_=1;END;
IF CPIC3=. THEN DO; CPIC3=0; CPIS3=0;CPIP3=0;TOT3=0;_TYPE_=1;END;
IF CPIC4=. THEN DO; CPIC4=0; CPIS4=0;CPIP4=0;TOT4=0;_TYPE_=1;END;
IF CPIC5=. THEN DO; CPIC5=0; CPIS5=0;CPIP5=0;TOT5=0;_TYPE_=1;END;
IF CPIC6=. THEN DO; CPIC6=0; CPIS6=0;CPIP6=0;TOT6=0;_TYPE_=1;END;
IF CPIC7=. THEN DO; CPIC7=0; CPIS7=0;CPIP7=0;TOT7=0;_TYPE_=1;END;
AVRG=(CPIP1+CPIP2+CPIP3+CPIP4+CPIP5+CPIP6+CPIP7)/7;

IF CPICAQ1=. THEN DO; CPICAQ1=0; CPISAQ1=0;_TYPE_=1;END;
IF CPICAQ2=. THEN DO; CPICAQ2=0; CPISAQ2=0;_TYPE_=1;END;
IF CPICAQ3=. THEN DO; CPICAQ3=0; CPISAQ3=0;_TYPE_=1;END;
IF CPICAQ4=. THEN DO; CPICAQ4=0; CPISAQ4=0;_TYPE_=1;END;
IF CPICAQ5=. THEN DO; CPICAQ5=0; CPISAQ5=0;_TYPE_=1;END;
IF CPICAQ6=. THEN DO; CPICAQ6=0; CPISAQ6=0;_TYPE_=1;END;
IF CPICAQ7=. THEN DO; CPICAQ7=0; CPISAQ7=0;_TYPE_=1;END;
KEEP DIST _TYPE_ CPIC1 CPIS1 CPIP1 TOT1
                 CPIC2 CPIS2 CPIP2 TOT2
                 CPIC3 CPIS3 CPIP3 TOT3
                 CPIC4 CPIS4 CPIP4 TOT4
                 CPIC5 CPIS5 CPIP5 TOT5
                 CPIC6 CPIS6 CPIP6 TOT6
                 CPIC7 CPIS7 CPIP7 TOT7  AVRG
                 CPICAQ1 CPISAQ1 CPICAQ2 CPISAQ2
                 CPICAQ3 CPISAQ3 CPICAQ4 CPISAQ4
                 CPICAQ5 CPISAQ5 CPICAQ6 CPISAQ6
                 CPICAQ7 CPISAQ7 ;
  DATA FINAL2;SET TEBS.FINAL;IF DIST= .  THEN DELETE;
OPTIONS PAGESIZE=60 CENTER ;
TITLE1 'BUDGET DISTRIBUTION FACTORS';
TITLE2 '  ';
  DATA _NULL_;FILE PRINT;SET WEIGHT ;
  PUT @44 44*'-' /
      @44 '|' @65 'WEIGHTS' @87 '|' /
      @44 44*'-' /  @44 '|'
      @45 'METHOD' @52 '|' @54 'CPV' @59 '|' @61 'ADT' @66 '|' @68
'SR'
      @73 '|' @75 'DSS' @80 '|' @82 'BWR' @87 '|' /
```

```
    @44 44*'-' /
    @44 '|' @47 '1' @52 '|' @54 WCPV1 @59 '|' @61 WADT1 @66 '|'
    @68 WSR1 @73 '|' @75 WDSS1 @80 '|' @82 WBWR1 @87 '|' /
    @44 44*'-' /
    @44 '|' @47 '2' @52 '|' @54 WCPV2 @59 '|' @61 WADT2 @66 '|'
    @68 WSR2 @73 '|' @75 WDSS2 @80 '|' @82 WBWR2 @87 '|' /
    @44 44*'-' /
    @44 '|' @47 '3' @52 '|' @54 WCPV3 @59 '|' @61 WADT3 @66 '|'
    @68 WSR3 @73 '|' @75 WDSS3 @80 '|' @82 WBWR3 @87 '|' /
    @44 44*'-' /
    @44 '|' @47 '4' @52 '|' @54 WCPV4 @59 '|' @61 WADT4 @66 '|'
    @68 WSR4 @73 '|' @75 WDSS4 @80 '|' @82 WBWR4 @87 '|' /
    @44 44*'-' /
    @44 '|' @47 '5' @52 '|' @54 WCPV5 @59 '|' @61 WADT5 @66 '|'
    @68 WSR5 @73 '|' @75 WDSS5 @80 '|' @82 WBWR5 @87 '|' /
    @44 44*'-' /
    @44 '|' @47 '6' @52 '|' @54 WCPV6 @59 '|' @61 WADT6 @66 '|'
    @68 WSR6 @73 '|' @75 WDSS6 @80 '|' @82 WBWR6 @87 '|' /
    @44 44*'-' /
    @44 '|' @47 '7' @52 '|' @54 WCPV7 @59 '|' @61 WADT7 @66 '|'
    @68 WSR7 @73 '|' @75 WDSS7 @80 '|' @82 WBWR7 @87 '|' /
    @44 44*'-' /
    @44 '|' @51 'CPV = COST PER VEHICLE' @87 '|' /
    @44 44*'-' /
    @44 '|' @51 'ADT = AVERAGE DAILY TRAFFIC' @87 '|' /
    @44 44*'-' /
    @44 '|' @51 'SR = SUFFICIENCY RATING' @87 '|' /
    @44 44*'-' /
    @44 '|' @51 'DSS = MINIMUM OF CONDITION RATINGS' @87 '|' /
    @44 44*'-' /
    @44 '|' @51 'BWR = BRIDGE WIDTH RATIO' @87 '|' /
    @44 44*'-' / /  ;
    SET AUTOQ;
    IF ANSW='YES' THEN DO ;
PUT @49 'AUTO QUALIFYING FEATURES USED :' / /
    @44 44*'-' /
    @44 '|' @46 'CPV' @52 '|' @56 AQCPV @87 '|' /
    @44 44*'-' /
    @44 '|' @46 'ADT' @52 '|' @56 AQADT @87 '|' /
    @44 44*'-' /
    @44 '|' @46 'SR' @52 '|' @56 AQSR @87 '|' /
    @44 44*'-' /
    @44 '|' @46 'DSS' @52 '|' @56 AQDSS @87 '|' /
    @44 44*'-' /
    @44 '|' @46 'BWR' @52 '|' @56 AQBWR @87 '|' /
    @44 44*'-' / /
    @49 'M = MISSING' ;
    END;
DATA _NULL_;FILE PRINT; IF _N_=1 THEN DO;SET BUDGET;
PUT @50 'FOR BUDGET= ' BUDGET '    ' ONOF '-SYSTEM' / /
    @24 77*'-' /
    @24 '|' @27 'DISTRICT' @36 '|' @38 'M1' @44 '|' @46 'M2' @52
'|'
    @54 'M3' @60 '|' @62 'M4' @68 '|' @70 'M5' @76 '|' @78 'M6'
```

```
      @84 '|' @86 'M7' @92 '|' @94 'AVRG.' @100 '|' /
      @24 77*'-';  END;
SET FINAL2;
FORMAT CPIP1 CPIP2 CPIP3 CPIP4 CPIP5 CPIP6 CPIP7 AVRG 5.2;
  PUT @24 '|' @27 DIST @36 '|' @38 CPIP1 @44 '|' @46 CPIP2 @52 '|'
@54 CPIP3 @60 '|' @62 CPIP4 @68 '|' @70 CPIP5 @76 '|' @78 CPIP6 @84
'|'
      @86 CPIP7 @92 '|' @94 AVRG @100 '|';
  PUT @24 77*'-'; RETURN;

  DATA _NULL_;FILE PRINT; IF _N_=1 THEN DO;SET BUDGET;
  PUT @50 'FOR BUDGET= ' BUDGET '    ' ONOF '-SYSTEM' /    ; END;
               IF _N_=1 THEN SET AUTOQ ;SET TEBS.FINAL;
  FORMAT CPIP1 5.2 TOTP 6.2 CPIS1 TOTC TOTCAQ CPISAQ1 DOLLAR14.;
      IF DIST= . THEN
DO;TOTN=CPIC1;TOTC=CPIS1;TOTP=CPIP1;TOTCAQ=CPISAQ1;
      TOTNAQ=CPICAQ1;
      RETAIN TOTN TOTC TOTP TOTCAQ TOTNAQ;DELETE; PUT _PAGE_;END;
      IF ANSW='YES' THEN DO;
        IF DIST=1 THEN PUT @27 72*'-' /
        @27 '|' @49 'METHOD 1'  @72 '||' @75 'AUTO-QUALIF.
STATISTICS'
        @98 '|' /
        @27 72*'-' /
        @27 '|' @30 'DISTRICT' @39 '|' @41 'N' @47 '|' @49 'SUM' @64
'|'
        @66 '%' @72 '||' @75 'N AQ' @81 '|' @83 'SUM AQ' @98 '|' /
        @27 72*'-'    ;

   PUT @27 '|' @30 DIST @39 '|' @41 CPIC1 @47 '|' @49 CPIS1 @64 '|'
       @66 CPIP1 @72 '||' @75 CPICAQ1 @81 '|' @83 CPISAQ1 @98 '|' /
       @27 72*'-';
      IF DIST=25 THEN
   PUT  @27 '|' @30 'TOTALS' @39 '|' @41 TOTN @47 '|' @49 TOTC @64
'|'
        @66 TOTP @72 '||' @75 TOTNAQ @81 '|' @83 TOTCAQ @98 '|' /
         @27 72*'-'; END;
   IF ANSW = 'NO' THEN DO ;
        IF DIST=1 THEN PUT @44 46*'-' /
            @44 '|' @66 'METHOD 1'  @89 '|' /
            @44 46*'-' /
        @44 '|' @47 'DISTRICT' @56 '|' @58 'N' @64 '|' @66 'SUM' @81
'|'
        @83 '%' @89 '|' /
        @44 46*'-';

   PUT @44 '|' @47 DIST @56 '|' @58 CPIC1 @64 '|' @66 CPIS1 @81 '|'
       @83 CPIP1 @89 '|' /
       @44 46*'-';
      IF DIST=25 THEN
   PUT  @44 '|' @47 'TOTALS' @56 '|' @58 TOTN @64 '|' @66 TOTC @81
'|'
        @83 TOTP @89 '|' /
         @44 46*'-';END; RETURN;
```

```
  DATA _NULL_;FILE PRINT; IF _N_=1 THEN DO;SET BUDGET;
  PUT @50 'FOR BUDGET= ' BUDGET '    ' ONOF '-SYSTEM' /    ; END;
               IF _N_=1 THEN SET AUTOQ ;SET TEBS.FINAL;
  FORMAT CPIP2 5.2 TOTP 6.2 CPIS2 TOTC TOTCAQ CPISAQ2 DOLLAR14.;
      IF DIST= . THEN
DO;TOTN=CPIC2;TOTC=CPIS2;TOTP=CPIP2;TOTCAQ=CPISAQ2;
      TOTNAQ=CPICAQ2;
      RETAIN TOTN TOTC TOTP TOTCAQ TOTNAQ;DELETE; PUT _PAGE_;END;
      IF ANSW='YES' THEN DO;
        IF DIST=1 THEN PUT @27 72*'-' /
        @27 '|' @49 'METHOD 2'  @72 '||' @75 'AUTO-QUALIF.
STATISTICS'
        @98 '|' /
        @27 72*'-' /
        @27 '|' @30 'DISTRICT' @39 '|' @41 'N' @47 '|' @49 'SUM' @64
'|'
        @66 '%' @72 '||' @75 'N AQ' @81 '|' @83 'SUM AQ' @98 '|' /
        @27 72*'-'   ;

   PUT @27 '|' @30 DIST @39 '|' @41 CPIC2 @47 '|' @49 CPIS2 @64 '|'
       @66 CPIP2 @72 '||' @75 CPICAQ2 @81 '|' @83 CPISAQ2 @98 '|' /
       @27 72*'-';
      IF DIST=25 THEN
   PUT  @27 '|' @30 'TOTALS' @39 '|' @41 TOTN @47 '|' @49 TOTC @64
'|'
        @66 TOTP @72 '||' @75 TOTNAQ @81 '|' @83 TOTCAQ @98 '|' /
         @27 72*'-'; END;
   IF ANSW = 'NO' THEN DO ;
        IF DIST=1 THEN PUT @44 46*'-' /
            @44 '|' @66 'METHOD 2'  @89 '|' /
            @44 46*'-' /
        @44 '|' @47 'DISTRICT' @56 '|' @58 'N' @64 '|' @66 'SUM' @81
'|'
        @83 '%' @89 '|' /
        @44 46*'-';

   PUT @44 '|' @47 DIST @56 '|' @58 CPIC2 @64 '|' @66 CPIS2 @81 '|'
       @83 CPIP2 @89 '|' /
       @44 46*'-';
      IF DIST=25 THEN
   PUT  @44 '|' @47 'TOTALS' @56 '|' @58 TOTN @64 '|' @66 TOTC @81
'|'
        @83 TOTP @89 '|' /
         @44 46*'-';END; RETURN;

  DATA _NULL_;FILE PRINT; IF _N_=1 THEN DO;SET BUDGET;
  PUT @50 'FOR BUDGET= ' BUDGET '    ' ONOF '-SYSTEM' /    ; END;
               IF _N_=1 THEN SET AUTOQ ;SET TEBS.FINAL;
  FORMAT CPIP3 5.2 TOTP 6.2 CPIS3 TOTC TOTCAQ CPISAQ3 DOLLAR14.;
      IF DIST= . THEN
DO;TOTN=CPIC3;TOTC=CPIS3;TOTP=CPIP3;TOTCAQ=CPISAQ3;
      TOTNAQ=CPICAQ3;
```

```
      RETAIN TOTN TOTC TOTP TOTCAQ TOTNAQ;DELETE; PUT _PAGE_;END;
      IF ANSW='YES' THEN DO;
        IF DIST=1 THEN PUT @27 72*'-' /
        @27 '|' @49 'METHOD 3'  @72 '||' @75 'AUTO-QUALIF.
STATISTICS'
        @98 '|' /
        @27 72*'-' /
        @27 '|' @30 'DISTRICT' @39 '|' @41 'N' @47 '|' @49 'SUM' @64
'|'
        @66 '%' @72 '||' @75 'N AQ' @81 '|' @83 'SUM AQ' @98 '|' /
        @27 72*'-'   ;

   PUT @27 '|' @30 DIST @39 '|' @41 CPIC3 @47 '|' @49 CPIS3 @64 '|'
       @66 CPIP3 @72 '||' @75 CPICAQ3 @81 '|' @83 CPISAQ3 @98 '|' /
       @27 72*'-';
      IF DIST=25 THEN
   PUT  @27 '|' @30 'TOTALS' @39 '|' @41 TOTN @47 '|' @49 TOTC @64
'|'
        @66 TOTP @72 '||' @75 TOTNAQ @81 '|' @83 TOTCAQ @98 '|' /
         @27 72*'-'; END;
   IF ANSW = 'NO' THEN DO ;
        IF DIST=1 THEN PUT @44 46*'-' /
            @44 '|' @66 'METHOD 3'  @89 '|' /
            @44 46*'-' /
        @44 '|' @47 'DISTRICT' @56 '|' @58 'N' @64 '|' @66 'SUM' @81
'|'
        @83 '%' @89 '|' /
        @44 46*'-';

   PUT @44 '|' @47 DIST @56 '|' @58 CPIC3 @64 '|' @66 CPIS3 @81 '|'
       @83 CPIP3 @89 '|' /
       @44 46*'-';
      IF DIST=25 THEN
   PUT  @44 '|' @47 'TOTALS' @56 '|' @58 TOTN @64 '|' @66 TOTC @81
'|'
        @83 TOTP @89 '|' /
         @44 46*'-';END; RETURN;

  DATA _NULL_;FILE PRINT; IF _N_=1 THEN DO;SET BUDGET;
  PUT @50 'FOR BUDGET= ' BUDGET '   ' ONOF '-SYSTEM' /   ; END;
                IF _N_=1 THEN SET AUTOQ ;SET SUM.FINAL;
  FORMAT CPIP4 5.2 TOTP 6.2 CPIS4 TOTC TOTCAQ CPISAQ4 DOLLAR14.;
      IF DIST= . THEN
DO;TOTN=CPIC4;TOTC=CPIS4;TOTP=CPIP4;TOTCAQ=CPISAQ4;
      TOTNAQ=CPICAQ4;
      RETAIN TOTN TOTC TOTP TOTCAQ TOTNAQ;DELETE; PUT _PAGE_;END;
      IF ANSW='YES' THEN DO;
        IF DIST=1 THEN PUT @27 72*'-' /
        @27 '|' @49 'METHOD 4'  @72 '||' @75 'AUTO-QUALIF.
STATISTICS'
        @98 '|' /
        @27 72*'-' /
        @27 '|' @30 'DISTRICT' @39 '|' @41 'N' @47 '|' @49 'SUM' @64
'|'
```

```
       @66 '%' @72 '||' @75 'N AQ' @81 '|' @83 'SUM AQ' @98 '|' /
       @27 72*'-'   ;

   PUT @27 '|' @30 DIST @39 '|' @41 CPIC4 @47 '|' @49 CPIS4 @64 '|'
      @66 CPIP4 @72 '||' @75 CPICAQ4 @81 '|' @83 CPISAQ4 @98 '|' /
      @27 72*'-';
     IF DIST=25 THEN
   PUT  @27 '|' @30 'TOTALS' @39 '|' @41 TOTN @47 '|' @49 TOTC @64
'|'
       @66 TOTP @72 '||' @75 TOTNAQ @81 '|' @83 TOTCAQ @98 '|' /
        @27 72*'-'; END;
   IF ANSW = 'NO' THEN DO ;
       IF DIST=1 THEN PUT @44 46*'-' /
           @44 '|' @66 'METHOD 4'  @89 '|' /
           @44 46*'-' /
       @44 '|' @47 'DISTRICT' @56 '|' @58 'N' @64 '|' @66 'SUM' @81
'|'
       @83 '%' @89 '|' /
       @44 46*'-';

   PUT @44 '|' @47 DIST @56 '|' @58 CPIC4 @64 '|' @66 CPIS4 @81 '|'
      @83 CPIP4 @89 '|' /
      @44 46*'-';
     IF DIST=25 THEN
   PUT  @44 '|' @47 'TOTALS' @56 '|' @58 TOTN @64 '|' @66 TOTC @81
'|'
       @83 TOTP @89 '|' /
        @44 46*'-';END; RETURN;

  DATA _NULL_;FILE PRINT; IF _N_=1 THEN DO;SET BUDGET;
  PUT @50 'FOR BUDGET= ' BUDGET '    ' ONOF '-SYSTEM' /    ; END;
              IF _N_=1 THEN SET AUTOQ ;SET TEBS.FINAL;
  FORMAT CPIP5 5.2 TOTP 6.2 CPIS5 TOTC TOTCAQ CPISAQ5 DOLLAR14.;
     IF DIST= . THEN
DO;TOTN=CPIC5;TOTC=CPIS5;TOTP=CPIP5;TOTCAQ=CPISAQ5;
     TOTNAQ=CPICAQ5;
     RETAIN TOTN TOTC TOTP TOTCAQ TOTNAQ;DELETE; PUT _PAGE_;END;
     IF ANSW='YES' THEN DO;
       IF DIST=1 THEN PUT @27 72*'-' /
       @27 '|' @49 'METHOD 5'  @72 '||' @75 'AUTO-QUALIF.
STATISTICS'
       @98 '|' /
       @27 72*'-' /
       @27 '|' @30 'DISTRICT' @39 '|' @41 'N' @47 '|' @49 'SUM' @64
'|'
       @66 '%' @72 '||' @75 'N AQ' @81 '|' @83 'SUM AQ' @98 '|' /
       @27 72*'-'   ;

   PUT @27 '|' @30 DIST @39 '|' @41 CPIC5 @47 '|' @49 CPIS5 @64 '|'
      @66 CPIP5 @72 '||' @75 CPICAQ5 @81 '|' @83 CPISAQ5 @98 '|' /
      @27 72*'-';
     IF DIST=25 THEN
   PUT  @27 '|' @30 'TOTALS' @39 '|' @41 TOTN @47 '|' @49 TOTC @64
'|'
```

```
        @66 TOTP @72 '||' @75 TOTNAQ @81 '|' @83 TOTCAQ @98 '|' /
         @27 72*'-'; END;
   IF ANSW = 'NO' THEN DO ;
        IF DIST=1 THEN PUT @44 46*'-' /
            @44 '|' @66 'METHOD 5'  @89 '|' /
            @44 46*'-' /
        @44 '|' @47 'DISTRICT' @56 '|' @58 'N' @64 '|' @66 'SUM' @81
'|'
        @83 '%' @89 '|' /
        @44 46*'-';

   PUT @44 '|' @47 DIST @56 '|' @58 CPIC5 @64 '|' @66 CPIS5 @81 '|'
       @83 CPIP5 @89 '|' /
       @44 46*'-';
      IF DIST=25 THEN
   PUT  @44 '|' @47 'TOTALS' @56 '|' @58 TOTN @64 '|' @66 TOTC @81
'|'
        @83 TOTP @89 '|' /
         @44 46*'-';END; RETURN;

  DATA _NULL_;FILE PRINT; IF _N_=1 THEN DO;SET BUDGET;
  PUT @50 'FOR BUDGET= ' BUDGET '    ' ONOF '-SYSTEM' /    ; END;
               IF _N_=1 THEN SET AUTOQ ;SET SUM.FINAL;
  FORMAT CPIP6 5.2 TOTP 6.2 CPIS6 TOTC TOTCAQ CPISAQ6 DOLLAR14.;
      IF DIST= . THEN
DO;TOTN=CPIC6;TOTC=CPIS6;TOTP=CPIP6;TOTCAQ=CPISAQ6;
      TOTNAQ=CPICAQ6;
      RETAIN TOTN TOTC TOTP TOTCAQ TOTNAQ;DELETE; PUT _PAGE_;END;
      IF ANSW='YES' THEN DO;
        IF DIST=1 THEN PUT @27 72*'-' /
        @27 '|' @49 'METHOD 6'  @72 '||' @75 'AUTO-QUALIF.
STATISTICS'
        @98 '|' /
        @27 72*'-' /
        @27 '|' @30 'DISTRICT' @39 '|' @41 'N' @47 '|' @49 'SUM' @64
'|'
        @66 '%' @72 '||' @75 'N AQ' @81 '|' @83 'SUM AQ' @98 '|' /
        @27 72*'-'    ;

   PUT @27 '|' @30 DIST @39 '|' @41 CPIC6 @47 '|' @49 CPIS6 @64 '|'
       @66 CPIP6 @72 '||' @75 CPICAQ6 @81 '|' @83 CPISAQ6 @98 '|' /
       @27 72*'-';
      IF DIST=25 THEN
   PUT  @27 '|' @30 'TOTALS' @39 '|' @41 TOTN @47 '|' @49 TOTC @64
'|'
        @66 TOTP @72 '||' @75 TOTNAQ @81 '|' @83 TOTCAQ @98 '|' /
         @27 72*'-'; END;
   IF ANSW = 'NO' THEN DO ;
        IF DIST=1 THEN PUT @44 46*'-' /
            @44 '|' @66 'METHOD 6'  @89 '|' /
            @44 46*'-' /
        @44 '|' @47 'DISTRICT' @56 '|' @58 'N' @64 '|' @66 'SUM' @81
'|'
        @83 '%' @89 '|' /
```

```
        @44 46*'-';

   PUT @44 '|' @47 DIST @56 '|' @58 CPIC6 @64 '|' @66 CPIS6 @81 '|'
       @83 CPIP6 @89 '|' /
       @44 46*'-';
      IF DIST=25 THEN
   PUT  @44 '|' @47 'TOTALS' @56 '|' @58 TOTN @64 '|' @66 TOTC @81
'|'
        @83 TOTP @89 '|' /
         @44 46*'-';END; RETURN;

  DATA _NULL_;FILE PRINT; IF _N_=1 THEN DO;SET BUDGET;
  PUT @50 'FOR BUDGET= ' BUDGET '    ' ONOF '-SYSTEM' /    ; END;
               IF _N_=1 THEN SET AUTOQ ;SET TEBS.FINAL;
  FORMAT CPIP7 5.2 TOTP 6.2 CPIS7 TOTC TOTCAQ CPISAQ7 DOLLAR14.;
      IF DIST= . THEN
DO;TOTN=CPIC7;TOTC=CPIS7;TOTP=CPIP7;TOTCAQ=CPISAQ7;
      TOTNAQ=CPICAQ7;
      RETAIN TOTN TOTC TOTP TOTCAQ TOTNAQ;DELETE; PUT _PAGE_;END;
      IF ANSW='YES' THEN DO;
        IF DIST=1 THEN PUT @27 72*'-' /
        @27 '|' @49 'METHOD 7'  @72 '||' @75 'AUTO-QUALIF.
STATISTICS'
        @98 '|' /
        @27 72*'-' /
        @27 '|' @30 'DISTRICT' @39 '|' @41 'N' @47 '|' @49 'SUM' @64
'|'
        @66 '%' @72 '||' @75 'N AQ' @81 '|' @83 'SUM AQ' @98 '|' /
        @27 72*'-'   ;

   PUT @27 '|' @30 DIST @39 '|' @41 CPIC7 @47 '|' @49 CPIS7 @64 '|'
       @66 CPIP7 @72 '||' @75 CPICAQ7 @81 '|' @83 CPISAQ7 @98 '|' /
       @27 72*'-';
      IF DIST=25 THEN
   PUT  @27 '|' @30 'TOTALS' @39 '|' @41 TOTN @47 '|' @49 TOTC @64
'|'
        @66 TOTP @72 '||' @75 TOTNAQ @81 '|' @83 TOTCAQ @98 '|' /
         @27 72*'-'; END;
   IF ANSW = 'NO' THEN DO ;
        IF DIST=1 THEN PUT @44 46*'-' /
            @44 '|' @66 'METHOD 7'  @89 '|' /
            @44 46*'-' /
        @44 '|' @47 'DISTRICT' @56 '|' @58 'N' @64 '|' @66 'SUM' @81
'|'
        @83 '%' @89 '|' /
        @44 46*'-';

   PUT @44 '|' @47 DIST @56 '|' @58 CPIC7 @64 '|' @66 CPIS7 @81 '|'
       @83 CPIP7 @89 '|' /
       @44 46*'-';
      IF DIST=25 THEN
   PUT  @44 '|' @47 'TOTALS' @56 '|' @58 TOTN @64 '|' @66 TOTC @81
'|'
        @83 TOTP @89 '|' /
```

```
        @44 46*'-';END; RETURN;

 /* CMS FI FT14F001 DISK DDF MAP A;*/
/*GOPTIONS DEVICE=TEK4105 GPROTOCOL=GSAS7171           ;  */
DATA FINAL3;SET TEBS.FINAL;IF _N_=1 THEN DELETE;KEEP DIST AVRG1 AVRG;
AVRG=ROUND(AVRG,0.01);LENGTH AVRG1 $ 5.2; AVRG1=AVRG;
DATA ANOT1;INPUT DIST X Y ; SET FINAL3   ;
LENGTH DIST2 $ 5 ;RETAIN Z 1; DIST1=DIST;
DIST2= (TRIM(LEFT('D')) || TRIM(LEFT(DIST1)));
LENGTH FUNCTION $ 8; LENGTH TEXT $ 24 ;LENGTH COLOR $ 6;
XSYS='2';YSYS='2';
TEXT=DIST2;FUNCTION='LABEL';POSITION='C';WHEN='A';OUTPUT;
POSITION='F';TEXT=PUT(AVRG,F5.2);FUNCTION='LABEL';WHEN='A';
COLOR='BLUE';
OUTPUT;
CARDS;
   1   0.057     0.040
  2   0.026     0.027
  3   0.016     0.046
  4  -0.028     0.079497
  5  -0.035     0.043758
  6  -0.050    -0.002
  7  -0.018255 -0.010
  8  -0.009     0.025641
  9   0.036     0.006
  10   0.063     0.020
  11   0.078739  0.007
  12   0.063    -0.022
  13   0.048    -0.030
  14   0.027    -0.010
  15   0.005    -0.036882
  16   0.031    -0.047
  17   0.053    -0.004
  18   0.046     0.028
  19   0.074     0.035
  20   0.080    -0.016
  21   0.019    -0.074
  23   0.009     0.006806
  24  -0.063738 -0.018030
  25  -0.0094    0.057126
DATA ANOT2; SET BUDGET;
X= 15   ;Y= 15  ; POSITION='3';XSYS='3';YSYS='3';
BUDG1=PUT(BUDGET,DOLLAR12.);
TEXT=(TRIM(LEFT('FOR BUDGET= ')) || TRIM(LEFT(BUDG1)));
FUNCTION='LABEL';WHEN='A'; COLOR='BLACK';
OUTPUT;
DATA ANOT3;SET BUDGET ;
DIA=PUT(DATE(),DATE7.);
TEXT=(TRIM(LEFT(ONOF)) || TRIM(LEFT('-SYSTEM')) || ('    ')
|| TRIM(LEFT(DIA)));
FUNCTION='LABEL';WHEN='A';COLOR='BLACK';POSITION='9';
X= 15   ;Y= 15  ;XSYS='3';YSYS='3';OUTPUT;
DATA ANOT2;SET ANOT2 ANOT3;
DATA ANOT1;SET ANOT1 ANOT2;
```

```
TITLE1 F=NONE 'BUDGET DISTRIBUTION FACTORS';
TITLE2 F=NONE C=BLUE '        (AVERAGES IN %)     ';
PATTERN1 C=WHITE V=ME;
  PROC GMAP MAP=TEBS.TEXAS DATA=ANOT1;
ID DIST;CHORO Z / NOLEGEND ANNOTATE=ANOT1 DISCRETE;RUN;

  /* CMS FI FT14F001 DISK DDF CHART A; */
/*GOPTIONS DEVICE=TEK4105 GPROTOCOL=GSAS7171;*/
DATA ANOT2; SET BUDGET;
X= 15   ;Y=  5  ; POSITION='3';XSYS='3';YSYS='3';
BUDG1=PUT(BUDGET,DOLLAR12.);
TEXT=(TRIM(LEFT('FOR BUDGET= ')) || TRIM(LEFT(BUDG1)));
FUNCTION='LABEL';WHEN='A'; COLOR='BLACK';
OUTPUT;
DATA ANOT3;SET BUDGET ;
DIA=PUT(DATE(),DATE7.);
TEXT=(TRIM(LEFT(ONOF)) || TRIM(LEFT('-SYSTEM')) || ('    ')
|| TRIM(LEFT(DIA)));
FUNCTION='LABEL';WHEN='A';COLOR='BLACK';POSITION='9';
X= 15   ;Y=  5  ;XSYS='3';YSYS='3';OUTPUT;
DATA ANOT2;SET ANOT2 ANOT3;
  PROC GPLOT DATA=FINAL2;
LABEL DIST='DISTRICTS';
LABEL CPIP1='%';
TITLE1 J=C  H=1 F=NONE 'BUDGET DISTRIBUTION FACTORS';
TITLE2 '  ';
  FOOTNOTE1 J=R H=1 F=NONE C=BLACK 'LEGEND:';
  FOOTNOTE2 J=R H=1 F=NONE C=RED 'METHOD1 = 1';
  FOOTNOTE3 J=R H=1 F=NONE C=GREEN 'METHOD7 = 7';
  FOOTNOTE4 J=R H=1 F=NONE C=BLUE 'AVERAGE = A';
  SYMBOL1 W=1 C=RED V=1 I=JOIN H=0.3 CM;
/*SYMBOL2 W=1 C=BLACK I=JOIN V=2        ;
SYMBOL3 W=1 C=BLACK I=JOIN V=3        ;
SYMBOL4 W=1 C=BLACK I=JOIN V=4        ;
SYMBOL5 W=1 C=BLACK I=JOIN V=5        ;
SYMBOL6 W=1 C=BLACK I=JOIN V=6        ; */
  SYMBOL3 W=1 C=GREEN I=JOIN V=7 H=0.3 CM       ;
SYMBOL4 W=1 C=BLUE I=JOIN V=A L=4 H=0.3 CM;
AXIS1 MINOR=NONE
ORDER=1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,23,24,25;
PLOT (CPIP1 CPIP7 AVRG)*DIST / OVERLAY ANNOTATE= ANOT2
HAXIS=AXIS1;
RUN;
```

SOURCE CODE FOR THE PROGRAM INICO (INITIALLY CONSIDERED PROJECTS)

```
/*********************************************************************
 SAS PROGRAM TO PRINT A SAS DATA SET OF PROJECTS IN THE EXISTING
TEXAS SDHPT FORMAT. IT ALLOWS THE USER TO GENERATE AN INITIALLY
CONSIDERED LIST OF PROJECTS TO BE SUBMITTED TO THE DISTRICT'S
APPRECIATIION. IT NEEDS THE SAS DATA SET GENERATED BY THE PROGRAM
FREQ WHICH CONTAINS THE PERCENTILE SCALING FACTORS FOR THE
DECISION ATTRIBUTES NAMED QDATON.TEBS OR QDATOF.TEBS.
IT ALSO NEEDS A SAS DATA SET CONTAINING THE DESCRIPTION OF THE
TEXAS DISTRICT MAP IN ORDER TO GENERATE GRAPHICS OUTPUT
IT IS DESIGNED TO BE SCREEN INTERACTIV

                      WRITTEN BY : JOSE WEISSMANN
                      ON: SEPTEMBER 88
      FOR MORE DETAILS REFER TO RESEARCH REPORT 439-4 CTR
CENTER FOR TRANSPORTATION RESEARCH UNIVERSITY OF TEXAS AT AUSTIN 1989

*********************************************************************/
CMS FI OUP DISK QDATOF OUP A;
CMS FI OUT DISK QADTON OUT A;
CMS FI LIST1 DISK INICO1 LISTING A (LRECL 133 RECFM V ;
CMS FI LIST2 DISK INICO2 LISTING A (LRECL 133 RECFM V ;
OPTIONS CENTER REPLACE MISSING=M ;   %GLOBAL ANSW;
DATA INITIAL;INPUT FALSE;CARDS;
.
PROC FSEDIT DATA=INITIAL SCREEN=TEBS.INICO;
  DATA BUDGET;
FORMAT BUDG1 BUDG2 BUDG3 BUDG4 BUDG5 BUDG6 BUDG7 BUDG8
       BUDG9 BUDG10 BUDG11 BUDG12 BUDG13 BUDG14 BUDG15 BUDG16
       BUDG17 BUDG18 BUDG19 BUDG20 BUDG21 BUDG23 BUDG24 BUDG25
                     DOLLAR14. ;
INFORMAT BUDG1 BUDG2 BUDG3 BUDG4 BUDG5 BUDG6 BUDG7 BUDG8
         BUDG9 BUDG10 BUDG11 BUDG12 BUDG13 BUDG14 BUDG15 BUDG16
         BUDG17 BUDG18 BUDG19 BUDG20 BUDG21 BUDG23 BUDG24 BUDG25
                     COMMA. ;
INPUT    BUDG1 BUDG2 BUDG3 BUDG4 BUDG5 BUDG6 BUDG7 BUDG8
         BUDG9 BUDG10 BUDG11 BUDG12 BUDG13 BUDG14 BUDG15 BUDG16
         BUDG17 BUDG18 BUDG19 BUDG20 BUDG21 BUDG23 BUDG24 BUDG25 ;
CARDS;
       4,445,000 19,263,000 10,584,000  1,789,000  5,240,000
00,000,000
         283,000  4,744,000    193,000  4,009,000  1,070,000
19,792,000
         460,000  3,146,000  5,176,000  2,102,000 00,000,000
37,066,000
      11,079,000 13,471,000    466,000    141,000 00,000,000
5,332,000
PROC FSEDIT DATA=BUDGET SCREEN=TEBS.INIBUDG;
DATA WEIGHT;
FORMAT WCPV1 WADT1 WSR1 WDSS1 WBWR1 4.2 ;
LENGTH ONOF $ 3 YEAR $ 10 ;
INPUT WCPV1 WADT1 WSR1 WDSS1 WBWR1 ONOF $ YEAR $ ;

CARDS;
0.2   0.2   0.2   0.2   0.2  ON 1988-1990
```

```
PROC FSEDIT DATA=WEIGHT SCREEN=TEBS.WTINI;

DATA ANS;SET WEIGHT;CALL SYMPUT('ANSW',ONOF);RETURN;
 /* MACRO TO OUTPUT THE INITIALLY CONSIDERED PROJECTS TO A
PERMANENT
         DATA SET  BY DISTRICT */
%MACRO CHOOS;
  %IF &ANSW=ON %THEN %DO;
  DATA TEBS.INION1 TEBS.INION2 TEBS.INION3 TEBS.INION4 TEBS.INION5
       TEBS.INION6 TEBS.INION7 TEBS.INION8 TEBS.INION9 TEBS.INION10
       TEBS.INION11 TEBS.INION12 TEBS.INION13 TEBS.INION14
       TEBS.INION15 TEBS.INION16 TEBS.INION17 TEBS.INION18
       TEBS.INION19 TEBS.INION20 TEBS.INION21 TEBS.INION23
       TEBS.INION24 TEBS.INION25;  SET REPDATA;
  IF DIST=1 THEN OUTPUT TEBS.INION1;
  IF DIST=2 THEN OUTPUT TEBS.INION2;
  IF DIST=3 THEN OUTPUT TEBS.INION3;
  IF DIST=4 THEN OUTPUT TEBS.INION4;
  IF DIST=5 THEN OUTPUT TEBS.INION5;
  IF DIST=6 THEN OUTPUT TEBS.INION6;
  IF DIST=7 THEN OUTPUT TEBS.INION7;
  IF DIST=8 THEN OUTPUT TEBS.INION8;
  IF DIST=9 THEN OUTPUT TEBS.INION9;
  IF DIST=10 THEN OUTPUT TEBS.INION10;
  IF DIST=11 THEN OUTPUT TEBS.INION11;
  IF DIST=12 THEN OUTPUT TEBS.INION12;
  IF DIST=13 THEN OUTPUT TEBS.INION13;
  IF DIST=14 THEN OUTPUT TEBS.INION14;
  IF DIST=15 THEN OUTPUT TEBS.INION15;
  IF DIST=16 THEN OUTPUT TEBS.INION16;
  IF DIST=17 THEN OUTPUT TEBS.INION17;
  IF DIST=18 THEN OUTPUT TEBS.INION18;
  IF DIST=19 THEN OUTPUT TEBS.INION19;
  IF DIST=20 THEN OUTPUT TEBS.INION20;
  IF DIST=21 THEN OUTPUT TEBS.INION21;
  IF DIST=23 THEN OUTPUT TEBS.INION23;
  IF DIST=24 THEN OUTPUT TEBS.INION24;
  IF DIST=25 THEN OUTPUT TEBS.INION25;
  KEEP BRID INIC SCORE1;  RETURN;%END;

  %IF &ANSW=OFF %THEN %DO;
  DATA TEBS.INIOF1 TEBS.INIOF2 TEBS.INIOF3 TEBS.INIOF4 TEBS.INIOF5
       TEBS.INIOF6 TEBS.INIOF7 TEBS.INIOF8 TEBS.INIOF9 TEBS.INIOF10
       TEBS.INIOF11 TEBS.INIOF12 TEBS.INIOF13 TEBS.INIOF14
       TEBS.INIOF15 TEBS.INIOF16 TEBS.INIOF17 TEBS.INIOF18
       TEBS.INIOF19 TEBS.INIOF20 TEBS.INIOF21 TEBS.INIOF23
       TEBS.INIOF24 TEBS.INIOF25;  SET REPDATA;
  IF DIST=1 THEN OUTPUT TEBS.INIOF1;
  IF DIST=2 THEN OUTPUT TEBS.INIOF2;
  IF DIST=3 THEN OUTPUT TEBS.INIOF3;
  IF DIST=4 THEN OUTPUT TEBS.INIOF4;
  IF DIST=5 THEN OUTPUT TEBS.INIOF5;
```

```
    IF DIST=6 THEN OUTPUT TEBS.INIOF6;
    IF DIST=7 THEN OUTPUT TEBS.INIOF7;
    IF DIST=8 THEN OUTPUT TEBS.INIOF8;
    IF DIST=9 THEN OUTPUT TEBS.INIOF9;
    IF DIST=10 THEN OUTPUT TEBS.INIOF10;
    IF DIST=11 THEN OUTPUT TEBS.INIOF11;
    IF DIST=12 THEN OUTPUT TEBS.INIOF12;
    IF DIST=13 THEN OUTPUT TEBS.INIOF13;
    IF DIST=14 THEN OUTPUT TEBS.INIOF14;
    IF DIST=15 THEN OUTPUT TEBS.INIOF15;
    IF DIST=16 THEN OUTPUT TEBS.INIOF16;
    IF DIST=17 THEN OUTPUT TEBS.INIOF17;
    IF DIST=18 THEN OUTPUT TEBS.INIOF18;
    IF DIST=19 THEN OUTPUT TEBS.INIOF19;
    IF DIST=20 THEN OUTPUT TEBS.INIOF20;
    IF DIST=21 THEN OUTPUT TEBS.INIOF21;
    IF DIST=23 THEN OUTPUT TEBS.INIOF23;
    IF DIST=24 THEN OUTPUT TEBS.INIOF24;
    IF DIST=25 THEN OUTPUT TEBS.INIOF25;
    KEEP BRID INIC SCORE1;  RETURN;%END;

             %MEND CHOOS;

DATA AUTOQ;INPUT ANSW $ AQCPV AQADT AQSR AQDSS AQBWR;CARDS;
NO . . . . .

  PROC FSEDIT DATA=AUTOQ SCREEN=TEBS.AQINI;

  /* MACRO TO CHOOSE THE CORRECT DATA SET OUTPUT BY THE MODULE FREQ
*/
     %MACRO CHOOS2;
     %IF &ANSW=ON %THEN TEBS.QDATON;
     %IF &ANSW=OFF %THEN TEBS.QDATOF;
     %MEND CHOOS2;

PROC FORMAT;

  VALUE $WTPIC 'RP'='REPLACE BRIDGE & APPROACHES'
               'RH'='REHABILITATE BRIDGE & APPROACHES';


  VALUE $CNTY '001'='ANDERSON' '002'='ANDREWS' '003'='ANGELINA'
              '004'='ARANSAS' '005'='ARCHER' '006'='ARMSTRONG'
              '007'='ATASCOSA' '008'='AUSTIN' '009'='BAILEY'
              '010'='BANDERA' '011'='BASTROP' '012'='BAYLOR'
'013'='BEE'
              '014'='BELL' '015'='BEXAR' '016'='BLANCO'
'017'='BORDEN'
              '018'='BOSQUE' '019'='BOWIE' '020'='BRAZORIA'
              '021'='BRAZOS' '022'='BREWSTER' '023'='BRISCOE'
              '024'='BROOKS' '025'='BROWN' '026'='BURLESON'
              '027'='BURNET' '028'='CALDWELL' '029'='CALHOUN'
              '030'='CALLAHAN' '031'='CAMERON' '032'='CAMP'
              '033'='CARSON' '034'='CASS' '035'='CASTRO'
```

```
'036'='CHAMBERS'
          '037'='CHEROKEE' '038'='CHILDRESS' '039'='CLAY'
          '040'='COCHRAN' '041'='COKE' '042'='COLEMAN'
'043'='COLLIN'
          '044'='COLLINGSWORTH' '045'='COLORADO' '046'='COMAL'
          '047'='COMANCHE' '048'='CONCHO' '049'='COOKE'
          '050'='CORYELL' '051'='COTTLE' '052'='CRANE'
          '053'='CROCKETT' '054'='CROSBY' '055'='CULBERSON'
          '056'='DALLAM' '057'='DALLAS' '058'='DAWSON'
          '059'='DEAF SMITH' '060'='DELTA' '061'='DENTON'
          '062'='DEWITT' '063'='DICKENS' '064'='DIMMIT'
          '065'='DONLEY' '066'='KENEDY' '067'='DUVAL'
          '068'='EASTLAND' '069'='ECTOR' '070'='EDWARDS'
          '071'='ELLIS' '072'='EL PASO' '073'='ERATH'
'074'='FALLS'
          '075'='FANNIN' '076'='FAYETTE' '077'='FISHER'
'078'='FLOYD'
          '079'='FOARD' '080'='FORT BEND' '081'='FRANKLIN'
          '082'='FREESTONE' '083'='FRIO' '084'='GAINES'
          '085'='GALVESTON' '086'='GARZA' '087'='GILLESPIE'
          '088'='GLASSCOCK' '089'='GOLIAD' '090'='GONZALES'
          '091'='GRAY' '092'='GRAYSON' '093'='GREGG'
'094'='GRIMES'
          '095'='GUADALUPE' '096'='HALE' '097'='HALL'
          '098'='HAMILTON' '099'='HANSFORD' '100'='HARDEMAN'
          '101'='HARDIN' '102'='HARRIS' '103'='HARRISON'
          '104'='HARTLEY' '105'='HASKELL' '106'='HAYS'
          '107'='HEMPHILL' '108'='HENDERSON' '109'='HIDALGO'
          '110'='HILL' '111'='HOCKLEY' '112'='HOOD'
          '113'='HOPKINS' '114'='HOUSTON' '115'='HOWARD'
          '116'='HUDSPETH' '117'='HUNT' '118'='HUTCHINSON'
          '119'='IRION' '120'='JACK' '121'='JACKSON'
'122'='JASPER'
          '123'='JEFF DAVIS' '124'='JEFFERSON' '125'='JIM HOGG'
          '126'='JIM WELLS' '127'='JOHNSON' '128'='JONES'
          '129'='KARNES' '130'='KAUFMAN' '131'='KENDALL'
'132'='KENT'
          '133'='KERR' '134'='KIMBLE' '135'='KING' '136'='KINNEY'
          '137'='KLEBERG' '138'='KNOX' '139'='LAMAR' '140'='LAMB'
          '141'='LAMPASAS' '142'='LA SALLE' '143'='LAVACA'
          '144'='LEE' '145'='LEON' '146'='LIBERTY'
'147'='LIMESTONE'
          '148'='LIPSCOMB' '149'='LIVE OAK' '150'='LLANO'
          '151'='LOVING' '152'='LUBBOCK' '153'='LYNN'
'154'='MADISON'
          '155'='MARION' '156'='MARTIN' '157'='MASON'
          '158'='MATAGORDA' '159'='MAVERICK' '160'='MCCULLOCH'
          '161'='MCLENNAN' '162'='MCMULLEN' '163'='MEDINA'
          '164'='MENARD' '165'='MIDLAND' '166'='MILAM'
'167'='MILLS'
          '168'='MITCHELL' '169'='MONTAGUE' '170'='MONTGOMERY'
          '171'='MOORE' '172'='MORRIS' '173'='MOTLEY'
          '174'='NACOGDOCHES' '175'='NAVARRO' '176'='NEWTON'
          '177'='NOLAN' '178'='NUECES' '179'='OCHILTREE'
```

```
               '180'='OLDHAM' '181'='ORANGE' '182'='PALO PINTO'
               '183'='PANOLA' '184'='PARKER' '185'='PARMER'
'186'='PECOS'
               '187'='POLK' '188'='POTTER' '189'='PRESIDIO'
'190'='RAINS'
               '191'='RANDALL' '192'='REAGAN' '193'='REAL'
               '194'='RED RIVER' '195'='REEVES' '196'='REFUGIO'
               '197'='ROBERTS' '198'='ROBERTSON' '199'='ROCKWALL'
               '200'='RUNNELS' '201'='RUSK' '202'='SABINE'
               '203'='SAN AUGUSTINE' '204'='SAN JACINTO'
               '205'='SAN PATRICIO' '206'='SAN SABA'
'207'='SCHLEICHER'
               '208'='SCURRY' '209'='SHACKELFORD' '210'='SHELBY'
               '211'='SHERMAN' '212'='SMITH' '213'='SOMERVELL'
               '214'='STARR' '215'='STEPHENS' '216'='STERLING'
               '217'='STONEWALL' '218'='SUTTON' '219'='SWISHER'
               '220'='TARRANT' '221'='TAYLOR' '222'='TERRELL'
               '223'='TERRY' '224'='THROCKMORTON' '225'='TITUS'
               '226'='TOM GREEN' '227'='TRAVIS' '228'='TRINITY'
               '229'='TYLER' '230'='UPSHUR' '231'='UPTON'
'232'='UVALDE'
               '233'='VAL VERDE' '234'='VAN ZANDT' '235'='VICTORIA'
               '236'='WALKER' '237'='WALLER' '238'='WARD'
               '239'='WASHINGTON' '240'='WEBB' '241'='WHARTON'
               '242'='WHEELER' '243'='WICHITA' '244'='WILBARGER'
               '245'='WILLACY' '246'='WILLIAMSON' '247'='WILSON'
               '248'='WINKLER' '249'='WISE' '250'='WOOD'
'251'='YOAKUM'
               '252'='YOUNG' '253'='ZAPATA' '254'='ZAVALA';


  VALUE  HQ 1='1 PARIS' 2='2 FT WORTH' 3='3 WICHITA FALLS'
            4='4 AMARILLO' 5='5 LUBBOCK' 6='6 ODESSA' 7='7 SAN
ANGELO'
            8='8 ABILENE' 9='9 WACO' 10='10 TYLER' 11='11 LUFKIN'
           12='12 HOUSTON' 13='13 YOAKUM' 14='14 AUSTIN'
           15='15 SAN ANTONIO' 16='16 CORPUS CHRISTI' 17='17 BRYAN'
           18='18 DALLAS' 19='19 ATLANTA' 20='20 BEAUMONT'
           21='21 PHARR' 23='23 BROWNWOOD' 24='24 EL PASO'
           25='25 CHILDRESS' 26='26 HOUSTON URBAN';

DATA REPDATA;
   IF _N_=1 THEN SET WEIGHT;
   IF _N_=1 THEN SET AUTOQ ;
   IF _N_=1 THEN SET BUDGET;
  LENGTH AQ $ 2;
  SET %CHOOS2;
  IF ANSW = 'NO' THEN  DO;AQ='1'; GO TO OK ; END;
  IF AQCPV NE . THEN DO;IF CPV<=AQCPV THEN AQ='AQ';END;
  IF AQADT NE . THEN DO;IF W_ADT>=AQADT THEN AQ='AQ';END;
  IF AQSR  NE . THEN DO;IF SR <=AQSR THEN AQ='AQ';END;
  IF AQDSS NE . THEN DO;IF DSS<=AQDSS THEN AQ='AQ';END;
  IF AQBWR NE . THEN DO;IF BWR<=AQBWR THEN AQ='AQ';END;
OK:SCORE1=0.0;
```

```
  SCORE1= SCORE1 + WCPV1*CPVPTL
                 + WADT1*ADTPTL
                 + WSR1 *SRPTL
                 + WDSS1*DSSPTL
                 + WBWR1*BWRPTL;
PROC SORT DATA=REPDATA ;
    BY DIST DESCENDING AQ DESCENDING SCORE1;
    DATA REPDATA;SET REPDATA;DISTT=LAG1(DIST);


DATA REPDATA;
    SET REPDATA;
    BY DIST DESCENDING AQ DESCENDING SCORE1;
          DROP DCOST DISTT;
    IF DIST NE DISTT THEN DCOST=0;
    DCOST=DCOST+CPI; RETAIN DCOST;
    IF DIST=1 AND DCOST>BUDG1 THEN DO;DCOST=DCOST-CPI;DELETE;END;
    IF DIST=2 AND DCOST>BUDG2 THEN DO;DCOST=DCOST-CPI;DELETE;END;
    IF DIST=3 AND DCOST>BUDG3 THEN DO;DCOST=DCOST-CPI;DELETE;END;
    IF DIST=4 AND DCOST>BUDG4 THEN DO;DCOST=DCOST-CPI;DELETE;END;
    IF DIST=5 AND DCOST>BUDG5 THEN DO;DCOST=DCOST-CPI;DELETE;END;
    IF DIST=6 AND DCOST>BUDG6 THEN DO;DCOST=DCOST-CPI;DELETE;END;
    IF DIST=7 AND DCOST>BUDG7 THEN DO;DCOST=DCOST-CPI;DELETE;END;
    IF DIST=8 AND DCOST>BUDG8 THEN DO;DCOST=DCOST-CPI;DELETE;END;
    IF DIST=9 AND DCOST>BUDG9 THEN DO;DCOST=DCOST-CPI;DELETE;END;
    IF DIST=10 AND DCOST>BUDG10 THEN DO;DCOST=DCOST-CPI;DELETE;END;
    IF DIST=11 AND DCOST>BUDG11 THEN DO;DCOST=DCOST-CPI;DELETE;END;
    IF DIST=12 AND DCOST>BUDG12 THEN DO;DCOST=DCOST-CPI;DELETE;END;
    IF DIST=13 AND DCOST>BUDG13 THEN DO;DCOST=DCOST-CPI;DELETE;END;
    IF DIST=14 AND DCOST>BUDG14 THEN DO;DCOST=DCOST-CPI;DELETE;END;
    IF DIST=15 AND DCOST>BUDG15 THEN DO;DCOST=DCOST-CPI;DELETE;END;
    IF DIST=16 AND DCOST>BUDG16 THEN DO;DCOST=DCOST-CPI;DELETE;END;
    IF DIST=17 AND DCOST>BUDG17 THEN DO;DCOST=DCOST-CPI;DELETE;END;
    IF DIST=18 AND DCOST>BUDG18 THEN DO;DCOST=DCOST-CPI;DELETE;END;
    IF DIST=19 AND DCOST>BUDG19 THEN DO;DCOST=DCOST-CPI;DELETE;END;
    IF DIST=20 AND DCOST>BUDG20 THEN DO;DCOST=DCOST-CPI;DELETE;END;
    IF DIST=21 AND DCOST>BUDG21 THEN DO;DCOST=DCOST-CPI;DELETE;END;
    IF DIST=23 AND DCOST>BUDG23 THEN DO;DCOST=DCOST-CPI;DELETE;END;
    IF DIST=24 AND DCOST>BUDG24 THEN DO;DCOST=DCOST-CPI;DELETE;END;
    IF DIST=25 AND DCOST>BUDG25 THEN DO;DCOST=DCOST-CPI;DELETE;END;

    IF DIST=1 AND BUDG1=0 THEN DO; DELETE;  END;
    IF DIST=2 AND BUDG2=0 THEN DO; DELETE;  END;
    IF DIST=3 AND BUDG3=0 THEN DO; DELETE;  END;
    IF DIST=4 AND BUDG4=0 THEN DO; DELETE;  END;
    IF DIST=5 AND BUDG5=0 THEN DO; DELETE;  END;
    IF DIST=6 AND BUDG6=0 THEN DO; DELETE;  END;
    IF DIST=7 AND BUDG7=0 THEN DO; DELETE;  END;
    IF DIST=8 AND BUDG8=0 THEN DO; DELETE;  END;
    IF DIST=9 AND BUDG9=0 THEN DO; DELETE;  END;
    IF DIST=10 AND BUDG10=0 THEN DO; DELETE;  END;
    IF DIST=11 AND BUDG11=0 THEN DO; DELETE;  END;
    IF DIST=12 AND BUDG12=0 THEN DO; DELETE;  END;
    IF DIST=13 AND BUDG13=0 THEN DO; DELETE;  END;
```

```
    IF DIST=14 AND BUDG14=0 THEN DO; DELETE;  END;
    IF DIST=15 AND BUDG15=0 THEN DO; DELETE;  END;
    IF DIST=16 AND BUDG16=0 THEN DO; DELETE;  END;
    IF DIST=17 AND BUDG17=0 THEN DO; DELETE;  END;
    IF DIST=18 AND BUDG18=0 THEN DO; DELETE;  END;
    IF DIST=19 AND BUDG19=0 THEN DO; DELETE;  END;
    IF DIST=20 AND BUDG20=0 THEN DO; DELETE;  END;
    IF DIST=21 AND BUDG21=0 THEN DO; DELETE;  END;
    IF DIST=23 AND BUDG23=0 THEN DO; DELETE;  END;
    IF DIST=24 AND BUDG24=0 THEN DO; DELETE;  END;
    IF DIST=25 AND BUDG25=0 THEN DO; DELETE;  END;
              INIC='INI';
RETURN;

  PROC SUMMARY DATA=REPDATA;
CLASS DIST; VAR CPI;OUTPUT OUT=TABM1 N=CPIC1 SUM=CPIS1;
DATA TABM1;SET TABM1;
IF _TYPE_=0 THEN TOT1=CPIS1;RETAIN TOT1;
CPIP1=(CPIS1/TOT1)*100;
  PROC SORT DATA=REPDATA; BY DESCENDING AQ ;
  PROC SUMMARY DATA=REPDATA;
CLASS DIST; VAR CPI;BY DESCENDING AQ ;
OUTPUT OUT=TAAQ1 N=CPICAQ1 SUM=CPISAQ1;

DATA TAAQ1;
    KEEP DIST _TYPE_ CPICAQ1 CPISAQ1;
    SET TAAQ1;IF AQ='AQ';


DATA DISLIST;INPUT DIST;CARDS;
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
23
24
25
```

```
DATA FINAL;MERGE DISLIST TABM1
TAAQ1  ;
           BY DIST;
DATA FINAL;SET FINAL;
IF CPIC1=. THEN DO; CPIC1=0; CPIS1=0;CPIP1=0;TOT1=0;_TYPE_=1;END;

IF CPICAQ1=. THEN DO; CPICAQ1=0; CPISAQ1=0;_TYPE_=1;END;
KEEP DIST _TYPE_ CPIC1 CPIS1 CPIP1 TOT1
                 CPICAQ1 CPISAQ1 ;
  DATA FINAL2;SET FINAL;IF DIST= .  THEN DELETE;

OPTIONS PAGESIZE=60             ;

PROC SORT DATA=REPDATA;
  BY DIST DESCENDING SCORE1;

  DATA _NULL_;FILE LIST1 PRINT HEADER=A;
             IF _N_=1 THEN SET AUTOQ ; SET WEIGHT;
  PUT @44 44*'-' /
      @44 '|' @65 'WEIGHTS' @87 '|' /
      @44 44*'-' /  @44 '|'
      @45 '      ' @52 '|' @54 'CPV' @59 '|' @61 'ADT' @66 '|' @68
'SR'
      @73 '|' @75 'DSS' @80 '|' @82 'BWR' @87 '|' /
      @44 44*'-' /
      @44 '|' @47 ' ' @52 '|' @54 WCPV1 @59 '|' @61 WADT1 @66 '|'
      @68 WSR1 @73 '|' @75 WDSS1 @80 '|' @82 WBWR1 @87 '|' /
      @44 44*'-' /
      @44 '|' @51 'CPV = COST PER VEHICLE' @87 '|' /
      @44 44*'-' /
      @44 '|' @51 'ADT = AVERAGE DAILY TRAFFIC' @87 '|' /
      @44 44*'-' /
      @44 '|' @51 'SR = SUFFICIENCY RATING' @87 '|' /
      @44 44*'-' /
      @44 '|' @51 'DSS = MINIMUM OF CONDITION RATINGS' @87 '|' /
      @44 44*'-' /
      @44 '|' @51 'BWR = BRIDGE WIDTH RATIO' @87 '|' /
      @44 44*'-' / /  ;
      IF ANSW='YES' THEN DO ;
  PUT @49 'AUTO QUALIFYING FEATURES USED :' / /
      @44 44*'-' /
      @44 '|' @46 'CPV' @52 '|' @56 AQCPV @87 '|' /
      @44 44*'-' /
      @44 '|' @46 'ADT' @52 '|' @56 AQADT @87 '|' /
      @44 44*'-' /
      @44 '|' @46 'SR' @52 '|' @56 AQSR @87 '|' /
      @44 44*'-' /
      @44 '|' @46 'DSS' @52 '|' @56 AQDSS @87 '|' /
      @44 44*'-' /
      @44 '|' @46 'BWR' @52 '|' @56 AQBWR @87 '|' /
      @44 44*'-' / /
      @49 'M = MISSING' ;
      END;    RETURN;
A: PUT @39 YEAR @49 ONOF '-STATE SYSTEM FEDERAL AID BRIDGE
```

```
REPLACEMENT'/
       @54 'AND REHABILITATION PROGRAM'/
       @52 'INITIALLY CONSIDERED PROJECTS'// ; RETURN;
CMS FI LIST1 DISK INICO1 LISTING A (LRECL 133 RECFM V DISP MOD;
  DATA _NULL_;FILE LIST1 PRINT HEADER=B;
      IF _N_=1 THEN SET AUTOQ ;IF _N_=1 THEN SET WEIGHT;SET FINAL;
  FORMAT CPIP1 5.2 TOTP 6.2 CPIS1 TOTC TOTCAQ CPISAQ1 DOLLAR14.;
      IF DIST= . THEN
DO;TOTN=CPIC1;TOTC=CPIS1;TOTP=CPIP1;TOTCAQ=CPISAQ1;
      TOTNAQ=CPICAQ1;
      RETAIN TOTN TOTC TOTP TOTCAQ TOTNAQ;DELETE; PUT _PAGE_;END;
      IF ANSW='YES' THEN DO;
        IF DIST=1 THEN PUT @27 72*'-' /
@27 '|' @39 'BUDGET DISTRIBUTION'  @72 '||' @75 'AUTO-QUALIF.
STATISTICS'
        @98 '|' /
        @27 72*'-' /
        @27 '|' @30 'DISTRICT' @39 '|' @41 'N' @47 '|' @49 'SUM' @64
'|'
        @66 '%' @72 '||' @75 'N AQ' @81 '|' @83 'SUM AQ' @98 '|' /
        @27 72*'-'    ;

   PUT @27 '|' @30 DIST @39 '|' @41 CPIC1 @47 '|' @49 CPIS1 @64 '|'
       @66 CPIP1 @72 '||' @75 CPICAQ1 @81 '|' @83 CPISAQ1 @98 '|' /
       @27 72*'-';
      IF DIST=25 THEN
   PUT  @27 '|' @30 'TOTALS' @39 '|' @41 TOTN @47 '|' @49 TOTC @64
'|'
        @66 TOTP @72 '||' @75 TOTNAQ @81 '|' @83 TOTCAQ @98 '|' /
         @27 72*'-'; END;
   IF ANSW = 'NO' THEN DO ;
        IF DIST=1 THEN PUT @44 46*'-' /
            @44 '|' @66 'BUDGET DISTRIBUTION'  @89 '|' /
            @44 46*'-' /
        @44 '|' @47 'DISTRICT' @56 '|' @58 'N' @64 '|' @66 'SUM' @81
'|'
        @83 '%' @89 '|' /
        @44 46*'-';

   PUT @44 '|' @47 DIST @56 '|' @58 CPIC1 @64 '|' @66 CPIS1 @81 '|'
       @83 CPIP1 @89 '|' /
       @44 46*'-';
      IF DIST=25 THEN
   PUT  @44 '|' @47 'TOTALS' @56 '|' @58 TOTN @64 '|' @66 TOTC @81
'|'
        @83 TOTP @89 '|' /
         @44 46*'-';END; RETURN;
B: PUT @39 YEAR @49 ONOF '-STATE SYSTEM FEDERAL AID BRIDGE
REPLACEMENT'/
       @54 'AND REHABILITATION PROGRAM'/
       @52 'INITIALLY CONSIDERED PROJECTS'/  ; RETURN;
DATA _NULL_;
  SET REPDATA END=EOF;
  BY DIST DESCENDING SCORE1;
```

```
  NPS+1;
  FILE LIST1 PRINT HEADER=C;
  IF FIRST.DIST OR NPS=6  THEN DO; PUT _PAGE_@; NPS=0; END;
  DN+1;
  DCOST+CPI;
  PUT @5 DIST  HQ. @25 COUNTY $CNTY. @41 RNUM @54 CSS /* CSSPIC. */
$12.
      @75 WT $WTPIC.
      @113 CPI DOLLAR14.  / /
      @5 'BRIDGE LOCATION: 'FX $20./ /
      @5 'EXISTING FACILITY: 'LOS ' LANE, ' ROWI 'FT ROADWAY'
      @55 ' PROPOSED FACILITY: ' PNL ' LANE, ' PRW 'FT ROADWAY' /
      @5 126*'=';
  IF LAST.DIST THEN DO;
   PUT @60 'DISTRICT TOTAL OF ' DN 3. ' INITIALLY CONSIDERED
PROJECTS:'
       @113  DCOST DOLLAR14.  ;
   TCOST+DCOST;
   TN+DN;
   DCOST=0;
   DN=0;
   END;
 IF EOF THEN PUT @63 'STATE TOTAL OF ' TN 3.
 ' INITIALLY CONSIDERED PROJECTS:'
 @117 TCOST DOLLAR14.  ;
IF _N_=1 THEN SET WEIGHT ;
  RETURN;

C: PUT @39 YEAR @49 ONOF '-STATE SYSTEM FEDERAL AID BRIDGE
REPLACEMENT'/
       @54 'AND REHABILITATION PROGRAM'/
       @52 'INITIALLY CONSIDERED PROJECTS'//
       @5 'DISTRICT-HDQRTRS' @25 'COUNTY' @40 'HWY NO'
       @53 'CONT-SECT-STR' @75 'TYPE OF WORK' @116 'ESTIMATED COST' /
       @5 126*'=' ;
 RETURN;


/* TITLE1 '1987-1991 ON-STATE SYSTEM FEDERAL AID BRIDGE REPLACEMENT';
TITLE2 'AND REHABILITATION PROGRAM';
TITLE3 'INITIALLY CONSIDERED PROJECTS';
TITLE4 ' ';
TITLE5 ' '; */

  DATA _NULL_;FILE LIST2 PRINT HEADER=D ;
              IF _N_=1 THEN SET AUTOQ ;SET WEIGHT;
  PUT @44 44*'-' /
      @44 '|' @65 'WEIGHTS' @87 '|' /
      @44 44*'-' /  @44 '|'
      @45 '      ' @52 '|' @54 'CPV' @59 '|' @61 'ADT' @66 '|' @68
'SR'
      @73 '|' @75 'DSS' @80 '|' @82 'BWR' @87 '|' /
      @44 44*'-' /
      @44 '|' @47 ' ' @52 '|' @54 WCPV1 @59 '|' @61 WADT1 @66 '|'
```

```
      @68 WSR1 @73 '|' @75 WDSS1 @80 '|' @82 WBWR1 @87 '|' /
      @44 44*'-' /
      @44 '|' @51 'CPV = COST PER VEHICLE' @87 '|' /
      @44 44*'-' /
      @44 '|' @51 'ADT = AVERAGE DAILY TRAFFIC' @87 '|' /
      @44 44*'-' /
      @44 '|' @51 'SR = SUFFICIENCY RATING' @87 '|' /
      @44 44*'-' /
      @44 '|' @51 'DSS = MINIMUM OF CONDITION RATINGS' @87 '|' /
      @44 44*'-' /
      @44 '|' @51 'BWR = BRIDGE WIDTH RATIO' @87 '|' /
      @44 44*'-' / /  ;
      IF ANSW='YES' THEN DO ;
  PUT @49 'AUTO QUALIFYING FEATURES USED :' / /
      @44 44*'-' /
      @44 '|' @46 'CPV' @52 '|' @56 AQCPV @87 '|' /
      @44 44*'-' /
      @44 '|' @46 'ADT' @52 '|' @56 AQADT @87 '|' /
      @44 44*'-' /
      @44 '|' @46 'SR' @52 '|' @56 AQSR @87 '|' /
      @44 44*'-' /
      @44 '|' @46 'DSS' @52 '|' @56 AQDSS @87 '|' /
      @44 44*'-' /
      @44 '|' @46 'BWR' @52 '|' @56 AQBWR @87 '|' /
      @44 44*'-' / /
      @49 'M = MISSING' ;
      END;  RETURN ;
D: PUT @39 YEAR @49 ONOF '-STATE SYSTEM FEDERAL AID BRIDGE
REPLACEMENT'/
       @54 'AND REHABILITATION PROGRAM'/
       @52 'INITIALLY CONSIDERED PROJECTS'// ; RETURN;
CMS FI LIST2 DISK INICO2 LISTING A (LRECL 133 RECFM V DISP MOD;
  DATA _NULL_;FILE LIST2 PRINT HEADER=E ;
  IF _N_=1 THEN SET AUTOQ ;IF _N_=1 THEN SET WEIGHT;SET FINAL;
  FORMAT CPIP1 5.2 TOTP 6.2 CPIS1 TOTC TOTCAQ CPISAQ1 DOLLAR14.;
      IF DIST= . THEN
DO;TOTN=CPIC1;TOTC=CPIS1;TOTP=CPIP1;TOTCAQ=CPISAQ1;
      TOTNAQ=CPICAQ1;
      RETAIN TOTN TOTC TOTP TOTCAQ TOTNAQ;DELETE; PUT _PAGE_;END;
      IF ANSW='YES' THEN DO;
        IF DIST=1 THEN PUT @27 72*'-' /
@27 '|' @39 'BUDGET DISTRIBUTION'  @72 '||' @75 'AUTO-QUALIF.
STATISTICS'
        @98 '|' /
        @27 72*'-' /
        @27 '|' @30 'DISTRICT' @39 '|' @41 'N' @47 '|' @49 'SUM' @64
'|'
        @66 '%' @72 '||' @75 'N AQ' @81 '|' @83 'SUM AQ' @98 '|' /
        @27 72*'-'   ;

   PUT @27 '|' @30 DIST @39 '|' @41 CPIC1 @47 '|' @49 CPIS1 @64 '|'
       @66 CPIP1 @72 '||' @75 CPICAQ1 @81 '|' @83 CPISAQ1 @98 '|' /
       @27 72*'-';
      IF DIST=25 THEN
```

```
   PUT  @27 '|' @30 'TOTALS' @39 '|' @41 TOTN @47 '|' @49 TOTC @64
'|'
        @66 TOTP @72 '||' @75 TOTNAQ @81 '|' @83 TOTCAQ @98 '|' /
         @27 72*'-'; END;
   IF ANSW = 'NO' THEN DO ;
        IF DIST=1 THEN PUT @44 46*'-' /
            @44 '|' @66 'BUDGET DISTRIBUTION'  @89 '|' /
            @44 46*'-' /
        @44 '|' @47 'DISTRICT' @56 '|' @58 'N' @64 '|' @66 'SUM' @81
'|'
        @83 '%' @89 '|' /
        @44 46*'-';

   PUT @44 '|' @47 DIST @56 '|' @58 CPIC1 @64 '|' @66 CPIS1 @81 '|'
       @83 CPIP1 @89 '|' /
       @44 46*'-';
      IF DIST=25 THEN
   PUT  @44 '|' @47 'TOTALS' @56 '|' @58 TOTN @64 '|' @66 TOTC @81
'|'
        @83 TOTP @89 '|' /
         @44 46*'-';END; RETURN;
E: PUT @39 YEAR @49 ONOF '-STATE SYSTEM FEDERAL AID BRIDGE
REPLACEMENT'/
       @54 'AND REHABILITATION PROGRAM'/
       @52 'INITIALLY CONSIDERED PROJECTS'/  ; RETURN;
DATA _NULL_;
  SET REPDATA END=EOF;
  BY DIST DESCENDING SCORE1;
  S='S';
  NPS+1;
  FILE LIST2 PRINT HEADER=F;
  IF FIRST.DIST OR NPS=6  THEN DO; PUT _PAGE_@; NPS=0; END;
  IF (S='S') THEN DO; A_COST+CPI; AN+1; END;
  PUT @13 W_ADT COMMA7. @27 SR 3. @43 DECO 1.
      @48 SSCO 1. @53 SUBCO 1.
      @57 CPV DOLLAR8. @73 BWR 5.3
      @85 SCORE1 3. @95 W_BDL 2.
      @115 A_COST DOLLAR14. / @2 CSS /* CSSPIC.*/ $12. / @13
'COMMENTS: '
      / /
      @12 119*'=' / ;
  IF LAST.DIST THEN DO;
     PUT @62 'DISTRICT TOTAL OF ' AN 3.
         ' INITIALLY CONSIDERED PROJECTS:'
         @115 A_COST DOLLAR14.  ;
     TA_COST+A_COST;
     TAN+AN;
     AN=0;
     A_COST=0;
     END;
  IF EOF THEN PUT @65 'STATE TOTAL OF ' TAN 3.
                  ' INITIALLY CONSIDERED PROJECTS:'
                  @115 TA_COST DOLLAR14.  ;
IF _N_=1 THEN SET WEIGHT ;
```

```
RETURN;

F: PUT @39 YEAR @49 ONOF '-STATE SYSTEM FEDERAL AID BRIDGE
REPLACEMENT'/
       @54 'AND REHABILITATION PROGRAM'/
       @52 'INITIALLY CONSIDERED PROJECTS'//
   @24 'SUFFICIENCY' @39 'CONDITION  RATINGS' @73 'BRIDGE'
   @85 'TEBS' @93 'DETOUR' @103 'DISTRICT' @121 'DISTRICT' /
   @16 'ADT' @26 'RATINGS' @41 'RDWY SUPR  SUB'
   @59 'COST/VEH' @70 'WIDTH  RATIO' @85 'SCORE   LENGTH    PRIORITY'
   @120 'ACCUM COST'/ @12 119*'=' /;
   RETURN;
   /* CMS FI FT14F001 DISK INICO MAP A; */
/*GOPTIONS DEVICE=TEK4105 GPROTOCOL=GSAS7171          ;  */
DATA FINAL3;SET FINAL;IF _N_=1 THEN DO; TOTC=CPIS1/1000000;RETAIN
TOTC;
DELETE;END; CPIS1=CPIS1/1000000;
KEEP DIST TOTC CPIS1;
CPIS1=ROUND(CPIS1,0.01);
DATA ANOT1;INPUT DIST X Y ; SET FINAL3   ;
LENGTH DIST2 $ 5 ;RETAIN Z 1; DIST1=DIST;
DIST2= (TRIM(LEFT('D')) || TRIM(LEFT(DIST1)));
LENGTH FUNCTION $ 8; LENGTH TEXT $ 27 ;LENGTH COLOR $ 6;
XSYS='2';YSYS='2';
TEXT=DIST2;FUNCTION='LABEL';POSITION='C';WHEN='A';OUTPUT;
POSITION='F';TEXT=PUT(CPIS1,DOLLAR6.2);FUNCTION='LABEL';
WHEN='A'; COLOR='BLUE';
OUTPUT;
CARDS;
   1   0.055     0.040
  2   0.026     0.027
  3   0.016     0.046
  4  -0.028     0.079497
  5  -0.035     0.043758
  6  -0.050    -0.002
  7  -0.018255 -0.010
  8  -0.009     0.025641
  9   0.036     0.006
  10   0.063     0.020
  11   0.078739  0.007
  12   0.061    -0.022
  13   0.042    -0.030
  14   0.024    -0.012
  15   0.005    -0.036882
  16   0.031    -0.047
  17   0.053    -0.004
  18   0.046     0.028
  19   0.075     0.035
  20   0.077    -0.016
  21   0.019    -0.074
  23   0.009     0.006806
  24  -0.063738 -0.018030
  25  -0.0094    0.050
DATA ANOT2; SET FINAL3; IF _N_=1;
```

```
X= 15   ;Y= 15  ; POSITION='3';XSYS='3';YSYS='3';
BUDG1=PUT(TOTC,DOLLAR8.2);
TEXT=(TRIM(LEFT('FOR INITIAL BUDGET= ')) || TRIM(LEFT(BUDG1)));
FUNCTION='LABEL';WHEN='A'; COLOR='BLACK';
OUTPUT;
DATA ANOT3; SET WEIGHT ;
DIA=PUT(DATE(),DATE7.);
TEXT=(TRIM(LEFT(ONOF)) || TRIM(LEFT('-SYSTEM')) || ('    ')
|| TRIM(LEFT(DIA)));
FUNCTION='LABEL';WHEN='A';COLOR='BLACK';POSITION='9';
X= 15   ;Y= 15  ;XSYS='3';YSYS='3';OUTPUT;
DATA ANOT2;SET ANOT2 ANOT3;
DATA ANOT1;SET ANOT1 ANOT2;
TITLE1 F=NONE 'BUDGET DISTRIBUTION FOR INITIAL LIST OF PROJECTS';
TITLE2 F=NONE C=BLUE '      (DOLLARS MILLIONS) ';
PATTERN1 C=WHITE V=ME;
  PROC GMAP MAP=TEBS.TEXAS DATA=ANOT1;
ID DIST;CHORO Z / NOLEGEND ANNOTATE=ANOT1 DISCRETE;RUN;

  /* CMS FI FT14F001 DISK INICO CHART A; */
/*GOPTIONS DEVICE=TEK4105 GPROTOCOL=GSAS7171; */
DATA ANOT2; SET FINAL3;IF _N_=1;
X= 15   ;Y=  5  ; POSITION='3';XSYS='3';YSYS='3';
BUDG1=PUT(TOTC,DOLLAR8.2);
TEXT=(TRIM(LEFT('FOR INITIAL BUDGET= ')) || TRIM(LEFT(BUDG1)));
FUNCTION='LABEL';WHEN='A'; COLOR='BLACK';
OUTPUT;
DATA ANOT3;SET WEIGHT ;
DIA=PUT(DATE(),DATE7.);
TEXT=(TRIM(LEFT(ONOF)) || TRIM(LEFT('-SYSTEM')) || ('    ')
|| TRIM(LEFT(DIA)));
FUNCTION='LABEL';WHEN='A';COLOR='BLACK';POSITION='9';
X= 15   ;Y=  5  ;XSYS='3';YSYS='3';OUTPUT;
DATA ANOT2;SET ANOT2 ANOT3;
  PROC GPLOT DATA=FINAL2;
LABEL DIST='DISTRICTS';
LABEL CPIP1='%';
TITLE1 F=NONE 'BUDGET DISTRIBUTION FOR INITIAL LIST OF PROJECTS';
TITLE2 F=NONE C=BLUE '   (BUDGET IN MILLIONS) ';
  FOOTNOTE1 J=R H=1 F=NONE C=BLACK 'LEGEND:';
  FOOTNOTE2 J=R H=1 F=NONE C=BLUE 'PERCENT OF BUDGET';
  FOOTNOTE3 J=R H=1 F=NONE C=GREEN '               ';
  FOOTNOTE4 J=R H=1 F=NONE C=BLUE '               ';
  SYMBOL1 W=1 C=BLUE V=PLUS I=JOIN H=0.3 CM;
AXIS1 MINOR=NONE
ORDER=1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,23,24,25;
PLOT (CPIP1)*DIST / OVERLAY ANNOTATE= ANOT2
HAXIS=AXIS1;
RUN;

  /* CREATE PERMANENT DATA SET OF THE INITIALLY CONSIDERED PROJECTS
*/

  %CHOOS;
```

SOURCE CODE FOR THE DISTRICT LEVEL REPORTING PROGRAM

```
/*******************************************************************
THIS IS THE DISTRICT REPORTING PROGRAM, IT ALLOWS THE USER TO
  PERFORM SEVERAL MENU OPTIONS:
1) PRINT THE LIST OF PROJECTS GENERATED BY THE PROGRAM INICO

2) SCORE ALL THE ELIGIBLE PROJECTS OF THE DISTRICT

3) ADD COMMNENTS TO THE PROJECTS

4) FORWARD THE LIST OF PROJECTS SELECTED BY THE DISTRICT TO THE STATE
LEVEL OF
      THE SYSTEM.
THE INPUT IS MADE VIA A BATCH FILE NAMED MENU.INP
IT NEEDS SAS DATA SETS GENERATED BY THE PROGRAMS INICO AND FREQ
FOR MORE DETAILS SEE REPORT 439-4 CTR

                      WRITTEN BY : JOSE WEISSMANN
                      ON: MAY 89
      FOR MORE DETAILS REFER TO RESEARCH REPORT 439-4 CTR
CENTER FOR TRANSPORTATION RESEARCH UNIVERSITY OF TEXAS AT AUSTIN 1989

*******************************************************************/

CMS FI INP DISK MENU INP A ;
CMS FI LIST1 DISK DISTR1 LISTING A (LRECL 133 RECFM V ;
CMS FI LIST2 DISK DISTR2 LISTING A (LRECL 133 RECFM V ;
%GLOBAL MEN DISTR SYST ;OPTIONS MISSING='M' PAGESIZE=59 REPLACE;
DATA MENU ;
     INFILE INP ;
     LENGTH SYS $ 3 CHOIC $ 5;INPUT DIST $ SYS $  CHOIC $ ;
OUTPUT MENU;STOP; RETURN;
DATA MENU;SET MENU;   CALL SYMPUT('MEN',CHOIC);
     CALL SYMPUT('DISTR',DIST);    CALL SYMPUT('SYST',SYS);   RETURN;

   /* MACRO TO CHOOSE THE CORRECT DATA SET FOR THE DISTRICT,ALREADY
      STORED BY THE PROGRAM FREQ  */

     %MACRO DISYS;
    %IF &DISTR=1 %THEN %DO;%IF &SYST=OFF %THEN TEBS.DISTOF1;
                 %IF &SYST=ON %THEN TEBS.DISTON1;%END;
    %IF &DISTR=2 %THEN %DO;%IF &SYST=OFF %THEN TEBS.DISTOF2;
                 %IF &SYST=ON %THEN TEBS.DISTON2;%END;
    %IF &DISTR=3 %THEN %DO;%IF &SYST=OFF %THEN TEBS.DISTOF3;
                 %IF &SYST=ON %THEN TEBS.DISTON3;%END;
    %IF &DISTR=4 %THEN %DO;%IF &SYST=OFF %THEN TEBS.DISTOF4;
                 %IF &SYST=ON %THEN TEBS.DISTON4;%END;
    %IF &DISTR=5 %THEN %DO;%IF &SYST=OFF %THEN TEBS.DISTOF5;
                 %IF &SYST=ON %THEN TEBS.DISTON5;%END;
    %IF &DISTR=6 %THEN %DO;%IF &SYST=OFF %THEN TEBS.DISTOF6;
                 %IF &SYST=ON %THEN TEBS.DISTON6;%END;
    %IF &DISTR=7 %THEN %DO;%IF &SYST=OFF %THEN TEBS.DISTOF7;
                 %IF &SYST=ON %THEN TEBS.DISTON7;%END;
    %IF &DISTR=8 %THEN %DO;%IF &SYST=OFF %THEN TEBS.DISTOF8;
                 %IF &SYST=ON %THEN TEBS.DISTON8;%END;
```

```
%IF &DISTR=9 %THEN %DO;%IF &SYST=OFF %THEN TEBS.DISTOF9;
              %IF &SYST=ON %THEN TEBS.DISTON9;%END;
%IF &DISTR=10 %THEN %DO;%IF &SYST=OFF %THEN TEBS.DISTOF10;
              %IF &SYST=ON %THEN TEBS.DISTON10;%END;
%IF &DISTR=11 %THEN %DO;%IF &SYST=OFF %THEN TEBS.DISTOF11;
              %IF &SYST=ON %THEN TEBS.DISTON11;%END;
%IF &DISTR=12 %THEN %DO;%IF &SYST=OFF %THEN TEBS.DISTOF12;
              %IF &SYST=ON %THEN TEBS.DISTON12;%END;
%IF &DISTR=13 %THEN %DO;%IF &SYST=OFF %THEN TEBS.DISTOF13;
              %IF &SYST=ON %THEN TEBS.DISTON13;%END;
%IF &DISTR=14 %THEN %DO;%IF &SYST=OFF %THEN TEBS.DISTOF14;
              %IF &SYST=ON %THEN TEBS.DISTON14;%END;
%IF &DISTR=15 %THEN %DO;%IF &SYST=OFF %THEN TEBS.DISTOF15;
              %IF &SYST=ON %THEN TEBS.DISTON15;%END;
%IF &DISTR=16 %THEN %DO;%IF &SYST=OFF %THEN TEBS.DISTOF16;
              %IF &SYST=ON %THEN TEBS.DISTON16;%END;
%IF &DISTR=17 %THEN %DO;%IF &SYST=OFF %THEN TEBS.DISTOF17;
              %IF &SYST=ON %THEN TEBS.DISTON17;%END;
%IF &DISTR=18 %THEN %DO;%IF &SYST=OFF %THEN TEBS.DISTOF18;
              %IF &SYST=ON %THEN TEBS.DISTON18;%END;
%IF &DISTR=19 %THEN %DO;%IF &SYST=OFF %THEN TEBS.DISTOF19;
              %IF &SYST=ON %THEN TEBS.DISTON19;%END;
%IF &DISTR=20 %THEN %DO;%IF &SYST=OFF %THEN TEBS.DISTOF20;
              %IF &SYST=ON %THEN TEBS.DISTON20;%END;
%IF &DISTR=21 %THEN %DO;%IF &SYST=OFF %THEN TEBS.DISTOF21;
              %IF &SYST=ON %THEN TEBS.DISTON21;%END;
%IF &DISTR=23 %THEN %DO;%IF &SYST=OFF %THEN TEBS.DISTOF23;
              %IF &SYST=ON %THEN TEBS.DISTON23;%END;
%IF &DISTR=24 %THEN %DO;%IF &SYST=OFF %THEN TEBS.DISTOF24;
              %IF &SYST=ON %THEN TEBS.DISTON24;%END;
%IF &DISTR=25 %THEN %DO;%IF &SYST=OFF %THEN TEBS.DISTOF25;
              %IF &SYST=ON %THEN TEBS.DISTON25;%END;

  %MEND DISYS;

/*MACRO TO STORE THE FINAL LIST OF SELECTED PROJECTS TO BE
FORWARDED
   TO THE STATE LEVEL OF THE SYSTEM */

 %MACRO FINLIST;
%IF &DISTR=1 %THEN %DO;%IF &SYST=OFF %THEN TEBS.FINOF1;
              %IF &SYST=ON %THEN TEBS.FINON1;%END;
%IF &DISTR=2 %THEN %DO;%IF &SYST=OFF %THEN TEBS.FINOF2;
              %IF &SYST=ON %THEN TEBS.FINON2;%END;
%IF &DISTR=3 %THEN %DO;%IF &SYST=OFF %THEN TEBS.FINOF3;
              %IF &SYST=ON %THEN TEBS.FINON3;%END;
%IF &DISTR=4 %THEN %DO;%IF &SYST=OFF %THEN TEBS.FINOF4;
              %IF &SYST=ON %THEN TEBS.FINON4;%END;
%IF &DISTR=5 %THEN %DO;%IF &SYST=OFF %THEN TEBS.FINOF5;
              %IF &SYST=ON %THEN TEBS.FINON5;%END;
%IF &DISTR=6 %THEN %DO;%IF &SYST=OFF %THEN TEBS.FINOF6;
              %IF &SYST=ON %THEN TEBS.FINON6;%END;
%IF &DISTR=7 %THEN %DO;%IF &SYST=OFF %THEN TEBS.FINOF7;
              %IF &SYST=ON %THEN TEBS.FINON7;%END;
```

```
    %IF &DISTR=8 %THEN %DO;%IF &SYST=OFF %THEN TEBS.FINOF8;
                  %IF &SYST=ON %THEN TEBS.FINON8;%END;
    %IF &DISTR=9 %THEN %DO;%IF &SYST=OFF %THEN TEBS.FINOF9;
                  %IF &SYST=ON %THEN TEBS.FINON9;%END;
    %IF &DISTR=10 %THEN %DO;%IF &SYST=OFF %THEN TEBS.FINOF10;
                  %IF &SYST=ON %THEN TEBS.FINON10;%END;
    %IF &DISTR=11 %THEN %DO;%IF &SYST=OFF %THEN TEBS.FINOF11;
                  %IF &SYST=ON %THEN TEBS.FINON11;%END;
    %IF &DISTR=12 %THEN %DO;%IF &SYST=OFF %THEN TEBS.FINOF12;
                  %IF &SYST=ON %THEN TEBS.FINON12;%END;
    %IF &DISTR=13 %THEN %DO;%IF &SYST=OFF %THEN TEBS.FINOF13;
                  %IF &SYST=ON %THEN TEBS.FINON13;%END;
    %IF &DISTR=14 %THEN %DO;%IF &SYST=OFF %THEN TEBS.FINOF14;
                  %IF &SYST=ON %THEN TEBS.FINON14;%END;
    %IF &DISTR=15 %THEN %DO;%IF &SYST=OFF %THEN TEBS.FINOF15;
                  %IF &SYST=ON %THEN TEBS.FINON15;%END;
    %IF &DISTR=16 %THEN %DO;%IF &SYST=OFF %THEN TEBS.FINOF16;
                  %IF &SYST=ON %THEN TEBS.FINON16;%END;
    %IF &DISTR=17 %THEN %DO;%IF &SYST=OFF %THEN TEBS.FINOF17;
                  %IF &SYST=ON %THEN TEBS.FINON17;%END;
    %IF &DISTR=18 %THEN %DO;%IF &SYST=OFF %THEN TEBS.FINOF18;
                  %IF &SYST=ON %THEN TEBS.FINON18;%END;
    %IF &DISTR=19 %THEN %DO;%IF &SYST=OFF %THEN TEBS.FINOF19;
                  %IF &SYST=ON %THEN TEBS.FINON19;%END;
    %IF &DISTR=20 %THEN %DO;%IF &SYST=OFF %THEN TEBS.FINOF20;
                  %IF &SYST=ON %THEN TEBS.FINON20;%END;
    %IF &DISTR=21 %THEN %DO;%IF &SYST=OFF %THEN TEBS.FINOF21;
                  %IF &SYST=ON %THEN TEBS.FINON21;%END;
    %IF &DISTR=23 %THEN %DO;%IF &SYST=OFF %THEN TEBS.FINOF23;
                  %IF &SYST=ON %THEN TEBS.FINON23;%END;
    %IF &DISTR=24 %THEN %DO;%IF &SYST=OFF %THEN TEBS.FINOF24;
                  %IF &SYST=ON %THEN TEBS.FINON24;%END;
    %IF &DISTR=25 %THEN %DO;%IF &SYST=OFF %THEN TEBS.FINOF25;
                  %IF &SYST=ON %THEN TEBS.FINON25;%END;
    %MEND FINLIST;

DATA _NULL_; SET MENU;RETURN;

  /*MACRO TO SELECT THE CORRECT INITIALLY CONSIDERED LIST */

     %MACRO INICO;
    %IF &DISTR=1 %THEN %DO;%IF &SYST=OFF %THEN SET TEBS.INIOF1;
                  %IF &SYST=ON %THEN SET TEBS.INION1;%END;
    %IF &DISTR=2 %THEN %DO;%IF &SYST=OFF %THEN SET TEBS.INIOF2;
                  %IF &SYST=ON %THEN SET TEBS.INION2;%END;
    %IF &DISTR=3 %THEN %DO;%IF &SYST=OFF %THEN SET TEBS.INIOF3;
                  %IF &SYST=ON %THEN SET TEBS.INION3;%END;
    %IF &DISTR=4 %THEN %DO;%IF &SYST=OFF %THEN SET TEBS.INIOF4;
                  %IF &SYST=ON %THEN SET TEBS.INION4;%END;
    %IF &DISTR=5 %THEN %DO;%IF &SYST=OFF %THEN SET TEBS.INIOF5;
                  %IF &SYST=ON %THEN SET TEBS.INION5;%END;
    %IF &DISTR=6 %THEN %DO;%IF &SYST=OFF %THEN SET TEBS.INIOF6;
                  %IF &SYST=ON %THEN SET TEBS.INION6;%END;
    %IF &DISTR=7 %THEN %DO;%IF &SYST=OFF %THEN SET TEBS.INIOF7;
```

```
                %IF &SYST=ON %THEN SET TEBS.INION7;%END;
    %IF &DISTR=8 %THEN %DO;%IF &SYST=OFF %THEN SET TEBS.INIOF8;
                %IF &SYST=ON %THEN SET TEBS.INION8;%END;
    %IF &DISTR=9 %THEN %DO;%IF &SYST=OFF %THEN SET TEBS.INIOF9;
                %IF &SYST=ON %THEN SET TEBS.INION9;%END;
    %IF &DISTR=10 %THEN %DO;%IF &SYST=OFF %THEN SET TEBS.INIOF10;
                %IF &SYST=ON %THEN SET TEBS.INION10;%END;
    %IF &DISTR=11 %THEN %DO;%IF &SYST=OFF %THEN SET TEBS.INIOF11;
                %IF &SYST=ON %THEN SET TEBS.INION11;%END;
    %IF &DISTR=12 %THEN %DO;%IF &SYST=OFF %THEN SET TEBS.INIOF12;
                %IF &SYST=ON %THEN SET TEBS.INION12;%END;
    %IF &DISTR=13 %THEN %DO;%IF &SYST=OFF %THEN SET TEBS.INIOF13;
                %IF &SYST=ON %THEN SET TEBS.INION13;%END;
    %IF &DISTR=14 %THEN %DO;%IF &SYST=OFF %THEN SET TEBS.INIOF14;
                %IF &SYST=ON %THEN SET TEBS.INION14;%END;
    %IF &DISTR=15 %THEN %DO;%IF &SYST=OFF %THEN SET TEBS.INIOF15;
                %IF &SYST=ON %THEN SET TEBS.INION15;%END;
    %IF &DISTR=16 %THEN %DO;%IF &SYST=OFF %THEN SET TEBS.INIOF16;
                %IF &SYST=ON %THEN SET TEBS.INION16;%END;
    %IF &DISTR=17 %THEN %DO;%IF &SYST=OFF %THEN SET TEBS.INIOF17;
                %IF &SYST=ON %THEN SET TEBS.INION17;%END;
    %IF &DISTR=18 %THEN %DO;%IF &SYST=OFF %THEN SET TEBS.INIOF18;
                %IF &SYST=ON %THEN SET TEBS.INION18;%END;
    %IF &DISTR=19 %THEN %DO;%IF &SYST=OFF %THEN SET TEBS.INIOF19;
                %IF &SYST=ON %THEN SET TEBS.INION19;%END;
    %IF &DISTR=20 %THEN %DO;%IF &SYST=OFF %THEN SET TEBS.INIOF20;
                %IF &SYST=ON %THEN SET TEBS.INION20;%END;
    %IF &DISTR=21 %THEN %DO;%IF &SYST=OFF %THEN SET TEBS.INIOF21;
                %IF &SYST=ON %THEN SET TEBS.INION21;%END;
    %IF &DISTR=23 %THEN %DO;%IF &SYST=OFF %THEN SET TEBS.INIOF23;
                %IF &SYST=ON %THEN SET TEBS.INION23;%END;
    %IF &DISTR=24 %THEN %DO;%IF &SYST=OFF %THEN SET TEBS.INIOF24;
                %IF &SYST=ON %THEN SET TEBS.INION24;%END;
    %IF &DISTR=25 %THEN %DO;%IF &SYST=OFF %THEN SET TEBS.INIOF25;
                %IF &SYST=ON %THEN SET TEBS.INION25;%END;

     %MEND INICO;

DATA _NULL_; SET MENU;RETURN;

  /*MACRO TO FORMAT THE COUNTY NAMES */

     %MACRO FORM;

PROC FORMAT;

  VALUE $WTPIC 'RP'='REPLACE BRIDGE & APPROACHES'
               'RH'='REHABILITATE BRIDGE & APPROACHES';

  VALUE $CNTY '001'='ANDERSON' '002'='ANDREWS' '003'='ANGELINA'
              '004'='ARANSAS' '005'='ARCHER' '006'='ARMSTRONG'
              '007'='ATASCOSA' '008'='AUSTIN' '009'='BAILEY'
              '010'='BANDERA' '011'='BASTROP' '012'='BAYLOR'
'013'='BEE'
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                '014'='BELL' '015'='BEXAR' '016'='BLANCO'
'017'='BORDEN'
                '018'='BOSQUE' '019'='BOWIE' '020'='BRAZORIA'
                '021'='BRAZOS' '022'='BREWSTER' '023'='BRISCOE'
                '024'='BROOKS' '025'='BROWN' '026'='BURLESON'
                '027'='BURNET' '028'='CALDWELL' '029'='CALHOUN'
                '030'='CALLAHAN' '031'='CAMERON' '032'='CAMP'
                '033'='CARSON' '034'='CASS' '035'='CASTRO'
'036'='CHAMBERS'
                '037'='CHEROKEE' '038'='CHILDRESS' '039'='CLAY'
                '040'='COCHRAN' '041'='COKE' '042'='COLEMAN'
'043'='COLLIN'
                '044'='COLLINGSWORTH' '045'='COLORADO' '046'='COMAL'
                '047'='COMANCHE' '048'='CONCHO' '049'='COOKE'
                '050'='CORYELL' '051'='COTTLE' '052'='CRANE'
                '053'='CROCKETT' '054'='CROSBY' '055'='CULBERSON'
                '056'='DALLAM' '057'='DALLAS' '058'='DAWSON'
                '059'='DEAF SMITH' '060'='DELTA' '061'='DENTON'
                '062'='DEWITT' '063'='DICKENS' '064'='DIMMIT'
                '065'='DONLEY' '066'='KENEDY' '067'='DUVAL'
                '068'='EASTLAND' '069'='ECTOR' '070'='EDWARDS'
                '071'='ELLIS' '072'='EL PASO' '073'='ERATH'
'074'='FALLS'
                '075'='FANNIN' '076'='FAYETTE' '077'='FISHER'
'078'='FLOYD'
                '079'='FOARD' '080'='FORT BEND' '081'='FRANKLIN'
                '082'='FREESTONE' '083'='FRIO' '084'='GAINES'
                '085'='GALVESTON' '086'='GARZA' '087'='GILLESPIE'
                '088'='GLASSCOCK' '089'='GOLIAD' '090'='GONZALES'
                '091'='GRAY' '092'='GRAYSON' '093'='GREGG'
'094'='GRIMES'
                '095'='GUADALUPE' '096'='HALE' '097'='HALL'
                '098'='HAMILTON' '099'='HANSFORD' '100'='HARDEMAN'
                '101'='HARDIN' '102'='HARRIS' '103'='HARRISON'
                '104'='HARTLEY' '105'='HASKELL' '106'='HAYS'
                '107'='HEMPHILL' '108'='HENDERSON' '109'='HIDALGO'
                '110'='HILL' '111'='HOCKLEY' '112'='HOOD'
                '113'='HOPKINS' '114'='HOUSTON' '115'='HOWARD'
                '116'='HUDSPETH' '117'='HUNT' '118'='HUTCHINSON'
                '119'='IRION' '120'='JACK' '121'='JACKSON'
'122'='JASPER'
                '123'='JEFF DAVIS' '124'='JEFFERSON' '125'='JIM HOGG'
                '126'='JIM WELLS' '127'='JOHNSON' '128'='JONES'
                '129'='KARNES' '130'='KAUFMAN' '131'='KENDALL'
'132'='KENT'
                '133'='KERR' '134'='KIMBLE' '135'='KING' '136'='KINNEY'
                '137'='KLEBERG' '138'='KNOX' '139'='LAMAR' '140'='LAMB'
                '141'='LAMPASAS' '142'='LA SALLE' '143'='LAVACA'
                '144'='LEE' '145'='LEON' '146'='LIBERTY'
'147'='LIMESTONE'
                '148'='LIPSCOMB' '149'='LIVE OAK' '150'='LLANO'
                '151'='LOVING' '152'='LUBBOCK' '153'='LYNN'
'154'='MADISON'
                '155'='MARION' '156'='MARTIN' '157'='MASON'
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               '158'='MATAGORDA' '159'='MAVERICK' '160'='MCCULLOCH'
               '161'='MCLENNAN' '162'='MCMULLEN' '163'='MEDINA'
               '164'='MENARD' '165'='MIDLAND' '166'='MILAM'
'167'='MILLS'
               '168'='MITCHELL' '169'='MONTAGUE' '170'='MONTGOMERY'
               '171'='MOORE' '172'='MORRIS' '173'='MOTLEY'
               '174'='NACOGDOCHES' '175'='NAVARRO' '176'='NEWTON'
               '177'='NOLAN' '178'='NUECES' '179'='OCHILTREE'
               '180'='OLDHAM' '181'='ORANGE' '182'='PALO PINTO'
               '183'='PANOLA' '184'='PARKER' '185'='PARMER'
'186'='PECOS'
               '187'='POLK' '188'='POTTER' '189'='PRESIDIO'
'190'='RAINS'
               '191'='RANDALL' '192'='REAGAN' '193'='REAL'
               '194'='RED RIVER' '195'='REEVES' '196'='REFUGIO'
               '197'='ROBERTS' '198'='ROBERTSON' '199'='ROCKWALL'
               '200'='RUNNELS' '201'='RUSK' '202'='SABINE'
               '203'='SAN AUGUSTINE' '204'='SAN JACINTO'
               '205'='SAN PATRICIO' '206'='SAN SABA'
'207'='SCHLEICHER'
               '208'='SCURRY' '209'='SHACKELFORD' '210'='SHELBY'
               '211'='SHERMAN' '212'='SMITH' '213'='SOMERVELL'
               '214'='STARR' '215'='STEPHENS' '216'='STERLING'
               '217'='STONEWALL' '218'='SUTTON' '219'='SWISHER'
               '220'='TARRANT' '221'='TAYLOR' '222'='TERRELL'
               '223'='TERRY' '224'='THROCKMORTON' '225'='TITUS'
               '226'='TOM GREEN' '227'='TRAVIS' '228'='TRINITY'
               '229'='TYLER' '230'='UPSHUR' '231'='UPTON'
'232'='UVALDE'
               '233'='VAL VERDE' '234'='VAN ZANDT' '235'='VICTORIA'
               '236'='WALKER' '237'='WALLER' '238'='WARD'
               '239'='WASHINGTON' '240'='WEBB' '241'='WHARTON'
               '242'='WHEELER' '243'='WICHITA' '244'='WILBARGER'
               '245'='WILLACY' '246'='WILLIAMSON' '247'='WILSON'
               '248'='WINKLER' '249'='WISE' '250'='WOOD'
'251'='YOAKUM'
               '252'='YOUNG' '253'='ZAPATA' '254'='ZAVALA';
               %MEND FORM;

   /* MACRO TO SELECT FROM OPTIONS IN A MAIN MENU */

 %MACRO MENU;

    /* PRINTING THE INITIALLY CONSIDERED LIST FOR THE DISTRICT */

     %IF &MEN=INICO %THEN %DO;

 DATA INIC; %INICO;RETURN;
            PROC SORT DATA=INIC;BY BRID;
 DATA REPDATA;SET %DISYS;RETURN;
            PROC SORT DATA=REPDATA;BY BRID;
 DATA REPDATA;MERGE REPDATA INIC;BY BRID;IF INIC='INI';DROP INIC ;
            PROC SORT DATA=REPDATA; BY DESCENDING SCORE1;
            %FORM;
```

```
DATA MENU2;SET MENU;DROP DIST;RETURN;
DATA _NULL_;
  SET REPDATA END=FIM; IF _N_=1 THEN SET MENU2;
  NPS+1;
  FILE LIST1 PRINT HEADER=C;
  IF NPS=6  THEN DO; PUT _PAGE_@; NPS=0; END;
  DN+1;
  DCOST+CPI;
  PUT @5 DIST @25 COUNTY $CNTY. @41 RNUM @54 CSS $12.
      @75 WT $WTPIC.
      @113 CPI DOLLAR14.  / /
      @5 'BRIDGE LOCATION: 'FX $20./ /
      @5 'EXISTING FACILITY: 'LOS ' LANE, ' ROWI 'FT ROADWAY'
      @55 ' PROPOSED FACILITY: ' PNL ' LANE, ' PRW 'FT ROADWAY' /
      @5 126*'=';
  IF FIM=1 THEN DO;
   PUT @60 'DISTRICT TOTAL OF ' DN 3. ' INITIALLY CONSIDERED
PROJECTS:'
       @113  DCOST DOLLAR14.  ;
   END;
  RETURN;

C: PUT @36 'DISTRICT-' DIST
       @49 SYS '-STATE SYSTEM FEDERAL AID BRIDGE REPLACEMENT'/
       @54 'AND REHABILITATION PROGRAM'/
       @52 'INITIALLY CONSIDERED PROJECTS'//
       @5 'DISTRICT' @25 'COUNTY' @40 'HWY NO'
       @53 'CONT-SECT-STR' @75 'TYPE OF WORK' @116 'ESTIMATED COST' /
       @5 126*'=' ;
 RETURN;

DATA _NULL_;
  SET REPDATA END=FIM; IF _N_=1 THEN SET MENU2;
  S='S';
  NPS+1;
  FILE LIST2 PRINT HEADER=F;
  IF NPS=6  THEN DO; PUT _PAGE_@; NPS=0; END;
  IF (S='S') THEN DO; A_COST+CPI; AN+1; END;
  PUT @13 W_ADT COMMA7. @27 SR 3. @43 DECO 1.
      @48 SSCO 1. @53 SUBCO 1.
      @57 CPV DOLLAR8. @73 BWR 5.3
      @85 SCORE1 3.  @95 W_BDL 2.
      @115 A_COST DOLLAR14. / @2 CSS /* CSSPIC.*/ $12. / @13
'COMMENTS: '
      / /
      @12 119*'=' / ;
  IF FIM=1 THEN DO;
     PUT @62 'DISTRICT TOTAL OF ' AN 3.
         ' INITIALLY CONSIDERED PROJECTS:'
         @115 A_COST DOLLAR14.  ;
     END;
RETURN;

F: PUT @36 'DISTRICT-' DIST
```

```
        @49 SYS '-STATE SYSTEM FEDERAL AID BRIDGE REPLACEMENT'/
        @54 'AND REHABILITATION PROGRAM'/
        @52 'INITIALLY CONSIDERED PROJECTS'//
    @24 'SUFFICIENCY' @39 'CONDITION  RATINGS' @73 'BRIDGE'
    @85 'TEBS' @93 'DETOUR' @103 'DISTRICT' @121 'DISTRICT' /
    @16 'ADT' @26 'RATINGS' @41 'RDWY SUPR  SUB'
    @59 'COST/VEH' @70 'WIDTH  RATIO' @85 'SCORE   LENGTH    PRIORITY'
    @120 'ACCUM COST'/ @12 119*'=' /;
    RETURN;   %END;

    /* ADDING COMMENTS TO THE PROJECT LIST */

      %IF &MEN=ADDCO %THEN %DO;
DATA LIST;
      INFILE INP FIRSTOBS=2 ;
      LENGTH BRID $ 16 COMM1 $ 64 COMM2 $ 80;
      INPUT BRID $  COMM1 & $64.;
      INPUT COMM2 & $80.;
                   RETURN;
      PROC SORT DATA= %DISYS; BY BRID;
   PROC SORT DATA=LIST;BY BRID;
DATA %DISYS;MERGE %DISYS LIST; BY BRID;
    DATA TEMP;SET %DISYS;IF COMM1=' ' THEN DELETE;KEEP BRID COMM1
COMM2;
TITLE
'THIS LIST INCLUDES ALL PROJECTS WITH COMMENTS UP TO THIS LAST RUN.';
       PROC PRINT DATA=TEMP LABEL;
            LABEL COMM1= 'FIRST LINE OF COMMENTS'
                  COMM2= 'SECOND LINE OF COMMENTS'  ;
%END;

      /* SCORING THE ELIGIBLE PROJECTS IN THE DISTRICT  */

      %IF &MEN=SCORE %THEN %DO;

DATA WEIGHT;
      INFILE INP ;IF _N_=1 THEN DO; INPUT;  DELETE;  END;
      LENGTH ANSW $ 3;
      INPUT WCPV WADT WSR WDSS WBWR ANSW $
      AQCPV AQADT AQSR AQDSS AQBWR;OUTPUT;STOP;RETURN;

     /* READING THE DISTRICT'S SELECTION OF AUTO Q. PROJECTS */

DATA SELEC;
      INFILE INP;IF _N_=1 THEN DO; INPUT;  DELETE;  END;
                 IF _N_=2 THEN DO; INPUT;  DELETE;  END;
      LENGTH BRID $ 16;
      INPUT BRID $ ;
      SEL= 'DS';FLAG=69;RETURN;
      PROC SORT DATA=SELEC;BY BRID;

DATA REPDATA;
    IF _N_=1 THEN SET WEIGHT;
   LENGTH AQ $ 2;
```

```
  SET %DISYS;
  IF ANSW = 'NO' THEN  DO;AQ=' '; GO TO OK ; END;
  IF AQCPV NE . THEN DO;IF CPV<=AQCPV THEN AQ='AQ';END;
  IF AQADT NE . THEN DO;IF W_ADT>=AQADT THEN AQ='AQ';END;
  IF AQSR  NE . THEN DO;IF SR <=AQSR THEN AQ='AQ';END;
  IF AQDSS NE . THEN DO;IF DSS<=AQDSS THEN AQ='AQ';END;
  IF AQBWR NE . THEN DO;IF BWR<=AQBWR THEN AQ='AQ';END;
OK:SCORE1=0.0;
  SCORE1= SCORE1 + WCPV*CPVPTL
                 + WADT*ADTPTL
                 + WSR *SRPTL
                 + WDSS*DSSPTL
                 + WBWR*BWRPTL;

  /* MERGING THE DISTRICT'S OWN AUTO QUALIF PROJECTS 'DS' */

PROC SORT DATA=REPDATA;BY BRID;
DATA REPDATA; MERGE REPDATA SELEC;BY BRID;
IF FLAG=69 THEN AQ=SEL;DROP SEL FLAG;RETURN;

PROC SORT DATA=REPDATA ;
    BY DESCENDING AQ DESCENDING SCORE1;
               %FORM;
  DATA _NULL_;FILE PRINT HEADER=A;
              IF _N_=1 THEN SET MENU;
              SET WEIGHT;
  PUT @44 44*'-' /
      @44 '|' @65 'WEIGHTS' @87 '|' /
      @44 44*'-' /  @44 '|'
      @45 '      ' @52 '|' @54 'CPV' @59 '|' @61 'ADT' @66 '|' @68
'SR'
      @73 '|' @75 'DSS' @80 '|' @82 'BWR' @87 '|' /
      @44 44*'-' /
      @44 '|' @47 ' ' @52 '|' @54 WCPV @59 '|' @61 WADT @66 '|'
      @68 WSR @73 '|' @75 WDSS @80 '|' @82 WBWR @87 '|' /
      @44 44*'-' /
      @44 '|' @51 'CPV = COST PER VEHICLE' @87 '|' /
      @44 44*'-' /
      @44 '|' @51 'ADT = AVERAGE DAILY TRAFFIC' @87 '|' /
      @44 44*'-' /
      @44 '|' @51 'SR = SUFFICIENCY RATING' @87 '|' /
      @44 44*'-' /
      @44 '|' @51 'DSS = MINIMUM OF CONDITION RATINGS' @87 '|' /
      @44 44*'-' /
      @44 '|' @51 'BWR = BRIDGE WIDTH RATIO' @87 '|' /
      @44 44*'-' / /  ;
      IF ANSW='YES' THEN DO ;
  PUT @49 'AUTO QUALIFYING FEATURES USED :' / /
      @44 44*'-' /
      @44 '|' @46 'CPV' @52 '|' @56 AQCPV @87 '|' /
      @44 44*'-' /
      @44 '|' @46 'ADT' @52 '|' @56 AQADT @87 '|' /
      @44 44*'-' /
      @44 '|' @46 'SR' @52 '|' @56 AQSR @87 '|' /
```

```
      @44 44*'-' /
      @44 '|' @46 'DSS' @52 '|' @56 AQDSS @87 '|' /
      @44 44*'-' /
      @44 '|' @46 'BWR' @52 '|' @56 AQBWR @87 '|' /
      @44 44*'-' / /
      @49 'M = MISSING' ;
      END;    RETURN;

A:  PUT @39 'LIST OF ELIGIBLE PROJECTS FOR DISTRICT-' DIST /
        @36 'BY DESCENDING AUTO-QUALIFYING AND DESCENDING SCORE'//
        @42 'WEIGHTS AND AUTO-QUALIFYING FEATURES USED:'  ;
 DATA _NULL_  ;
    SET REPDATA END=EOF;
    BY DESCENDING AQ DESCENDING SCORE1;
    SCORE1=ROUND(SCORE1);BWR =ROUND(BWR,.01);
    DCOST+CPI;
    FILE PRINT HEADER=B;
    PUT @2 130*'*' @19 '||' @36 '||' @48 '||' @59 '||' @65 '||'
    @72 '||' @80 '||' @87 '||' @97 '||' @115 '||' ;
    PUT @19 '||' @36 '||' @48 '||' @59 '||' @65 '||'
    @72 '||' @80 '||' @87 '||' @97 '||' @115 '||'  ;
    PUT @3 BRID @19 '||' @36 '||' @39 CPV DOLLAR8. @48 '||'
    @51 W_ADT COMMA7. @59 '||'
    @62 SR @65 '||' @69 DSS @72 '||'
    @75 BWR @80 '||' @87 '||' @92 AQ @97 '||' @115 '||' ;
    PUT @19 '||' @22 COUNTY $CNTY. @36 '||==========='
    @48 '||=========' @59 '||===='
    @65 '||=====' @72 '||======' @80 '||' @83 SCORE1 @87 '||========'
    @97 '||' @100 CPI DOLLAR14. @115 '||' @118 DCOST DOLLAR14.;
    PUT @2 FX $17. @19 '||' @36 '||' @42 CPVPTL
    @48 '||' @55 ADTPTL @59 '||'
    @62 SRPTL @65 '||' @68 DSSPTL @72 '||'
    @76 BWRPTL @80 '||' @87 '||' @92 WT @97 '||' @115 '||';
    PUT @19 '||' @36 '||' @48 '||' @59 '||' @65 '||'
    @72 '||' @80 '||' @87 '||' @97 '||' @115 '||'  ;
    PUT @19 113*'=' @19 '||' @115 '||' ;
    PUT @19 '||' @21 'EXISTING FACILITY: 'LOS ' LANE, ' ROWI 'FT
ROADWAY'
        @63 ' PROPOSED FACILITY: ' PNL ' LANE, ' PRW 'FT ROADWAY'
        @115 '||' ;
RETURN;
B:  PUT @39 'LIST OF ELIGIBLE PROJECTS FOR DISTRICT-' DIST /
        @36 'BY DESCENDING AUTO-QUALIFYING AND DESCENDING SCORE'//
        @2 130*'=' @19 '||' @36 '||' @48 '||' @59 '||' @65 '||'
    @72 '||' @80 '||' @87 '||' @97 '||' @115 '||' ;
    PUT @19 '||' @36 '||' @48 '||' @59 '||' @65 '||'
    @72 '||' @80 '||' @87 '||' @90 'AUTO-Q.' @97 '||' @115 '||'  ;
    PUT @5 'BRIDGE ID.' @19 '||' @36 '||' @41 'CPV' @48 '||'
    @53 'ADT' @59 '||'
    @62 'SR' @65 '||' @69 'DSS' @72 '||'
    @75 'BWR' @80 '||' @87 '||' @91 'FLAG' @97 '||' @115 '||' ;
    PUT @19 '||' @26 'COUNTY' @36 '||=========='
    @48 '||=========' @59 '||===='
    @65 '||=====' @72 '||======' @80 '||' @82 'SCORE' @87
```

```
'||═══════'
    @97 '||' @100 'PROJECT COST' @115 '||'
    @118 'CUMUL. COST' ;
    PUT @3 'STRUCTURE LOC.' @19 '||' @36 '||' @41 'CPV%' @48 '||'
    @53 'ADT%' @59 '||'
    @62 'SR%' @65 '||' @68 'DSS%' @72 '||'
    @75 'BWR%' @80 '||' @87 '||' @89 'REHAB=RH' @97 '||' @115 '||';
    PUT @19 '||' @36 '||' @48 '||' @59 '||' @65 '||'
    @72 '||' @80 '||' @87 '||' @89 'REPL.=RP' @97 '||' @115 '||'  ;
    PUT @2 130*'=' @19 '||' @36 '||' @48 '||' @59 '||' @65 '||'
    @72 '||' @80 '||' @87 '||' @97 '||' @115 '||' ;
    %END;

 /* GENERATING THE FINAL SELECTED LIST OF PROJECTS  */

     %IF &MEN=FINAL %THEN %DO;
   /* PATCHING COMM1 AND COMM2 IN THE DISTRICT FREQUENCY DATA TO
AVOID
    PROBLEMS IN THE FINAL MODULE */
DATA PATCH;LENGTH BRID $ 16 COMM1 $ 64 COMM2 $ 80;
          BRID=' ';COMM1=' '; COMM2=' ';
DATA %DISYS;SET %DISYS PATCH;
DATA LIST %FINLIST;
     INFILE INP FIRSTOBS=2 ;
     LENGTH BRID $ 16 DISEL $ 5;
     INPUT BRID $ ; DISEL= 'DISEL';RANK=_N_;
     OUTPUT LIST;OUTPUT %FINLIST; RETURN;
PROC SORT DATA=LIST;BY BRID;
PROC SORT DATA=%DISYS;BY BRID;
DATA %DISYS;SET %DISYS ;DISEL=' ' ; DROP DISEL;
DATA REPDATA;MERGE %DISYS LIST;BY BRID;IF DISEL='DISEL';
          PROC SORT DATA=REPDATA; BY RANK;
          %FORM;
DATA MENU2;SET MENU;DROP DIST;RETURN;
DATA _NULL_;
  SET REPDATA END=FIM; IF _N_=1 THEN SET MENU2;
  NPS+1;
  FILE LIST1 PRINT HEADER=C;
  IF NPS=6  THEN DO; PUT _PAGE_@; NPS=0; END;
  DN+1;
  DCOST+CPI;
  PUT @5 DIST @25 COUNTY $CNTY. @41 RNUM @54 CSS $12.
      @75 WT $WTPIC.
      @113 CPI DOLLAR14.  / /
      @5 'BRIDGE LOCATION: 'FX $20./ /
      @5 'EXISTING FACILITY: 'LOS ' LANE, ' ROWI 'FT ROADWAY'
      @55 ' PROPOSED FACILITY: ' PNL ' LANE, ' PRW 'FT ROADWAY' /
      @5 126*'=';
  IF FIM=1 THEN DO;
   PUT @60 'DISTRICT TOTAL OF ' DN 3. ' SELECTED PROJECTS:'
       @113  DCOST DOLLAR14.  ;
   END;
  RETURN;
```

```
C: PUT @36 'DISTRICT-' DIST
       @49 SYS '-STATE SYSTEM FEDERAL AID BRIDGE REPLACEMENT'/
       @54 'AND REHABILITATION PROGRAM'/
       @56 'DISTRICT SELECTION'//
       @5 'DISTRICT' @25 'COUNTY' @40 'HWY NO'
       @53 'CONT-SECT-STR' @75 'TYPE OF WORK' @116 'ESTIMATED COST' /
       @5 126*'=' ;
 RETURN;

DATA _NULL_;
  SET REPDATA END=FIM; IF _N_=1 THEN SET MENU2;
  S='S';
  NPS+1;
  FILE LIST2 PRINT HEADER=F;
  IF NPS=6  THEN DO; PUT _PAGE_@; NPS=0; END;
  IF (S='S') THEN DO; A_COST+CPI; AN+1; END;
  PUT @13 W_ADT COMMA7. @27 SR 3. @43 DECO 1.
      @48 SSCO 1. @53 SUBCO 1.
      @57 CPV DOLLAR8. @73 BWR 5.3
    /* @85 SCORE1 3. */  @95 W_BDL 2. @107 RANK
      @115 A_COST DOLLAR14. / @2 CSS $12. / @13 'COMMENTS: ' COMM1
      / @23 COMM2
      /
      @12 119*'=' / ;
  IF FIM=1 THEN DO;
     PUT @62 'DISTRICT TOTAL OF ' AN 3.
         ' SELECTED PROJECTS:'
         @115 A_COST DOLLAR14.  ;
     END;
RETURN;

F: PUT @36 'DISTRICT-' DIST
       @49 SYS '-STATE SYSTEM FEDERAL AID BRIDGE REPLACEMENT'/
       @54 'AND REHABILITATION PROGRAM'/
       @56 'DISTRICT SELECTION'//
   @24 'SUFFICIENCY' @39 'CONDITION  RATINGS' @73 'BRIDGE'
   @85 'TEBS' @93 'DETOUR' @103 'DISTRICT' @121 'DISTRICT' /
   @16 'ADT' @26 'RATINGS' @41 'RDWY SUPR  SUB'
   @59 'COST/VEH' @70 'WIDTH  RATIO' @85 'SCORE   LENGTH    PRIORITY'
   @120 'ACCUM COST'/ @12 119*'=' /;
   RETURN;   %END;
  %MEND MENU;
DATA MENU;SET MENU;RETURN;
     %MENU;
```

SOURCE CODE FOR THE PROGRAM FINAL (FINAL STATEWIDE SELECTION)

```
/**********************************************************
THIS IS THE STATE LEVEL PROGRAM FINAL OF THE TEBS PROJECT SELECTION
SYSTEM. IT HAS SEVERAL OPTIONS ACCESSED BY THE USER VIA INTERACTIVE
SCREENS.

1) BROWSE THROUGH AND PRINT THE DISTRICTS SELECTIONS

2) ADD OR DELETE PROJECTS TO THE DISTRICTS SELECTIONS, PRINT REPORT

3) ASSEMB;E THE FINAL LIST OF PROJECTS FOR ALL DISTRICTS, PRINT
REPORT

4) UPDATE THE PREVIOUSLY SELECTED PROJECTS DATA BASE

IT NEEDS DATA GENERATED BY THE PROGRAM FREQ AND THE DISTRICT LEVEL
REPORTING
PROGRAM.

                      WRITTEN BY : JOSE WEISSMANN
                      ON: MAY 89
      FOR MORE DETAILS REFER TO RESEARCH REPORT 439-4 CTR
CENTER FOR TRANSPORTATION RESEARCH UNIVERSITY OF TEXAS AT AUSTIN 1989

*********************************************************************/

CMS FI LIST1 DISK FINAL1 LISTING A (LRECL 133 RECFM V ;
CMS FI LIST2 DISK FINAL2 LISTING A (LRECL 133 RECFM V ;
   OPTIONS MISSING= 'M' REPLACE;
   %GLOBAL MEN DISTR SYST;

    /*MENU SELECTION FOR THE FINAL REPORTING PROGRAM */
   DATA MENU;LENGTH OPT $ 3 DISTRICT $ 3 SYS $ 3 AVAIL $ 3;
   INPUT OPT $ DISTRICT $ SYS $ AVAIL $;CARDS;
1 99 ON YES
   PROC FSEDIT DATA=MENU SCREEN=TEBS.MEN;
   DATA MENU; SET MENU;  CALL SYMPUT('MEN',OPT);
   CALL SYMPUT('DISTR',DISTRICT); CALL SYMPUT('SYST',SYS);
   CALL SYMPUT('AVAI',AVAIL);
   DATA MENU;SET MENU;
   /* MACRO TO CREATE A DATA SET FOR A DISTRICT IN CASE IT IS
MISSING*/
     %MACRO MISDIS;
   DATA REPDATA;LENGTH BRID $ 16;BRID=' ';
       PROC FSEDIT DATA= REPDATA SCREEN=TEBS.OPT23;
       DATA %FINSEL; SET REPDATA;LENGTH FINAL $ 5 STATE $ 21;
       FINAL='FINAL'; STATE='STATE LEVEL SELECTION';
                      IF BRID=' ' THEN DELETE;
       KEEP BRID FINAL STATE ;
PROC SORT DATA=%FINSEL;BY BRID;
PROC SORT DATA=%DISYS;BY BRID;
DATA REPDATA;MERGE %DISYS %FINSEL;BY BRID;IF FINAL='FINAL';
             IF BRID=' ' THEN DELETE;
             FORMAT COUNTY $CNTY. WT $WTPIC. W_ADT COMMA7. CPV
DOLLAR8.
```

```
               CPI DOLLAR14.;
              PROC SORT DATA=REPDATA; BY BRID;
         PROC FSBROWSE DATA= REPDATA SCREEN=TEBS.OPT22;
DATA _NULL_;
  SET REPDATA END=FIM;IF _N_=1 THEN SET MENU;
  NPS+1;
  FILE LIST1 PRINT HEADER=C;
  IF NPS=6  THEN DO; PUT _PAGE_@; NPS=0; END;
  DN+1;
  DCOST+CPI;
  PUT @5 DIST @25 COUNTY $CNTY. @41 RNUM @54 CSS $12.
      @75 WT $WTPIC.
      @113 CPI DOLLAR14.  / /
      @5 'BRIDGE LOCATION: 'FX $20./ /
      @5 'EXISTING FACILITY: 'LOS ' LANE, ' ROWI 'FT ROADWAY'
      @55 ' PROPOSED FACILITY: ' PNL ' LANE, ' PRW 'FT ROADWAY' /
      @5 126*'=';
  IF FIM=1 THEN DO;
   PUT @60 'DISTRICT TOTAL OF ' DN 3. ' SELECTED PROJECTS:'
       @113  DCOST DOLLAR14.  ;
   END;
  RETURN;

C: PUT @36 'DISTRICT-' DIST
       @49 SYS '-STATE SYSTEM FEDERAL AID BRIDGE REPLACEMENT'/
       @54 'AND REHABILITATION PROGRAM'/
       @56 'FINAL LIST OF PROJECTS'//
       @5 'DISTRICT' @25 'COUNTY' @40 'HWY NO'
       @53 'CONT-SECT-STR' @75 'TYPE OF WORK' @116 'ESTIMATED COST' /
       @5 126*'=' ;
 RETURN;

DATA _NULL_;
  SET REPDATA END=FIM; IF _N_=1 THEN SET MENU;
  S='S';
  NPS+1;
  FILE LIST2 PRINT HEADER=F;
  IF NPS=6  THEN DO; PUT _PAGE_@; NPS=0; END;
  IF (S='S') THEN DO; A_COST+CPI; AN+1; END;
  PUT @13 W_ADT COMMA7. @27 SR 3. @43 DECO 1.
      @48 SSCO 1. @53 SUBCO 1.
      @57 CPV DOLLAR8. @73 BWR 5.3
    /* @85 SCORE1 3. */  @95 W_BDL 2.
      @115 A_COST DOLLAR14. / @2 CSS $12. / @13 'COMMENTS: '
      /
      /
      @12 119*'=' / ;
  IF FIM=1 THEN DO;
     PUT @62 'DISTRICT TOTAL OF ' AN 3.
         ' SELECTED PROJECTS:'
         @115 A_COST DOLLAR14.  ;
     END;
RETURN;
```

```
F: PUT @36 'DISTRICT-' DIST
       @49 SYS '-STATE SYSTEM FEDERAL AID BRIDGE REPLACEMENT'/
       @54 'AND REHABILITATION PROGRAM'/
       @56 'FINAL LIST OF PROJECTS'//
   @24 'SUFFICIENCY' @39 'CONDITION  RATINGS' @73 'BRIDGE'
   @85 'TEBS' @93 'DETOUR' @103 'DISTRICT' @121 'DISTRICT' /
   @16 'ADT' @26 'RATINGS' @41 'RDWY SUPR  SUB'
   @59 'COST/VEH' @70 'WIDTH  RATIO' @85 'SCORE   LENGTH    PRIORITY'
   @120 'ACCUM COST'/ @12 119*'=' /;
      RETURN; %MEND MISDIS;
   DATA MENU;SET MENU;
  /* MACRO TO RETRIEVE DATA FROM THE ELIGIBLE SET OF STRUCTURES */
     %MACRO DISYS;
    %IF &DISTR=1 %THEN %DO;%IF &SYST=OFF %THEN TEBS.DISTOF1;
                 %IF &SYST=ON %THEN TEBS.DISTON1;%END;
    %IF &DISTR=2 %THEN %DO;%IF &SYST=OFF %THEN TEBS.DISTOF2;
                 %IF &SYST=ON %THEN TEBS.DISTON2;%END;
    %IF &DISTR=3 %THEN %DO;%IF &SYST=OFF %THEN TEBS.DISTOF3;
                 %IF &SYST=ON %THEN TEBS.DISTON3;%END;
    %IF &DISTR=4 %THEN %DO;%IF &SYST=OFF %THEN TEBS.DISTOF4;
                 %IF &SYST=ON %THEN TEBS.DISTON4;%END;
    %IF &DISTR=5 %THEN %DO;%IF &SYST=OFF %THEN TEBS.DISTOF5;
                 %IF &SYST=ON %THEN TEBS.DISTON5;%END;
    %IF &DISTR=6 %THEN %DO;%IF &SYST=OFF %THEN TEBS.DISTOF6;
                 %IF &SYST=ON %THEN TEBS.DISTON6;%END;
    %IF &DISTR=7 %THEN %DO;%IF &SYST=OFF %THEN TEBS.DISTOF7;
                 %IF &SYST=ON %THEN TEBS.DISTON7;%END;
    %IF &DISTR=8 %THEN %DO;%IF &SYST=OFF %THEN TEBS.DISTOF8;
                 %IF &SYST=ON %THEN TEBS.DISTON8;%END;
    %IF &DISTR=9 %THEN %DO;%IF &SYST=OFF %THEN TEBS.DISTOF9;
                 %IF &SYST=ON %THEN TEBS.DISTON9;%END;
    %IF &DISTR=10 %THEN %DO;%IF &SYST=OFF %THEN TEBS.DISTOF10;
                 %IF &SYST=ON %THEN TEBS.DISTON10;%END;
    %IF &DISTR=11 %THEN %DO;%IF &SYST=OFF %THEN TEBS.DISTOF11;
                 %IF &SYST=ON %THEN TEBS.DISTON11;%END;
    %IF &DISTR=12 %THEN %DO;%IF &SYST=OFF %THEN TEBS.DISTOF12;
                 %IF &SYST=ON %THEN TEBS.DISTON12;%END;
    %IF &DISTR=13 %THEN %DO;%IF &SYST=OFF %THEN TEBS.DISTOF13;
                 %IF &SYST=ON %THEN TEBS.DISTON13;%END;
    %IF &DISTR=14 %THEN %DO;%IF &SYST=OFF %THEN TEBS.DISTOF14;
                 %IF &SYST=ON %THEN TEBS.DISTON14;%END;
    %IF &DISTR=15 %THEN %DO;%IF &SYST=OFF %THEN TEBS.DISTOF15;
                 %IF &SYST=ON %THEN TEBS.DISTON15;%END;
    %IF &DISTR=16 %THEN %DO;%IF &SYST=OFF %THEN TEBS.DISTOF16;
                 %IF &SYST=ON %THEN TEBS.DISTON16;%END;
    %IF &DISTR=17 %THEN %DO;%IF &SYST=OFF %THEN TEBS.DISTOF17;
                 %IF &SYST=ON %THEN TEBS.DISTON17;%END;
    %IF &DISTR=18 %THEN %DO;%IF &SYST=OFF %THEN TEBS.DISTOF18;
                 %IF &SYST=ON %THEN TEBS.DISTON18;%END;
    %IF &DISTR=19 %THEN %DO;%IF &SYST=OFF %THEN TEBS.DISTOF19;
                 %IF &SYST=ON %THEN TEBS.DISTON19;%END;
    %IF &DISTR=20 %THEN %DO;%IF &SYST=OFF %THEN TEBS.DISTOF20;
                 %IF &SYST=ON %THEN TEBS.DISTON20;%END;
    %IF &DISTR=21 %THEN %DO;%IF &SYST=OFF %THEN TEBS.DISTOF21;
```

```
              %IF &SYST=ON %THEN TEBS.DISTON21;%END;
 %IF &DISTR=23 %THEN %DO;%IF &SYST=OFF %THEN TEBS.DISTOF23;
              %IF &SYST=ON %THEN TEBS.DISTON23;%END;
 %IF &DISTR=24 %THEN %DO;%IF &SYST=OFF %THEN TEBS.DISTOF24;
              %IF &SYST=ON %THEN TEBS.DISTON24;%END;
 %IF &DISTR=25 %THEN %DO;%IF &SYST=OFF %THEN TEBS.DISTOF25;
              %IF &SYST=ON %THEN TEBS.DISTON25;%END;

   %MEND DISYS;
   DATA MENU; SET MENU;
/*MACRO TO RETRIEVE  THE FINAL LIST OF SELECTED PROJECTS FORWARDED
BY THE DISTRICT LEVEL OF THE SYSTEM */
  %MACRO FINLIST;
 %IF &DISTR=1 %THEN %DO;%IF &SYST=OFF %THEN TEBS.FINOF1;
              %IF &SYST=ON %THEN TEBS.FINON1;%END;
 %IF &DISTR=2 %THEN %DO;%IF &SYST=OFF %THEN TEBS.FINOF2;
              %IF &SYST=ON %THEN TEBS.FINON2;%END;
 %IF &DISTR=3 %THEN %DO;%IF &SYST=OFF %THEN TEBS.FINOF3;
              %IF &SYST=ON %THEN TEBS.FINON3;%END;
 %IF &DISTR=4 %THEN %DO;%IF &SYST=OFF %THEN TEBS.FINOF4;
              %IF &SYST=ON %THEN TEBS.FINON4;%END;
 %IF &DISTR=5 %THEN %DO;%IF &SYST=OFF %THEN TEBS.FINOF5;
              %IF &SYST=ON %THEN TEBS.FINON5;%END;
 %IF &DISTR=6 %THEN %DO;%IF &SYST=OFF %THEN TEBS.FINOF6;
              %IF &SYST=ON %THEN TEBS.FINON6;%END;
 %IF &DISTR=7 %THEN %DO;%IF &SYST=OFF %THEN TEBS.FINOF7;
              %IF &SYST=ON %THEN TEBS.FINON7;%END;
 %IF &DISTR=8 %THEN %DO;%IF &SYST=OFF %THEN TEBS.FINOF8;
              %IF &SYST=ON %THEN TEBS.FINON8;%END;
 %IF &DISTR=9 %THEN %DO;%IF &SYST=OFF %THEN TEBS.FINOF9;
              %IF &SYST=ON %THEN TEBS.FINON9;%END;
 %IF &DISTR=10 %THEN %DO;%IF &SYST=OFF %THEN TEBS.FINOF10;
              %IF &SYST=ON %THEN TEBS.FINON10;%END;
 %IF &DISTR=11 %THEN %DO;%IF &SYST=OFF %THEN TEBS.FINOF11;
              %IF &SYST=ON %THEN TEBS.FINON11;%END;
 %IF &DISTR=12 %THEN %DO;%IF &SYST=OFF %THEN TEBS.FINOF12;
              %IF &SYST=ON %THEN TEBS.FINON12;%END;
 %IF &DISTR=13 %THEN %DO;%IF &SYST=OFF %THEN TEBS.FINOF13;
              %IF &SYST=ON %THEN TEBS.FINON13;%END;
 %IF &DISTR=14 %THEN %DO;%IF &SYST=OFF %THEN TEBS.FINOF14;
              %IF &SYST=ON %THEN TEBS.FINON14;%END;
 %IF &DISTR=15 %THEN %DO;%IF &SYST=OFF %THEN TEBS.FINOF15;
              %IF &SYST=ON %THEN TEBS.FINON15;%END;
 %IF &DISTR=16 %THEN %DO;%IF &SYST=OFF %THEN TEBS.FINOF16;
              %IF &SYST=ON %THEN TEBS.FINON16;%END;
 %IF &DISTR=17 %THEN %DO;%IF &SYST=OFF %THEN TEBS.FINOF17;
              %IF &SYST=ON %THEN TEBS.FINON17;%END;
 %IF &DISTR=18 %THEN %DO;%IF &SYST=OFF %THEN TEBS.FINOF18;
              %IF &SYST=ON %THEN TEBS.FINON18;%END;
 %IF &DISTR=19 %THEN %DO;%IF &SYST=OFF %THEN TEBS.FINOF19;
              %IF &SYST=ON %THEN TEBS.FINON19;%END;
 %IF &DISTR=20 %THEN %DO;%IF &SYST=OFF %THEN TEBS.FINOF20;
              %IF &SYST=ON %THEN TEBS.FINON20;%END;
 %IF &DISTR=21 %THEN %DO;%IF &SYST=OFF %THEN TEBS.FINOF21;
```

```
              %IF &SYST=ON %THEN TEBS.FINON21;%END;
   %IF &DISTR=23 %THEN %DO;%IF &SYST=OFF %THEN TEBS.FINOF23;
              %IF &SYST=ON %THEN TEBS.FINON23;%END;
   %IF &DISTR=24 %THEN %DO;%IF &SYST=OFF %THEN TEBS.FINOF24;
              %IF &SYST=ON %THEN TEBS.FINON24;%END;
   %IF &DISTR=25 %THEN %DO;%IF &SYST=OFF %THEN TEBS.FINOF25;
              %IF &SYST=ON %THEN TEBS.FINON25;%END;
   %MEND FINLIST;

DATA MENU; SET MENU;

    %MACRO FINSEL;
 /*MACRO TO GENERATE THE FINAL LIST DATA SET AT THE STATE LEVEL */
   %IF &DISTR=1 %THEN %DO;%IF &SYST=OFF %THEN TEBS.STATOF1;
              %IF &SYST=ON %THEN TEBS.STATON1;%END;
   %IF &DISTR=2 %THEN %DO;%IF &SYST=OFF %THEN TEBS.STATOF2;
              %IF &SYST=ON %THEN TEBS.STATON2;%END;
   %IF &DISTR=3 %THEN %DO;%IF &SYST=OFF %THEN TEBS.STATOF3;
              %IF &SYST=ON %THEN TEBS.STATON3;%END;
   %IF &DISTR=4 %THEN %DO;%IF &SYST=OFF %THEN TEBS.STATOF4;
              %IF &SYST=ON %THEN TEBS.STATON4;%END;
   %IF &DISTR=5 %THEN %DO;%IF &SYST=OFF %THEN TEBS.STATOF5;
              %IF &SYST=ON %THEN TEBS.STATON5;%END;
   %IF &DISTR=6 %THEN %DO;%IF &SYST=OFF %THEN TEBS.STATOF6;
              %IF &SYST=ON %THEN TEBS.STATON6;%END;
   %IF &DISTR=7 %THEN %DO;%IF &SYST=OFF %THEN TEBS.STATOF7;
              %IF &SYST=ON %THEN TEBS.STATON7;%END;
   %IF &DISTR=8 %THEN %DO;%IF &SYST=OFF %THEN TEBS.STATOF8;
              %IF &SYST=ON %THEN TEBS.STATON8;%END;
   %IF &DISTR=9 %THEN %DO;%IF &SYST=OFF %THEN TEBS.STATOF9;
              %IF &SYST=ON %THEN TEBS.STATON9;%END;
   %IF &DISTR=10 %THEN %DO;%IF &SYST=OFF %THEN TEBS.STATOF10;
              %IF &SYST=ON %THEN TEBS.STATON10;%END;
   %IF &DISTR=11 %THEN %DO;%IF &SYST=OFF %THEN TEBS.STATOF11;
              %IF &SYST=ON %THEN TEBS.STATON11;%END;
   %IF &DISTR=12 %THEN %DO;%IF &SYST=OFF %THEN TEBS.STATOF12;
              %IF &SYST=ON %THEN TEBS.STATON12;%END;
   %IF &DISTR=13 %THEN %DO;%IF &SYST=OFF %THEN TEBS.STATOF13;
              %IF &SYST=ON %THEN TEBS.STATON13;%END;
   %IF &DISTR=14 %THEN %DO;%IF &SYST=OFF %THEN TEBS.STATOF14;
              %IF &SYST=ON %THEN TEBS14.STATON14;%END;
   %IF &DISTR=15 %THEN %DO;%IF &SYST=OFF %THEN TEBS.STATOF15;
              %IF &SYST=ON %THEN TEBS.STATON15;%END;
   %IF &DISTR=16 %THEN %DO;%IF &SYST=OFF %THEN TEBS.STATOF16;
              %IF &SYST=ON %THEN TEBS.STATON16;%END;
   %IF &DISTR=17 %THEN %DO;%IF &SYST=OFF %THEN TEBS.STATOF17;
              %IF &SYST=ON %THEN TEBS.STATON17;%END;
   %IF &DISTR=18 %THEN %DO;%IF &SYST=OFF %THEN TEBS.STATOF18;
              %IF &SYST=ON %THEN TEBS.STATON18;%END;
   %IF &DISTR=19 %THEN %DO;%IF &SYST=OFF %THEN TEBS.STATOF19;
              %IF &SYST=ON %THEN TEBS.STATON19;%END;
   %IF &DISTR=20 %THEN %DO;%IF &SYST=OFF %THEN TEBS.STATOF20;
              %IF &SYST=ON %THEN TEBS.STATON20;%END;
   %IF &DISTR=21 %THEN %DO;%IF &SYST=OFF %THEN TEBS.STATOF21;
```

```
                %IF &SYST=ON %THEN TEBS.STATON21;%END;
   %IF &DISTR=23 %THEN %DO;%IF &SYST=OFF %THEN TEBS.STATOF23;
                %IF &SYST=ON %THEN TEBS.STATON23;%END;
   %IF &DISTR=24 %THEN %DO;%IF &SYST=OFF %THEN TEBS.STATOF24;
                %IF &SYST=ON %THEN TEBS.STATON24;%END;
   %IF &DISTR=25 %THEN %DO;%IF &SYST=OFF %THEN TEBS.STATOF25;
                %IF &SYST=ON %THEN TEBS.STATON25;%END;
   %MEND FINSEL;

 DATA MENU; SET MENU;
     /* MACRO TO ASSEMBLE THE FINAL LIST OF PROJECTS USED IN OPTION
3.
     IN OPTION 3 THE USER HAS THE OPTION OF MAKING A PARTIAL LIST
     INCLUDING ONLY THE DISTRICTS OF HIS CHOICE */
    %MACRO FINSTAT;
   %IF &IN1=YES %THEN %DO;
   %IF &D1=1 %THEN %DO;%IF &SYST=OFF %THEN TEBS.STATOF1;
                %IF &SYST=ON %THEN TEBS.STATON1;%END;%END;
   %IF &IN2=YES %THEN %DO;
   %IF &D2=2 %THEN %DO;%IF &SYST=OFF %THEN TEBS.STATOF2;
                %IF &SYST=ON %THEN TEBS.STATON2;%END;%END;
   %IF &IN3=YES %THEN %DO;
   %IF &D3=3 %THEN %DO;%IF &SYST=OFF %THEN TEBS.STATOF3;
                %IF &SYST=ON %THEN TEBS.STATON3;%END;%END;
   %IF &IN4=YES %THEN %DO;
   %IF &D4=4 %THEN %DO;%IF &SYST=OFF %THEN TEBS.STATOF4;
                %IF &SYST=ON %THEN TEBS.STATON4;%END;%END;
   %IF &IN5=YES %THEN %DO;
   %IF &D5=5 %THEN %DO;%IF &SYST=OFF %THEN TEBS.STATOF5;
                %IF &SYST=ON %THEN TEBS.STATON5;%END;%END;
   %IF &IN6=YES %THEN %DO;
   %IF &D6=6 %THEN %DO;%IF &SYST=OFF %THEN TEBS.STATOF6;
                %IF &SYST=ON %THEN TEBS.STATON6;%END;%END;
   %IF &IN7=YES %THEN %DO;
   %IF &D7=7 %THEN %DO;%IF &SYST=OFF %THEN TEBS.STATOF7;
                %IF &SYST=ON %THEN TEBS.STATON7;%END;%END;
   %IF &IN8=YES %THEN %DO;
   %IF &D8=8 %THEN %DO;%IF &SYST=OFF %THEN TEBS.STATOF8;
                %IF &SYST=ON %THEN TEBS.STATON8;%END;%END;
   %IF &IN9=YES %THEN %DO;
   %IF &D9=9 %THEN %DO;%IF &SYST=OFF %THEN TEBS.STATOF9;
                %IF &SYST=ON %THEN TEBS.STATON9;%END;%END;
   %IF &IN10=YES %THEN %DO;
   %IF &D10=10 %THEN %DO;%IF &SYST=OFF %THEN TEBS.STATOF10;
                %IF &SYST=ON %THEN TEBS.STATON10;%END;%END;
   %IF &IN11=YES %THEN %DO;
   %IF &D11=11 %THEN %DO;%IF &SYST=OFF %THEN TEBS.STATOF11;
                %IF &SYST=ON %THEN TEBS.STATON11;%END;%END;
   %IF &IN12=YES %THEN %DO;
   %IF &D12=12 %THEN %DO;%IF &SYST=OFF %THEN TEBS.STATOF12;
                %IF &SYST=ON %THEN TEBS.STATON12;%END;%END;
   %IF &IN13=YES %THEN %DO;
   %IF &D13=13 %THEN %DO;%IF &SYST=OFF %THEN TEBS.STATOF13;
                %IF &SYST=ON %THEN TEBS.STATON13;%END;%END;
```

```
%IF &IN14=YES %THEN %DO;
%IF &D14=14 %THEN %DO;%IF &SYST=OFF %THEN TEBS.STATOF14;
             %IF &SYST=ON %THEN TEBS.STATON14;%END;%END;
%IF &IN15=YES %THEN %DO;
%IF &D15=15 %THEN %DO;%IF &SYST=OFF %THEN TEBS.STATOF15;
             %IF &SYST=ON %THEN TEBS.STATON15;%END;%END;
%IF &IN16=YES %THEN %DO;
%IF &D16=16 %THEN %DO;%IF &SYST=OFF %THEN TEBS.STATOF16;
             %IF &SYST=ON %THEN TEBS.STATON16;%END;%END;
%IF &IN17=YES %THEN %DO;
%IF &D17=17 %THEN %DO;%IF &SYST=OFF %THEN TEBS.STATOF17;
             %IF &SYST=ON %THEN TEBS.STATON17;%END;%END;
%IF &IN18=YES %THEN %DO;
%IF &D18=18 %THEN %DO;%IF &SYST=OFF %THEN TEBS.STATOF18;
             %IF &SYST=ON %THEN TEBS.STATON18;%END;%END;
%IF &IN19=YES %THEN %DO;
%IF &D19=19 %THEN %DO;%IF &SYST=OFF %THEN TEBS.STATOF19;
             %IF &SYST=ON %THEN TEBS.STATON19;%END;%END;
%IF &IN20=YES %THEN %DO;
%IF &D20=20 %THEN %DO;%IF &SYST=OFF %THEN TEBS.STATOF20;
             %IF &SYST=ON %THEN TEBS.STATON20;%END;%END;
%IF &IN21=YES %THEN %DO;
%IF &D21=21 %THEN %DO;%IF &SYST=OFF %THEN TEBS.STATOF21;
             %IF &SYST=ON %THEN TEBS.STATON21;%END;%END;
%IF &IN23=YES %THEN %DO;
%IF &D23=23 %THEN %DO;%IF &SYST=OFF %THEN TEBS.STATOF23;
             %IF &SYST=ON %THEN TEBS.STATON23;%END;%END;
%IF &IN24=YES %THEN %DO;
%IF &D24=24 %THEN %DO;%IF &SYST=OFF %THEN TEBS.STATOF24;
             %IF &SYST=ON %THEN TEBS.STATON24;%END;%END;
%IF &IN25=YES %THEN %DO;
%IF &D25=25 %THEN %DO;%IF &SYST=OFF %THEN TEBS.STATOF25;
             %IF &SYST=ON %THEN TEBS.STATON25;%END;%END;
%MEND FINSTAT;
DATA MENU; SET MENU;
/*MACRO TO FORMAT THE COUNTY NAMES */

   %MACRO FORM;

PROC FORMAT;

  VALUE $WTPIC 'RP'='REPLACE BRIDGE & APPROACHES'
               'RH'='REHABILITATE BRIDGE & APPROACHES';

  VALUE $CNTY '001'='ANDERSON' '002'='ANDREWS' '003'='ANGELINA'
              '004'='ARANSAS' '005'='ARCHER' '006'='ARMSTRONG'
              '007'='ATASCOSA' '008'='AUSTIN' '009'='BAILEY'
              '010'='BANDERA' '011'='BASTROP' '012'='BAYLOR'
'013'='BEE'
              '014'='BELL' '015'='BEXAR' '016'='BLANCO'
'017'='BORDEN'
              '018'='BOSQUE' '019'='BOWIE' '020'='BRAZORIA'
              '021'='BRAZOS' '022'='BREWSTER' '023'='BRISCOE'
              '024'='BROOKS' '025'='BROWN' '026'='BURLESON'
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                '027'='BURNET' '028'='CALDWELL' '029'='CALHOUN'
                '030'='CALLAHAN' '031'='CAMERON' '032'='CAMP'
                '033'='CARSON' '034'='CASS' '035'='CASTRO'
'036'='CHAMBERS'
                '037'='CHEROKEE' '038'='CHILDRESS' '039'='CLAY'
                '040'='COCHRAN' '041'='COKE' '042'='COLEMAN'
'043'='COLLIN'
                '044'='COLLINGSWORTH' '045'='COLORADO' '046'='COMAL'
                '047'='COMANCHE' '048'='CONCHO' '049'='COOKE'
                '050'='CORYELL' '051'='COTTLE' '052'='CRANE'
                '053'='CROCKETT' '054'='CROSBY' '055'='CULBERSON'
                '056'='DALLAM' '057'='DALLAS' '058'='DAWSON'
                '059'='DEAF SMITH' '060'='DELTA' '061'='DENTON'
                '062'='DEWITT' '063'='DICKENS' '064'='DIMMIT'
                '065'='DONLEY' '066'='KENEDY' '067'='DUVAL'
                '068'='EASTLAND' '069'='ECTOR' '070'='EDWARDS'
                '071'='ELLIS' '072'='EL PASO' '073'='ERATH'
'074'='FALLS'
                '075'='FANNIN' '076'='FAYETTE' '077'='FISHER'
'078'='FLOYD'
                '079'='FOARD' '080'='FORT BEND' '081'='FRANKLIN'
                '082'='FREESTONE' '083'='FRIO' '084'='GAINES'
                '085'='GALVESTON' '086'='GARZA' '087'='GILLESPIE'
                '088'='GLASSCOCK' '089'='GOLIAD' '090'='GONZALES'
                '091'='GRAY' '092'='GRAYSON' '093'='GREGG'
'094'='GRIMES'
                '095'='GUADALUPE' '096'='HALE' '097'='HALL'
                '098'='HAMILTON' '099'='HANSFORD' '100'='HARDEMAN'
                '101'='HARDIN' '102'='HARRIS' '103'='HARRISON'
                '104'='HARTLEY' '105'='HASKELL' '106'='HAYS'
                '107'='HEMPHILL' '108'='HENDERSON' '109'='HIDALGO'
                '110'='HILL' '111'='HOCKLEY' '112'='HOOD'
                '113'='HOPKINS' '114'='HOUSTON' '115'='HOWARD'
                '116'='HUDSPETH' '117'='HUNT' '118'='HUTCHINSON'
                '119'='IRION' '120'='JACK' '121'='JACKSON'
'122'='JASPER'
                '123'='JEFF DAVIS' '124'='JEFFERSON' '125'='JIM HOGG'
                '126'='JIM WELLS' '127'='JOHNSON' '128'='JONES'
                '129'='KARNES' '130'='KAUFMAN' '131'='KENDALL'
'132'='KENT'
                '133'='KERR' '134'='KIMBLE' '135'='KING' '136'='KINNEY'
                '137'='KLEBERG' '138'='KNOX' '139'='LAMAR' '140'='LAMB'
                '141'='LAMPASAS' '142'='LA SALLE' '143'='LAVACA'
                '144'='LEE' '145'='LEON' '146'='LIBERTY'
'147'='LIMESTONE'
                '148'='LIPSCOMB' '149'='LIVE OAK' '150'='LLANO'
                '151'='LOVING' '152'='LUBBOCK' '153'='LYNN'
'154'='MADISON'
                '155'='MARION' '156'='MARTIN' '157'='MASON'
                '158'='MATAGORDA' '159'='MAVERICK' '160'='MCCULLOCH'
                '161'='MCLENNAN' '162'='MCMULLEN' '163'='MEDINA'
                '164'='MENARD' '165'='MIDLAND' '166'='MILAM'
'167'='MILLS'
                '168'='MITCHELL' '169'='MONTAGUE' '170'='MONTGOMERY'
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                '171'='MOORE' '172'='MORRIS' '173'='MOTLEY'
                '174'='NACOGDOCHES' '175'='NAVARRO' '176'='NEWTON'
                '177'='NOLAN' '178'='NUECES' '179'='OCHILTREE'
                '180'='OLDHAM' '181'='ORANGE' '182'='PALO PINTO'
                '183'='PANOLA' '184'='PARKER' '185'='PARMER'
'186'='PECOS'
                '187'='POLK' '188'='POTTER' '189'='PRESIDIO'
'190'='RAINS'
                '191'='RANDALL' '192'='REAGAN' '193'='REAL'
                '194'='RED RIVER' '195'='REEVES' '196'='REFUGIO'
                '197'='ROBERTS' '198'='ROBERTSON' '199'='ROCKWALL'
                '200'='RUNNELS' '201'='RUSK' '202'='SABINE'
                '203'='SAN AUGUSTINE' '204'='SAN JACINTO'
                '205'='SAN PATRICIO' '206'='SAN SABA'
'207'='SCHLEICHER'
                '208'='SCURRY' '209'='SHACKELFORD' '210'='SHELBY'
                '211'='SHERMAN' '212'='SMITH' '213'='SOMERVELL'
                '214'='STARR' '215'='STEPHENS' '216'='STERLING'
                '217'='STONEWALL' '218'='SUTTON' '219'='SWISHER'
                '220'='TARRANT' '221'='TAYLOR' '222'='TERRELL'
                '223'='TERRY' '224'='THROCKMORTON' '225'='TITUS'
                '226'='TOM GREEN' '227'='TRAVIS' '228'='TRINITY'
                '229'='TYLER' '230'='UPSHUR' '231'='UPTON'
'232'='UVALDE'
                '233'='VAL VERDE' '234'='VAN ZANDT' '235'='VICTORIA'
                '236'='WALKER' '237'='WALLER' '238'='WARD'
                '239'='WASHINGTON' '240'='WEBB' '241'='WHARTON'
                '242'='WHEELER' '243'='WICHITA' '244'='WILBARGER'
                '245'='WILLACY' '246'='WILLIAMSON' '247'='WILSON'
                '248'='WINKLER' '249'='WISE' '250'='WOOD'
'251'='YOAKUM'
                '252'='YOUNG' '253'='ZAPATA' '254'='ZAVALA';
  VALUE  HQ 1='1 PARIS' 2='2 FT WORTH' 3='3 WICHITA FALLS'
             4='4 AMARILLO' 5='5 LUBBOCK' 6='6 ODESSA' 7='7 SAN
ANGELO'
             8='8 ABILENE' 9='9 WACO' 10='10 TYLER' 11='11 LUFKIN'
            12='12 HOUSTON' 13='13 YOAKUM' 14='14 AUSTIN'
            15='15 SAN ANTONIO' 16='16 CORPUS CHRISTI' 17='17 BRYAN'
            18='18 DALLAS' 19='19 ATLANTA' 20='20 BEAUMONT'
            21='21 PHARR' 23='23 BROWNWOOD' 24='24 EL PASO'
            25='25 CHILDRESS' 26='26 HOUSTON URBAN';
               %MEND FORM;
    DATA MENU;SET MENU;
    %FORM;
  /*MACRO TO SELECT THE CORRECT ACTION FROM THE MENU SELECTION */
        %MACRO MENU;
  /* BROWSING THROUGH THE DISTRICT SELECTION */
       %IF &MEN=1 %THEN %DO;
       %IF &AVAI=NO %THEN %DO;PROC FSBROWSE DATA=MENU
SCREEN=TEBS.OPT12;
     ENDSAS;%END;
PROC SORT DATA=%FINLIST;BY BRID;
PROC SORT DATA=%DISYS;BY BRID;
DATA REPDATA;MERGE %DISYS %FINLIST;BY BRID;IF DISEL='DISEL';
```

```
               IF BRID=' ' THEN DELETE;
               FORMAT COUNTY $CNTY. WT $WTPIC. W_ADT COMMA7. CPV
DOLLAR8.
               CPI DOLLAR14.;
              PROC SORT DATA=REPDATA; BY RANK;
        PROC FSBROWSE DATA= REPDATA SCREEN=TEBS.OPT1;
DATA _NULL_;
  SET REPDATA END=FIM;IF _N_=1 THEN SET MENU;
  NPS+1;
  FILE LIST1 PRINT HEADER=C;
  IF NPS=6  THEN DO; PUT _PAGE_@; NPS=0; END;
  DN+1;
  DCOST+CPI;
  PUT @5 DIST @25 COUNTY $CNTY. @41 RNUM @54 CSS $12.
      @75 WT $WTPIC.
      @113 CPI DOLLAR14.  / /
      @5 'BRIDGE LOCATION: 'FX $20./ /
      @5 'EXISTING FACILITY: 'LOS ' LANE, ' ROWI 'FT ROADWAY'
      @55 ' PROPOSED FACILITY: ' PNL ' LANE, ' PRW 'FT ROADWAY' /
      @5 126*'=';
  IF FIM=1 THEN DO;
   PUT @60 'DISTRICT TOTAL OF ' DN 3. ' SELECTED PROJECTS:'
       @113  DCOST DOLLAR14.  ;
   END;
  RETURN;

C: PUT @36 'DISTRICT-' DIST
       @49 SYS '-STATE SYSTEM FEDERAL AID BRIDGE REPLACEMENT'/
       @54 'AND REHABILITATION PROGRAM'/
       @56 'DISTRICT SELECTION'//
       @5 'DISTRICT' @25 'COUNTY' @40 'HWY NO'
       @53 'CONT-SECT-STR' @75 'TYPE OF WORK' @116 'ESTIMATED COST' /
       @5 126*'=' ;
 RETURN;

DATA _NULL_;
  SET REPDATA END=FIM; IF _N_=1 THEN SET MENU;
  S='S';
  NPS+1;
  FILE LIST2 PRINT HEADER=F;
  IF NPS=6  THEN DO; PUT _PAGE_@; NPS=0; END;
  IF (S='S') THEN DO; A_COST+CPI; AN+1; END;
  PUT @13 W_ADT COMMA7. @27 SR 3. @43 DECO 1.
      @48 SSCO 1. @53 SUBCO 1.
      @57 CPV DOLLAR8. @73 BWR 5.3
    /* @85 SCORE1 3. */  @95 W_BDL 2. @107 RANK
      @115 A_COST DOLLAR14. / @2 CSS $12. / @13 'COMMENTS: ' COMM1
      / @23 COMM2
      /
      @12 119*'=' / ;
  IF FIM=1 THEN DO;
     PUT @62 'DISTRICT TOTAL OF ' AN 3.
         ' SELECTED PROJECTS:'
         @115 A_COST DOLLAR14.  ;
```

```
     END;
RETURN;

F: PUT @36 'DISTRICT-' DIST
       @49 SYS '-STATE SYSTEM FEDERAL AID BRIDGE REPLACEMENT'/
       @54 'AND REHABILITATION PROGRAM'/
       @56 'DISTRICT SELECTION'//
   @24 'SUFFICIENCY' @39 'CONDITION  RATINGS' @73 'BRIDGE'
   @85 'TEBS' @93 'DETOUR' @103 'DISTRICT' @121 'DISTRICT' /
   @16 'ADT' @26 'RATINGS' @41 'RDWY SUPR  SUB'
   @59 'COST/VEH' @70 'WIDTH  RATIO' @85 'SCORE   LENGTH    PRIORITY'
   @120 'ACCUM COST'/ @12 119*'=' /;
      RETURN; %END;
   /* CREATING THE FINAL LIST OF SELECTED PROJECTS STARTING FROM THE
LIST
      SUPLIED BY THE DISTRICT */
      %IF &MEN=2 %THEN %DO;
      %IF &AVAI=NO %THEN %DO;%MISDIS;ENDSAS;%END;
      /*THIS MACRO IS USED WHEN THE DISTRICT
                                  DATA IS MISSING FOR ANY REASON */
PROC SORT DATA=%FINLIST;BY BRID;    /*THE NEXT STEPS CREATE THE */
PROC SORT DATA=%DISYS;BY BRID;      /*LIST SUPLYED BY THE DISTRICTS
*/
   /*AND ALLOWS THE USER TO ADD OR DELETE
   PROJECTS BY THE BRID IF HE WISHES */
DATA REPDATA;MERGE %DISYS %FINLIST;BY BRID;IF DISEL='DISEL';
             FORMAT COUNTY $CNTY. WT $WTPIC. W_ADT COMMA7. CPV
DOLLAR8.
             CPI DOLLAR14.;
            PROC SORT DATA=REPDATA; BY RANK;
       PROC FSEDIT DATA= REPDATA SCREEN=TEBS.OPT21;
       DATA %FINSEL; SET REPDATA;LENGTH FINAL $ 5 STATE $ 21;
       FINAL='FINAL'; IF RANK=. THEN  STATE='STATE LEVEL SELECTION';
                      IF BRID=' ' THEN DELETE;
      IF DIST= . THEN DIST=&DISTR;
       KEEP DIST BRID FINAL RANK STATE COMM1 COMM2;
PROC SORT DATA=%FINSEL;BY BRID;
PROC SORT DATA=%DISYS;BY BRID;
DATA REPDATA;MERGE %DISYS %FINSEL;BY BRID;IF FINAL='FINAL';
             IF BRID=' ' THEN DELETE;
             FORMAT COUNTY $CNTY. WT $WTPIC. W_ADT COMMA7. CPV
DOLLAR8.
             CPI DOLLAR14.;
            PROC SORT DATA=REPDATA; BY RANK;
       PROC FSBROWSE DATA= REPDATA SCREEN=TEBS.OPT22;
DATA _NULL_;
  SET REPDATA END=FIM;IF _N_=1 THEN SET MENU;
  NPS+1;
  FILE LIST1 PRINT HEADER=C;
  IF NPS=6  THEN DO; PUT _PAGE_@; NPS=0; END;
  DN+1;
  DCOST+CPI;
  PUT @5 DIST @25 COUNTY $CNTY. @41 RNUM @54 CSS $12.
      @75 WT $WTPIC.
```

```
      @113 CPI DOLLAR14.  / /
      @5 'BRIDGE LOCATION: 'FX $20./ /
      @5 'EXISTING FACILITY: 'LOS ' LANE, ' ROWI 'FT ROADWAY'
      @55 ' PROPOSED FACILITY: ' PNL ' LANE, ' PRW 'FT ROADWAY' /
      @5 126*'=';
  IF FIM=1 THEN DO;
   PUT @60 'DISTRICT TOTAL OF ' DN 3. ' SELECTED PROJECTS:'
       @113  DCOST DOLLAR14.  ;
   END;
  RETURN;

C: PUT @36 'DISTRICT-' DIST
       @49 SYS '-STATE SYSTEM FEDERAL AID BRIDGE REPLACEMENT'/
       @54 'AND REHABILITATION PROGRAM'/
       @56 'FINAL LIST OF PROJECTS'//
       @5 'DISTRICT' @25 'COUNTY' @40 'HWY NO'
       @53 'CONT-SECT-STR' @75 'TYPE OF WORK' @116 'ESTIMATED COST' /
       @5 126*'=' ;
 RETURN;

DATA _NULL_;
  SET REPDATA END=FIM; IF _N_=1 THEN SET MENU;
  S='S';
  NPS+1;
  IF RANK=. THEN COMM1=STATE;
  FILE LIST2 PRINT HEADER=F;
  IF NPS=6  THEN DO; PUT _PAGE_@; NPS=0; END;
  IF (S='S') THEN DO; A_COST+CPI; AN+1; END;
  PUT @13 W_ADT COMMA7. @27 SR 3. @43 DECO 1.
      @48 SSCO 1. @53 SUBCO 1.
      @57 CPV DOLLAR8. @73 BWR 5.3
    /* @85 SCORE1 3. */  @95 W_BDL 2. @107 RANK
      @115 A_COST DOLLAR14. / @2 CSS $12. / @13 'COMMENTS: ' COMM1
      / @23 COMM2
      /
      @12 119*'=' / ;
  IF FIM=1 THEN DO;
     PUT @62 'DISTRICT TOTAL OF ' AN 3.
         ' SELECTED PROJECTS:'
         @115 A_COST DOLLAR14.  ;
     END;
RETURN;

F: PUT @36 'DISTRICT-' DIST
       @49 SYS '-STATE SYSTEM FEDERAL AID BRIDGE REPLACEMENT'/
       @54 'AND REHABILITATION PROGRAM'/
       @56 'FINAL LIST OF PROJECTS'//
   @24 'SUFFICIENCY' @39 'CONDITION  RATINGS' @73 'BRIDGE'
   @85 'TEBS' @93 'DETOUR' @103 'DISTRICT' @121 'DISTRICT' /
   @16 'ADT' @26 'RATINGS' @41 'RDWY SUPR  SUB'
   @59 'COST/VEH' @70 'WIDTH  RATIO' @85 'SCORE   LENGTH    PRIORITY'
   @120 'ACCUM COST'/ @12 119*'=' /;
     RETURN; %END;
  /*MACRO TO PUT ALL THE FINAL STATE LEVEL SELECTIONS IN ONE DATA SET
```

```
   ,PRINT THE FINAL LIST OF SELECTED PROJECTS CREATE A DATA SET OF
THE
   SELECTION TO BE ADDED TO THE PREVIOUSLY SELECTED PROJECT LIST
USING
   MENU OPTION 4 OF THIS MODULE */
        %IF &MEN=3 %THEN %DO;
        DATA MENU3; RETAIN;
        %DO I=1 %TO 25 %BY 1;
        LENGTH DIST&I $ 3 INCL&I $ 3 ; %END;
                   %DO I=1 %TO 25 %BY 1;
                   INPUT DIST&I $ INCL&I $; %END;
                   OUTPUT;
                   CARDS;
1 NO
2 NO
3 NO
4 NO
5 NO
6 NO
7 NO
8 NO
9 NO
10 YES
11 NO
12 NO
13 NO
14 NO
15 NO
16 NO
17 NO
18 NO
19 NO
20 NO
21 NO
22 NO
23 NO
24 NO
25 NO
   DATA MENU3;SET MENU3;LENGTH YEAR $ 9; YEAR='1988-1992';
        PROC FSEDIT DATA=MENU3 SCREEN=TEBS.OPT3;
   DATA MENU3; SET MENU3;
   CALL SYMPUT('D1',DIST1); CALL SYMPUT('IN1',INCL1);
   CALL SYMPUT('D2',DIST2); CALL SYMPUT('IN2',INCL2);
   CALL SYMPUT('D3',DIST3); CALL SYMPUT('IN3',INCL3);
   CALL SYMPUT('D4',DIST4); CALL SYMPUT('IN4',INCL4);
   CALL SYMPUT('D5',DIST5); CALL SYMPUT('IN5',INCL5);
   CALL SYMPUT('D6',DIST6); CALL SYMPUT('IN6',INCL6);
   CALL SYMPUT('D7',DIST7); CALL SYMPUT('IN7',INCL7);
   CALL SYMPUT('D8',DIST8); CALL SYMPUT('IN8',INCL8);
   CALL SYMPUT('D9',DIST9); CALL SYMPUT('IN9',INCL9);
   CALL SYMPUT('D10',DIST10); CALL SYMPUT('IN10',INCL10);
   CALL SYMPUT('D11',DIST11); CALL SYMPUT('IN11',INCL11);
   CALL SYMPUT('D12',DIST12); CALL SYMPUT('IN12',INCL12);
   CALL SYMPUT('D13',DIST13); CALL SYMPUT('IN13',INCL13);
```

```
CALL SYMPUT('D14',DIST14); CALL SYMPUT('IN14',INCL14);
CALL SYMPUT('D15',DIST15); CALL SYMPUT('IN15',INCL15);
CALL SYMPUT('D16',DIST16); CALL SYMPUT('IN16',INCL16);
CALL SYMPUT('D17',DIST17); CALL SYMPUT('IN17',INCL17);
CALL SYMPUT('D18',DIST18); CALL SYMPUT('IN18',INCL18);
CALL SYMPUT('D19',DIST19); CALL SYMPUT('IN19',INCL19);
CALL SYMPUT('D20',DIST20); CALL SYMPUT('IN20',INCL20);
CALL SYMPUT('D21',DIST21); CALL SYMPUT('IN21',INCL21);
CALL SYMPUT('D22',DIST22); CALL SYMPUT('IN22',INCL22);
CALL SYMPUT('D23',DIST23); CALL SYMPUT('IN23',INCL23);
CALL SYMPUT('D24',DIST24); CALL SYMPUT('IN24',INCL24);
CALL SYMPUT('D25',DIST25); CALL SYMPUT('IN25',INCL25);
     DATA REPDATA; SET %FINSTAT; FLAG3='LAS';
     PROC SORT DATA=REPDATA;BY BRID;
%IF &SYST=ON %THEN %DO;DATA TEBS.PRON;SET REPDATA;
IF _N_=1 THEN SET MENU3;
LENGTH FLAG $ 4;
    FLAG='PREV';KEEP BRID FLAG DIST YEAR;
%END;
%IF &SYST=OFF %THEN %DO;DATA TEBS.PROFF;SET REPDATA;
 IF _N_=1 THEN SET MENU3;
LENGTH FLAG $ 4;
    FLAG='PREV';KEEP BRID FLAG DIST YEAR;
%END;
DATA TEMP3;
%IF &SYST=ON %THEN %DO;SET TEBS.QDATON;%END;
%IF &SYST=OFF %THEN %DO;SET TEBS.QDATOF;%END;
     PROC SORT DATA=TEMP3;BY BRID;
DATA REPDATA;MERGE REPDATA TEMP3;BY BRID;IF FLAG3='LAS';DROP FLAG3;
DATA REPDATA;SET REPDATA;IF _N_=1 THEN SET MENU;
                         IF _N_=1 THEN SET MENU3;
     PROC SORT DATA=REPDATA;BY DIST RANK;
DATA _NULL_;
SET REPDATA END=EOF;
BY DIST RANK  ;
NPS+1;
FILE LIST1 PRINT HEADER=C;
IF FIRST.DIST OR NPS=6  THEN DO; PUT _PAGE_@; NPS=0; END;
DN+1;
DCOST+CPI;
PUT @5 DIST  HQ. @25 COUNTY $CNTY. @41 RNUM @54 CSS $12.
    @75 WT $WTPIC.
    @113 CPI DOLLAR14.  / /
    @5 'BRIDGE LOCATION: 'FX $20./ /
    @5 'EXISTING FACILITY: 'LOS ' LANE, ' ROWI 'FT ROADWAY'
    @55 ' PROPOSED FACILITY: ' PNL ' LANE, ' PRW 'FT ROADWAY' /
    @5 126*'=';
IF LAST.DIST THEN DO;
 PUT @60 'DISTRICT TOTAL OF ' DN 3. '          CONSIDERED
PROJECTS:'
     @113  DCOST DOLLAR14.  ;
 TCOST+DCOST;
 TN+DN;
 DCOST=0;
```

```
   DN=0;
   END;
 IF EOF THEN PUT @63 'STATE TOTAL OF ' TN 3.
 ' SELECTED PROJECTS:'
 @117 TCOST DOLLAR14.  ;
  RETURN;

C: PUT @39  YEAR @49 SYS '-STATE SYSTEM FEDERAL AID BRIDGE
REPLACEMENT'/
       @54 'AND REHABILITATION PROGRAM'/
       @39 'FINAL LIST OF PROJECTS TO BE SUBMITTED FOR CONTRACTING'
//
       @5 'DISTRICT-HDQRTRS' @25 'COUNTY' @40 'HWY NO'
       @53 'CONT-SECT-STR' @75 'TYPE OF WORK' @116 'ESTIMATED COST' /
       @5 126*'=' ;
 RETURN;
DATA _NULL_;
  SET REPDATA END=EOF;
  BY DIST RANK ;
  S='S';
  NPS+1;
  IF RANK=. THEN COMM1=STATE;
  FILE LIST2 PRINT HEADER=F;
  IF FIRST.DIST OR NPS=6  THEN DO; PUT _PAGE_@; NPS=0; END;
  IF (S='S') THEN DO; A_COST+CPI; AN+1; END;
  PUT @13 W_ADT COMMA7. @27 SR 3. @43 DECO 1.
      @48 SSCO 1. @53 SUBCO 1.
      @57 CPV DOLLAR8. @73 BWR 5.3
      /*@85 SCORE1 3.*/ @95 W_BDL 2. @107 RANK
      @115 A_COST DOLLAR14. / @2 CSS $12. / @13 'COMMENTS: ' COMM1
      / @23 COMM2
      /
      @12 119*'=' / ;
  IF LAST.DIST THEN DO;
     PUT @62 'DISTRICT TOTAL OF ' AN 3.
         ' SELECTED PROJECTS:'
         @115 A_COST DOLLAR14.  ;
     TA_COST+A_COST;
     TAN+AN;
     AN=0;
     A_COST=0;
     END;
  IF EOF THEN PUT @65 'STATE TOTAL OF ' TAN 3.
                  '            CONSIDERED PROJECTS:'
                  @115 TA_COST DOLLAR14.  ;
RETURN;

F: PUT @39 YEAR @49 SYS '-STATE SYSTEM FEDERAL AID BRIDGE
REPLACEMENT'/
       @54 'AND REHABILITATION PROGRAM'/
       @39 'FINAL LIST OF PROJECTS TO BE SUBMITTED FOR CONTRACTING'
//
   @24 'SUFFICIENCY' @39 'CONDITION  RATINGS' @73 'BRIDGE'
   @85 'TEBS' @93 'DETOUR' @103 'DISTRICT' @121 'DISTRICT' /
```

```
   @16 'ADT' @26 'RATINGS' @41 'RDWY SUPR  SUB'
   @59 'COST/VEH' @70 'WIDTH  RATIO' @85 'SCORE   LENGTH    PRIORITY'
   @120 'ACCUM COST'/ @12 119*'=' /;
   RETURN;

        %END;

    /*THIS OPTION OF THE MENU ALLOWS THE USER TO UPDATE THE
PREVIOUSLY
      SELECTED DATA SET OF STRUCTURES PREVION TEBS PREVIOFF TEBS IT
ALSO
      CREATES A BACKUP OF THE LAST ONE TO AVOID PROBLEMS WITH
INDECISION
      ABOUT THE FINAL SELECTION LIST */
      %IF &MEN=4 %THEN %DO;
   %IF &SYST=ON %THEN %DO;DATA TEBS.BUPRON;SET TEBS.PREVION;
       DATA TEBS.PREVION;SET TEBS.PREVION TEBS.PRON;
TITLE 'THIS IS THE CURRENT STATUS OF THE PREVIOUSLY SELECTED PROJECT
LIST
 AS OF THIS LAST RUN';
       PROC PRINT DATA=TEBS.PREVION; RUN; %END;
   %IF &SYST=OFF %THEN %DO;DATA TEBS.BUPROFF;SET TEBS.PREVOFF;
       DATA TEBS.PREVOFF;SET TEBS.PREVOFF TEBS.PROFF;
TITLE 'THIS IS THE CURRENT STATUS OF THE PREVIOUSLY SELECTED PROJECT
LIST
 AS OF THIS LAST RUN';
       PROC PRINT DATA=TEBS.PREVOFF; RUN; %END; %END;
        %MEND MENU;
   DATA MENU; SET MENU;

        %MENU;
```

SOURCE CODE FOR THE PROGRAM PREV
(PREVIOUSLY SELECTED PROJECTS)

```
/*******************************************************************
THIS UTILITY PROGRAM IS DESIGNED TO ALLOW THE USER AT THE STATE LEVEL
      TO PERFORM THE MANAGEMENT OF THE PREVIOUSLY SELECTED PROJECT
LIST.
     IT IS SCREEN INTERACTIVE AND ALLOWS THE USER TO ADD OR DELETE
PROJECTS
      TO THE LIST. A  REPORT IS PRINTED GIVING THE CURRENT STATUS OF
THE LIST.

                      WRITTEN BY : JOSE WEISSMANN
                      ON: MAY 89
      FOR MORE DETAILS REFER TO RESEARCH REPORT 439-4 CTR
CENTER FOR TRANSPORTATION RESEARCH UNIVERSITY OF TEXAS AT AUSTIN 1989

*******************************************************************/

%GLOBAL SYS; OPTIONS REPLACE;
DATA INITIAL ; INPUT FALSE ONOF $; CARDS;
. ON
PROC FSEDIT DATA=INITIAL SCREEN=TEBS.PREV;
DATA INITIAL; SET INITIAL; CALL SYMPUT('SYS',ONOF); RETURN;
/* MACRO TO SELECT THE CORRECT DATA SET FOR THE ON OR THE OFF
SYSTEM;*/
 %MACRO CHOOS;

  %IF &SYS=ON %THEN %DO;
    PROC FSEDIT DATA=TEBS.PREVION SCREEN=TEBS.MODIF;
      DATA TEBS.PREVION;SET TEBS.PREVION;
                   IF BRID= ' ' THEN DELETE;FLAG='PREV';
     PROC PRINT DATA=TEBS.PREVION; VAR BRID DIST YEAR;
      %END;
   %IF &SYS=OFF %THEN %DO;
    PROC FSEDIT DATA=TEBS.PREVOFF SCREEN=TEBS.MODIF;
      DATA TEBS.PREVOFF;SET TEBS.PREVOFF;
                    IF BRID= ' ' THEN DELETE; FLAG='PREV';
    PROC PRINT DATA=TEBS.PREVOFF;VAR BRID DIST YEAR; %END;
      %MEND CHOOS;
DATA INITIAL; SET INITIAL;
 TITLE1 'THIS IS THE PRESENT STATUS OF THE LIST OF PROJECTS NOT TO
BE';
 TITLE2 'CONSIDERED';
     %CHOOS;
```

SOURCE CODE FOR THE PROGRAM FUTURE
(FORECAST OF FUTURE FUNDING NEEDS)

```
/***********************************************************************
  THIS PROGRAM IS DESIGNED TO ALLOW THE USER TO FORECAST THE
BUDGETING NEEDS FOR A NETWORK OF BRIDGES OVER A PLANNING HORIZON.
FOR REHABILITATION AND REPLACEMENT ACTIVITIES. IT NEEDS THE
DISTRIBUTION
OF DECK AREA BUILT IN THE PAST YEARS IN ORDER TO PERFORM THE
ANALYSIS.
THIS DISTRIIBUTION NEEDS TO BE RETRIEVED FROM THE BRINSAP DATA BASE
AND ASSUMES THE FORM OF A SAS DATA SET SQFDON.OUT OR SQFDOF.OUT
FOR MORE DETAILS CONSULT RESEARCH REPORT 439-4 CTR.
THE USER IS PROMPTED WITH SCREENS FOR INPUTTING THE APPROPRIATE DATA

                                          WRITTEN BY: JOSE WEISSMANN
                                               ON: MARCH 1989

**********************************************************************/
OPTIONS REPLACE; libname out 'd:\josew';
data temp; input horiz expan crh crp first agerh agerp  syst $;
cards;
40 1.5 20 35 1988 30 60 on
proc fsedit data=temp screen=out.futin;
data temp; set temp;
call symput('hor',horiz);
call symput('exp',expan);
call symput('rh',crh);
call symput('firs',first);
call symput('rp',crp);
call symput('agrh',agerh);
call symput('agrp',agerp);
call symput('sys',syst);
   %MACRO LOOP;
      %LET YMACR= %eval(&firs-1);
DATA SQF&YMACR;
 %if &sys=on %then %DO ;set out.sqfdon; %END;
   %if &sys=off %then %DO;set out.sqfdoff; %END;
                    IF _TYPE_=0 THEN DELETE; YB=YB+1900;
     KEEP YB ABUILT ;
     %LET I=0;
     %let temp=%eval(&firs+&hor);
     %DO YMACR=&firs %TO &temp %BY 1;
      %LET I=%EVAL(&I+1);
      %LET YMAC1=%EVAL(&YMACR-1);

DATA BL&YMACR (KEEP= YBL BL) DEC&YMACR (KEEP=YB ABUILT)        ;
     SET SQF&YMAC1;
     YEAR=&YMACR;
     AGE =YEAR-YB;
     IF AGE=&agrp THEN DO ; BL=&rp*&exp*ABUILT ;
     RETAIN BL;ABUILT=&exp*ABUILT;YB=&YMACR;
     OUTPUT DEC&YMACR; END;
     IF AGE=&agrh THEN DO; BL=BL+(&rh*ABUILT); YBL=&YMACR;
     OUTPUT BL&YMACR;END;
  /* DATA OUT.SQF&YMACR;SET SQF&YMAC1 DEC&YMACR;IF _N_=1 THEN DELETE;
*/
```

```
     DATA SQF&YMACR;SET SQF&YMAC1 DEC&YMACR;/* IF _N_=1 THEN DELETE;
*/
     %IF &I>1 %THEN %DO;DATA BL&YMACR;SET BL&YMAC1 BL&YMACR ;%END;
     /* PROC PRINT DATA=BL&YMACR; */
/*PROC PRINT DATA=SQF&YMACR;  */
     %LET ULT=&YMACR;
                %END;
  DATA OUT.BL&ULT;SET BL&ULT;
  DATA OUT.SQF&ULT;SET SQF&ULT;
  PROC PRINT DATA=OUT.BL&ULT;
  PROC PRINT DATA=OUT.SQF&ULT;
proc gchart data=out.bl&ult;
vbar ybl/ type=mean sumvar=bl discrete;run;
                %MEND LOOP;%LOOP;run;
```

APPENDIX C
TABLES FOR TEXAS BRIDGE STATISTICS

TABLE C.1. DATA FOR THE DISTRIBUTION OF DECK AREA BUILT FOR THE ON SYSTEM

Year	Area Built	Year	Area Built
1900	6,726	1946	438,002
1901	44,280	1947	2,123,631
1902	216,085	1948	2,881,085
1904	14,736	1950	3,168,282
1905	4,786	1951	1,921,800
1906	15,352	1952	2,149,944
1909	57,240	1953	3,497,863
1910	65,352	1954	3,590,253
1911	5,640	1955	4,159,495
1913	76,080	1956	3,608,440
1914	73,770	1957	5,329,856
1915	130,466	1958	6,685,025
1916	4,474	1959	6,322,597
1917	4,176	1960	5,598,985
1918	17,424	1961	55,560,533
1919	2,796	1962	6,807,115
1920	52,066	1963	5,864,879
1921	131,948	1964	7,029,288
1922	274,765	1965	50,636,791
1923	245,059	1966	6,329,312
1924	287,456	1967	9,649,766
1925	902,068	1968	6,047,176
1926	648,874	1969	7,289,593
1927	395,975	1970	5,845,266
1928	499,963	1971	12,625,076
1929	926,691	1972	8,492,287
1930	2,491,195	1973	7,911,446
1931	2,254,936	1974	6,333,728
1932	1,971,329	1975	5,671,781
1933	2,198,677	1976	5,012,910
1934	2,182,569	1977	4,080,447
1935	1,533,663	1978	4,429,414
1936	1,453,736	1979	3,249,049
1937	2,082,254	1980	3,097,838
1938	2,232,229	1981	4,206,021
1939	2,939,851	1982	3,181,002
1940	1,783,661	1983	2,797,065
1941	1,339,649	1984	4,445,137
1942	1,193,099	1985	2,874,117
1943	737,449	1986	2,401,099
1944	176,719	1987	264,430
1945	166,145	TOTAL	328,000,000

Source BRINSAP/1988

TABLE C.2. DATA FOR THE DISTRIBUTION OF DECK AREA BUILT FOR THE OFF SYSTEM

Year	Area Built	Year	Area Built
1900	397,359	1945	248,947
1901	29,123	1946	116,884
1902	9,721	1947	69,097
1903	5,990	1948	139,173
1904	5,225	1949	46,168
1905	24,960	1950	962,718
1906	4,003	1951	62,395
1907	5,028	1952	168,096
1908	52,844	1953	104,579
1909	13,549	1954	167,353
1910	134,410	1955	700,648
1911	21,961	1956	235,351
1912	20,182	1957	103,057
1913	22,916	1958	14,472,740
1914	80,787	1959	151,083
1915	53,283	1960	4,041,865
1916	20,696	1961	172,501
1917	4,353	1962	309,351
1918	12,006	1963	9,387,790
1919	11,253	1964	26,418,833
1920	275,622	1965	870,333
1921	36,677	1966	152,048
1922	135,324	1967	186,927
1923	39,195	1968	303,460
1924	50,615	1969	299,464
1925	153,001	1970	1,015,954
1926	65,336	1971	141,551
1927	61,534	1972	485,895
1928	154,011	1973	3,283,063
1929	107,924	1974	881,673
1930	1,016,564	1975	708,613
1931	77,534	1976	313,354
1932	193,178	1977	297,743
1933	55,244	1978	424,398
1934	112,394	1979	2,817,745
1935	461,579	1980	506,772
1936	135,137	1981	196,524
1937	124,731	1982	1,341,105
1938	234,180	1983	957,826
1939	233,233	1984	2,867,018
1940	1,384,642	1985	436,664
1941	86,089	1986	58,483
1942	76,821	1987	14,080
1943	58,001		
1944	36,105	TOTAL	82,933,642

TABLE C.3. PERCENTILE SCALING TABLE FOR THE ATTRIBUTE SR (SUFFICIENCY RATING) ON SYSTEM

SR (Sufficiency Rating)	Count	Percent	Percentile Scaling
2	4	0.16	
3	1	0.04	100
5	4	0.16	100
6	3	0.12	100
7	2	0.08	100
8	3	0.12	99
9	3	0.12	99
10	2	0.08	99
12	2	0.08	99
13	4	0.16	99
14	1	0.04	99
15	1	0.04	99
16	2	0.08	99
17	5	0.20	99
18	1	0.04	99
19	3	0.12	98
20	7	0.28	98
21	4	0.16	98
22	5	0.20	98
23	5	0.20	98
24	4	0.16	98
25	1	0.04	97
26	4	0.16	97
27	5	0.20	97
28	9	0.36	97
29	7	0.28	97
30	4	0.16	96
31	7	0.28	96
32	5	0.20	96
33	9	0.36	96
34	7	0.28	95

(continued)

TABLE C.3. CONTINUED

SR (Sufficiency Rating)	Count	Percent	Percentile Scaling
35	9	0.36	95
36	10	0.40	95
37	13	0.52	94
38	20	0.81	94
39	15	0.60	93
40	12	0.48	92
41	12	0.48	92
42	18	0.73	91
43	10	0.40	91
44	13	0.52	90
45	11	0.44	90
46	13	0.52	89
47	23	0.93	89
48	41	1.65	88
49	68	2.74	86
50	63	2.54	83
51	43	1.73	81
52	44	1.77	79
53	48	1.93	77
54	34	1.37	75
55	36	1.45	74
56	40	1.61	73
57	55	2.22	71
58	55	2.22	69
59	57	2.30	67
60	65	2.62	64

(continued)

TABLE C.3. CONTINUED

SR (Sufficiency Rating)	Count	Percent	Percentile Scaling
61	77	3.10	62
62	92	3.71	59
63	93	3.75	55
64	69	2.78	51
65	64	2.58	48
66	65	2.62	46
67	72	2.90	43
68	59	2.38	40
69	72	2.90	38
70	62	2.50	35
71	87	3.51	32
72	131	5.28	29
73	113	4.55	24
74	102	4.11	19
75	95	3.83	15
76	70	2.82	11
77	48	1.93	8
78	75	3.02	6
79	61	2.46	3
80	23	0.93	1
Totals	2482	100.00	