PAKISTAN
WATER AND POWER DEVELOPMENT AUTHORITY

CADPAD

DISTRIBUTION PLANNING

APPLICATION MANUAL

CADPAD AND OVERVIEW
SECTIONS I - II

VOLUME 1 OF 4

WAPDA
POWER DISTRIBUTION WING
LAHORE, PAKISTAN

JULY 1994

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LAHORE, PAKISTAN

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EBASCO

WAPDA-USAID Power Distribution Program

INTEROFFICE CORRESPONDENCE

IOM/12/94/034 July 12, 1994

To : Riaz A. Baig
CE (DP), WAPDA

From : Louis A. Rodriguez
General Manager, EBASCO

Sub : **CADPAD Distribution Planning - Application Manual**

Attached are two copies of a manual entitled "CADPAD Users Application Manual, Volumes I through IV". RE&C, EBASCO Division has developed this Users Application Manual with the support of WAPDA Distribution Planning Engineers.

The manual provides the procedures for the use of the CADPAD software package in planning and designing of the WAPDA power distribution system. The manual describes the various procedures, programs and utilities which will permit the users to develop a load forecast, determine grid station siting/sizing and to perform detailed feeder planning studies using the various planning modules of CADPAD. The manual has been divided into four volumes as follows:

Volume 1 - CADPAD and Overview

Volume 2 - Load Forecasting

Volume 3 - Grid Station and Feeder Planning

Volume 4 - Appendices

The manual is based on the performance of several load forecast and grid station siting/sizing studies and a prototype study of feeder planning undertaken by various WAPDA planning engineers. The manual also serves as a guide to be used in the performance of short and long range planning studies, training programs and as a standard reference on the use of the CADPAD planning modules.

cc: S.A.K. Niazi
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Raytheon Engineers & Constructors Inc. through its various subsidiary companies, is now operating selected acquired assets of Ebasco

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I. INTRODUCTION

I. INTRODUCTION

A. PURPOSE AND SCOPE

The purpose of this manual is:

- To present the planning modules of the CADPAD package and explain their use in planning the WAPDA distribution system.
- To present the philosophy of load forecasting and system planning for electrical power distribution systems.
- To outline procedures that have been developed for data preparation and program application at WAPDA.
- To document details of those procedures.
- To serve as a reference, along with the Users Manuals, for those wanting to learn about CADPAD and how to use it. It is recommended that all users study the applicable sections of this manual before using the programs.
- To serve as a reference for the transfer files, spreadsheets, and utility programs developed for use with CADPAD as well as other useful information.
- To give some examples of data and procedures to help clarify them in the minds of the users.

B. ORGANIZATION OF THE MANUAL

Section II of this manual gives a brief overview of the CADPAD package, including the planning modules as well as the feeder analysis and feeder data storage and manipulation modules. The remainder of the manual describes only the planning modules.

Section III gives general background information on the philosophy of distribution load forecasting using the small-area approach. It discusses the requirements of load forecasting for distribution system planning, the characteristics of customer and load growth, densities, etc. It discusses the components of growth and factors influencing growth, introduces the concept of multi-scenario forecasts, reviews different forecasting techniques, and suggests ways of reducing errors in the load forecast and in the forecast data. It also discusses the use of customers versus land-use as a basis for the forecast, and which forecast module to use for different kinds of areas. It ends with a short introduction to ways of improving or calibrating the base year data if certain kinds of information are available.

Section IV provides the details to organize the necessary data for beginning the development of the load forecast, including grid coordinate systems, load profiles, global customer or land-use forecasts and base year customer data. The base year customer data preparation is by far the most laborious and time-consuming part of the data preparation and detailed procedures are given, including map marking instructions, data entry forms, spreadsheets, VAX utility programs, and transfer files to assist the user in this work. Procedures are also given for checking the data after it is compiled. Data items that are unique to the DLF and SLF modules are also discussed.

Section V gives additional descriptive details about calibrating the base year data, and creating the horizon year customer maps in DLF. This is the heart of the DLF forecast and is the most difficult part of the work. Again the tools of spreadsheets, utility programs, and transfer files are used. There are two options given for creating a Start Year map, which is a map defining what year growth will begin in any empty cell in the base year but with load in the horizon year. One method lets the user manually enter the years and the other is an automated procedure that generates the start years using a weighted random ranking procedure to choose the order that cells will start to have customer load growth. After the DLF forecast is completed, other procedures are given for adjusting the load maps to match known loads from either the FEEDERSITE database loads for the base year (normally these originate in FEEDERDESIGN) or the metered loadings of the Grid Stations in the base year.

Section VI describes the use of the SLF load forecast modules after the base year data is set up according to the procedures of Section IV and the base year customer data is checked. The procedures are different for DLF and SLF from that point onward.

The conversion of customer data to land-use data is explained and sample spreadsheets are given to assist the user. A procedure is given to create a vacant-useable land map which the program requires. Data calibration is discussed and instructions are given on entering other data that is unique to SLF. Two procedures are given for running the actual forecast as follows:

> The first is the standard procedure for forecasting growth for a large urban area, and it follows the procedure outlined in the User's Manual.
>
> The second is a special procedure which does not follow the standard procedure, except at the beginning when the factor maps and preference maps are being set up. The special procedure uses transfer files and one of the VAX utility programs to allow the user to control the areas where growth

occurs, to control the number of cells where growth occurs by limiting the amount of land that can be used in a cell, and to control the concentration or scattering (with respect to the highly preferred areas) of the cells receiving growth.

Section VII discusses the general approach to Grid Station planning and introduces the SUBSITE module of CADPAD which is used for Grid Station planning. The SUBSITE data requirements are presented and each type of data is discussed. There is a sub-section explaining how the program works, one sub-section on the results output from the program and another which outlines the major steps of a typical application. The section ends with a summary of what the program does and a summary of the required and optional input data.

Section VIII lists the input data items and identifies the sources of the data used in a SUBSITE study of one of the WAPDA operating Divisions. The major part of the Section consists of the step-by-step procedure of entering the SUBSITE data, showing the program menus and prompts, and the user responses.

Section IX presents a step-by-step example of using SUBSITE to plan the future Grid Stations of a study area, showing the program menus and prompts, and the user responses.

Section X discusses feeder planning and introduces the FEEDERSITE module of CADPAD which is used for feeder planning and for fine-tuning the Grid Station plan from SUBSITE. The FEEDERSITE data requirements are presented and each type of data is discussed. There is a subsection on how to use the different constraint and optimization options available in the program, one on how the program works, one on the results outputs from the program, and another which outlines the major steps of a typical application.

Section XI presents a step-by-step example of using FEEDERSITE to plan the feeders of a study area, giving the program menus and prompts, and the user responses.

Section XII discusses the transfer of the bus and loads data between FEEDERSITE and LOADSITE using the NODESIM module of LOADSITE. The normal procedure for this load transfer is given, and a special procedure is also given for use in cases where the NODESIM capacities for handling multiple buses in small-areas are exceeded.

The Appendices contain reference materials for the tools which are available to assist the user in data preparation, program application and results processing.

Appendix A discusses the use of transfer files in the CADPAD modules and gives a list of the transfer files available. For each transfer file, a description, including what needs to be done before running the transfer file and what the transfer file

produces, and a listing of the transfer file are given. The transfer files are presented in alphabetical order.

Appendix B discusses the use of spreadsheets in the planning process and presents a description and an example of each one. They are in alphabetical order.

Appendix C presents the VAX utility programs which were developed, using FORTRAN, to assist in data preparation and processing. A description and a listing of each program is given, in alphabetical order.

Appendix D describes some useful commands and procedures available on the VAX for transferring files to and from the PC, for sorting and comparing files, for capturing screen sessions, and for using the VAX Editor. A section of a VAX Editor manual is included for those wishing to learn more about the VAX Editor.

Appendix E presents the CONVERT program, used on the PC to convert from one coordinate system to another, normally from Geodetic coordinates (latitude and longitude) to Lambert coordinates (those used on the SOP maps). The input parameters needed to use the program are given and a step-by-step procedure is given, including the program menus and prompts and the user responses. A copy of the User Guide is also included.

C. LOAD FORECASTING

Sections IV, V and VII give procedures for preparing the base year data for load forecasting. These procedures were developed to take advantage of the data that are available within WAPDA, and to avoid having to collect land-use data, which is commonly used but which would take much field work to compile for the WAPDA areas.

The data available basically consists of power consumption by customer class for each batch, available in data files on the VAX computer. At the Divisions, batches are marked on maps, village totals are entered on forms, and industrial customers are identified. The procedures, using transfer files, spreadsheets, and utility programs were developed to help the user bring all of these data together in a LOADSITE database, so the forecast can be run.

Some may consider this process to be complicated but it is the best way to use the available data, to give the most accurate basis for developing the forecast. The process also divides the work into manageable tasks so that the users are not overwhelmed with the magnitude of data and work involved.

WAPDA personnel are investigating alternate ways to accelerate the development of databases and load forecasts. The WAPDA engineers have gone through a process that uses the most accurate and detailed data available, and understand the process and the data involved and the results desired, and as a result they are in a position to use short-cuts and to understand the effects on the results of any changes that they may have considered. The procedures in this manual are only a set of tools to achieve an end.

Figure I-1 shows two possible paths for developing a load forecast. On the left hand side of Figure I-1 are the steps of the procedures presented in this manual and on the right hand side are the steps of an alternate to that procedure.

One way of developing the base year load maps is to use the load map which can be created by NODESIM when the bus data is received from FEEDERSITE. Section V.J.1 describes the use of this map in adjusting the forecast load maps so that in the base year the load map matches the load map from FEEDERSITE. . In other words, if that procedure is followed, the base year load map is the same as the load map from FEEDERSITE, and the future load maps are adjusted by the same amount as the adjustment that was made in the base year load map.

The FEEDERSITE base year loads normally come from FEEDERDESIGN where a procedure is available for allocating Grid Station or feeder loads to the nodes or buses, based on the connected transformer kVA at the buses. This information is created at the time the feeders are digitized using the WIDGIT program. In the future, information will come from the WIDGIT/RDB database. In the future there may also be some way of getting actual transformer loads into the FEEDERDESIGN and FEEDERSITE databases. That would be ideal for creating the base year load map.

The user might ask why we go to all the work of creating customer data if we can create a base year load map directly from FEEDERDESIGN/ FEEDERSITE data. The answer is that for the base year that would be fine, but in order to forecast the future growth, the most accurate way is to forecast each customer class annual growth and then convert each class to customer class load.

If a satisfactory way could be developed to forecast loads without the customer data then customer data could be avoided. For example, the future load maps might be developed from the base year load map using the functions available in Map Mathematics of LOADSITE. First, the user would have to define the rules of load growth and then use Map Mathematics to implement those rules. It may be that the rules cannot be applied using only Map Mathematics but that a FORTRAN program could be developed to apply the rules and create the future load maps.

Again, this approach would involve more assumptions and be less accurate, but the increase of speed in getting results might justify that loss in some cases.

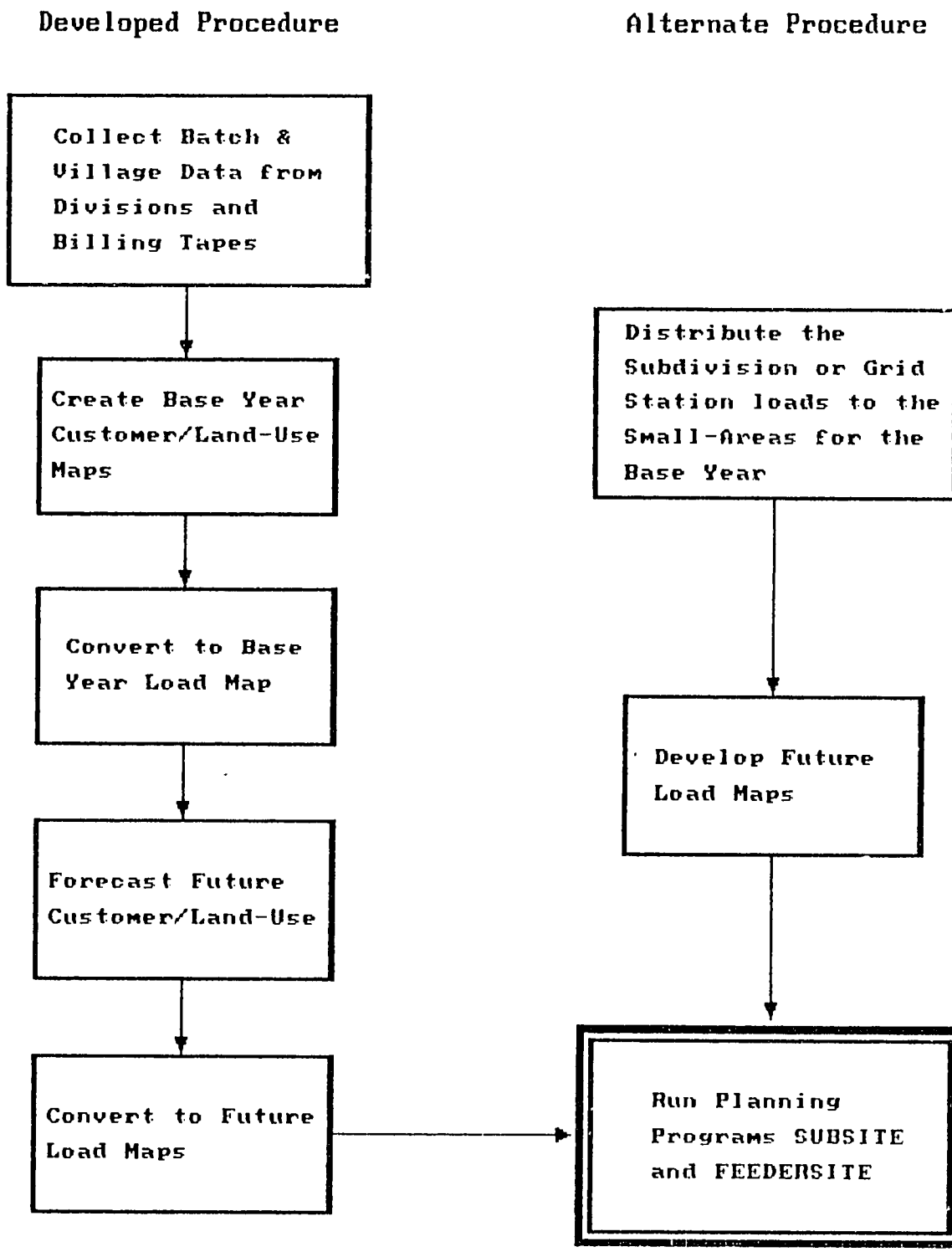

FIGURE I-1 - POSSIBLE PATHS FOR DEVELOPING A LOAD FORECAST

D. ECONOMIC EVALUATION

The SUBSITE and FEEDERSITE programs give the economics of one particular study year at a time. In order to evaluate the economics of a complete expansion plan, and to compare the economics of alternative expansion plans, it is necessary to translate the economics of all the study years of a plan to a common basis and get a total for comparison. The usual method of comparing costs that occur at different years is to use future worth, present worth, or a combination of the two, to convert all the costs to an equivalent worth at some common point in time.

The user has two alternatives for doing this. One is to use the Economics module of SUBSITE, and the other is to use a spreadsheet set up to perform the calculations. The spreadsheet PWECON, described in APPENDIX B, has been provided. The user should study the spreadsheet and the Economics module of SUBSITE and decide which one to use. The spreadsheet is easier to use and has the advantage that the costs can be entered in terms of base year costs, whereas in SUBSITE the user will need to determine the future costs manually or by setting up a spreadsheet to compute the future costs.

II. CADPAD OVERVIEW

II. CADPAD OVERVIEW

A. COMPUTERIZED DISTRIBUTION MAPPING AND PLANNING SYSTEM

The specifications of WAPDA's mapping and planning system were identified in the Distribution Mapping Report. Based on these specifications, WAPDA proceeded to procure the complete CADPAD software (Computer Aided Distribution Planning and Design) and the required computer hardware and peripherals. The CADPAD software was identified to support WAPDA's mapping database and make the baseline distribution network data available to the Planning Engineers for feeder analysis, load forecasting, substation siting and sizing and detailed area planning studies.

WAPDA Distribution Planning Headquarters is equipped with two DEC VAX-3800 minicomputers with a combined disk storage of about 6 Megabytes. The systems interface with the users with high quality color graphics Tektronix 4207 terminals. For digitizing, one top quality Tektronix 4211 color graphics terminal is attached with each machine. The Tektronix 4211 terminals interface with two Calcomp 9100 A0 size digitizers. Two Calcomp plotters are also attached with the DEC machines for plotting maps. In addition high speed line printers are available for hard copy outputs of the results of various CADPAD modules.

DEC VAX-3800 minicomputers with color graphics terminals, line printers, plotters and digitizers have been installed in all the eight Area Electricity Boards with the exception of Quetta AEB. The Quetta AEB installation has a DEC VAX-3600 machine instead of a DEC VAX-3800 machine.

1. WAPDA Mapping System

The requirements of WAPDA Mapping database were first ascertained and documented in the Distribution Mapping Report developed in 1987. It has since, been revised and updated to make it compatible with WAPDA's evolving requirements. The Mapping Report comprehensively describes WAPDA's Distribution Mapping System. It covers the following main areas:

- Mapping of WAPDA's Distribution Feeders (Both HT and LT) by contractors
- Map Updating Procedures and Maintenance of the Mapping System
- Computer Hardware and Software required for building and maintaining Mapping Database and Maps

- Surveying/Drafting Equipment required by WAPDA

- Manpower required by WAPDA for the Mapping System

USAID commitment of funds for the development of WAPDA's Mapping System was about thirty million US dollars. Bids for mapping were submitted in 1990. After negotiating the rates and settling the terms and conditions, WAPDA signed contracts with four contractors in 1991 for distribution system mapping. These contractors were:

- GEONEX
  Lahore and Gujranwala AEBs

- ICC
  Islamabad and Peshawar AEBs

- Black & Veatch / Techno-Consult
  Faisalabad and Multan AEBs

- TECHRED
  Hyderabad and Quetta AEBs

Later Black & Veatch / Techno-Consult were disassociated from the contract and their share of the work load was distributed between TECHRED and GEONEX. The contractors were to provide WAPDA with Distribution Record Maps (DRMs) on various scales, Key Maps of completed Divisions and database on magnetic tapes according to the specified WRDTP formats. WAPDA is building up its mapping database by reading tapes provided by the Contractors.

The mapping database built up at each Area Electricity Board will be used for feeder analysis / rehabilitation, system expansion and area planning. Mapping Directorate has been set up at the Distribution Planning H/Q at Lahore and engineers have been assigned at Area Electricity Boards for handling the mapping work. Data collected will also be used by Accounts and Inventory for assets accounting and costing etc.

2. WIDGIT and WRDTP, AM/FM - Circuit Digitizing and Database

WIDGIT is the program which in the past was used to digitize feeder circuit data into a WIDGIT database, to be used by the FEEDERDESIGN program. It provided an efficient way of entering the data needed for circuit planning, analysis and design.

WRDTP AM/FM is the new digitizing and mapping program developed for WAPDA. It utilizes a Relational Database (RDB) and stores and accesses much more data than the original WIDGIT program. Although WRDTP AM/FM will be used for other tasks, one of its functions is to do the job that WIDGIT was performing in the past -to provide feeder circuit data to the FEEDERDESIGN program. It has the capability to retrieve data from its database and create direct-access FEEDERDESIGN Case Study Files which can be directly accessed by that program.

WIDGIT was the original mapping package offered with CADPAD. WAPDA enhanced the specifications of WIDGIT and placed order on the suppliers ABB-ADD to develop a full fledged relational database management mapping package. The term AM/FM is the industry standard for Automated Mapping / Facility Management. The enhanced WIDGIT version, the WRDTP installed at WAPDA computer sites allows the users to develop a relational database of WAPDA's mapping system comprising the HT and LT networks and comprehensive background geographical information.

The WRDTP AM/FM package has enhanced capacities with one electrical layer comprising HT information and ninety nine geographical layers capacity. At the present moment, 17 of the ninety nine layers are being used to store a variety of background information required by mapping and planning personnel.

Data in WRDTP is stored in a specific format which is known as WRDTP format. WRDTP stands for WIDGIT Relational Database Transfer Program. The WRDTP formats consist of a number of different type of information cards with each card having different types of field with varying capacities. The type and length of data fields is determined by the kind of information contained in them. The data fields may contain information pertaining to equipment capacities, line length, X-Y coordinates, conductor types, labels, node numbers, unique identifiers and many others.

The WRDTP is built around DEC's RDB package which is known as Datatrieve. The DEC package is fully installed at the Distribution Planning Headquarters machine and its kernel software is installed at all the Area Board computer systems. This enables WIDGIT RDBMS to run on all the systems. WAPDA users were provided comprehensive training on the DEC RDB and also on the capabilities of the WRDTP AM/FM package. These training sessions were conducted during 1992 and 1993.

WRDTP is a true AM/FM (Automated Mapping and Facilities Management) package and greatly enhances WAPDA's efforts to automate and integrate its mapping and planning functions.

WRDTP is the format structure under which all electrical and geographical information is stored by the program. A number of WRDTP data cards have been designed to accommodate the information specified in the WAPDA Mapping Database. In 1991 WAPDA entered into contracts with several contractors to inventory, field survey, plot maps and provide all the mapping information to WAPDA on magnetic tapes in the specified WRDTP formats. WAPDA reads the magnetic data tapes on its computer systems and gradually builds up its mapping database. All Area Electricity Boards will have information on their HT and LT system whereas the Headquarters will have information on the entire system which was surveyed and ma ped. WRDTP program enables WAPDA to build up the mapping database from the information collected and provided by the mapping contractors on the specified formats.

3. Capabilities of WRDTP AM/FM Package

CADPAD's enhanced mapping module WRDTP AM/FM is a far more advanced package than the original WIDGIT which WAPDA used during the initial stages of computerization. The mapping system can be built up in the current program by two methods. First one of these methods is by digitizing the available maps. But digitizing is a comparatively slow method recommended only for map updating and not for entering complete mapping information from scratch. The other method is by reading mapping files prepared in ASCII in the specified WRDTP data formats. These formats were supplied to the mapping contractors after the signing of the contracts and the contractors developed the magnetic data tapes comprising mapping information according to these formats.

At the WAPDA computer installations, the data tapes were copied on to the disk and then read through the WRDTP program to convert it to the mapping database. The program is capable of generating logical errors as well as errors in the data formats. Error free files are accepted and converted to mapping databases and files with errors are returned to the contractors for corrections. In this way WAPDA mapping database is built up.

The WRDTP allows the user to change or modify defective data either by digitizing or by editing. The editing functions provided are powerful and flexible and the user may fetch any kind of data for on screen editing. Similarly powerful editing tools are available while digitizing. An excellent feature of the program is user defined display and plot choices. The user may display or plot any or all layers or any selected number of layers of information. He may also select specific feeder(s), windows defined by coordinates or any defined

polygon(s) for displaying or plotting information selectively. This allows for viewing map information or plotting maps according to requirements of different users or for various end uses. For example, load forecasting and planning engineers and inventory personnel have widely varying requirements for viewing information. All these requirements can easily be catered for in the WRDTP program.

Another enhanced feature of the WRDTP AM/FM is the powerful Report Generator. The Report Generator allows the users to define their reports on virtually any piece of information comprising the mapping database. After selecting the information, the user can define the report format exactly as he requires it. Using the Report Generator facility, the user can design tailor made reports suiting specific needs extracting data from any table. Moreover, the data can be extracted in many different ways by using logical and mathematical operators. Further specifications can be applied by limiting the data to a certain layer, feeder, polygon or user defined coordinate window. The report comprises data in columns followed by summarized information. The choices of selecting columns and their placement lies with the user. The report formats designed by the user may be saved permanently for later use. Report formats once defined can be modified or deleted should they become obsolete. The selection of tables and columns is through entering the appropriate numbers as these are displayed on the screen menus. Eighteen predefined reports have been included for use and reference. The reports may be listed on the screen, sent to a printer for hard copy output or stored in files to be reviewed or printed at a later stage.

For example if the user wishes to list distribution transformers in a data file, he can limit the report by defining the output to show only those transformers below or equal to 100 kVA capacity or above 100 kVA capacity or between 100 and 1000 kVA capacities. At the same time he can impose other limitations by requesting that the information be confined to only one or more of the feeders in that particular mapping database. These capabilities are of immense use to WAPDA because users from different departments like Planning, Accounts and Inventory can define their own reports to get desired information from the common mapping database. This enhanced feature of the mapping database will be used by several users from various departments to perform different jobs like Fixed Assets Accounting Verification and cross checking of Inventory Data.

This Manual does not cover the use of WIDGIT or WRDTP.

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B. WAPDA PLANNING SYSTEM

CADPAD is a modular package of programs developed for the electric utility industry. The name is an acronym standing for Computer-Aided Distribution Planning and Design. Figure II-1 shows the different modules of CADPAD, and their relationship to each other and to other programs outside of CADPAD. With these modules, a wide range of work can be done, from long-range Grid Station planning to very detailed analysis of feeders to determine load flows, short circuits, voltage profiles, power losses, etc.

The modules are WRDTP AM/FM, FEEDERDESIGN, FEEDERSITE, LOADSITE, SUBSITE, and CADPAW. Although CADPAW is not part of CADPAD, it can receive data from the FEEDERDESIGN program and database via ASCII Card Image files. This may become a significant benefit if CADPAW continues to be used specifically when the mapping database development is completed. Data for any feeder in the WAPDA system could be brought into CADPAW from WRDTP via FEEDERDESIGN.

1. FEEDERDESIGN - Feeder Analysis and Design

FEEDERDESIGN is the feeder analysis and design module of CADPAD. It uses a direct-access database file normally created by WIDGIT or WRDTP, and can send data to the CADPAW program and to the LOADSITE and FEEDERSITE modules of CADPAD via ASCII Card Image files.

FEEDERDESIGN will use Case Study Files created by WRDTP. It has data editing capability (the same as in the original WIDGIT) with which the user can edit the WRDTP database or FEEDERDESIGN case study files. It also has tabular and graphical displays, printout, and plotting capabilities.

FEEDERDESIGN has data manipulation features, including load creation, which creates loads on the buses of a feeder based on the connected kVA at the buses and the metered load for the feeder as supplied by the user. Switching, reconfiguration and feeder type changes can also be done easily in the program.

The design and analysis features of FEEDERDESIGN include single and three-phase load flows, short circuit analysis, protective device coordination, and capacitor application.

FEEDERDESIGN can receive feeder segment data as well as switching and conductor changes from the feeder planning module FEEDERSITE. This allows the user to do detailed analysis of feeder plans that have been determined using that program.

This manual does not cover the use of FEEDERDESIGN.

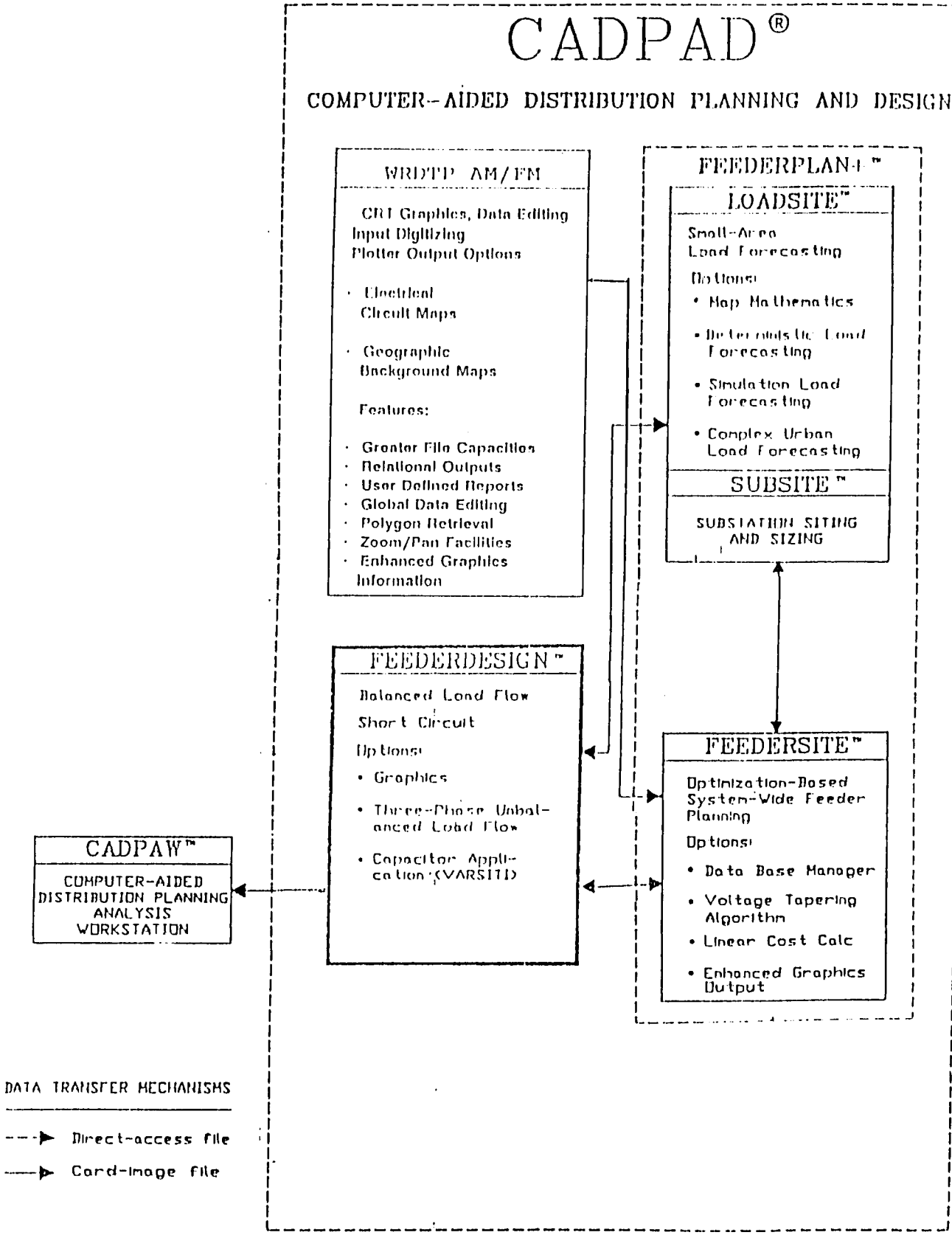

FIGURE II-1 - CADPAD OVERVIEW DIAGRAM

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C. THE PLANNING MODULES

LOADSITE, SUBSITE, and FEEDERSITE are the planning modules of CADPAD and together are sometimes, as a group, referred to as FEEDERPLAN. LOADSITE provides the load forecast, SUBSITE determines/plans the Grid Stations size and location based on the load forecast, and FEEDERSITE completes the planning by analyzing the SUBSITE Grid Station plan but also including the feeder network. There are some approximations and assumptions built into these modules and if the planner wants a detailed analysis of his short-range results he can transfer the planned system back to FEEDERDESIGN for final detailed analysis.

1. LOADSITE - Load Forecasting

There are two different versions of LOADSITE available. Both versions provide access to the SUBSITE program and both include the NODESIM module for transferring loads from LOADSITE to FEEDERSITE or to FEEDERDESIGN.

The details of the LOADSITE data and operation are given in Sections IV, V, and VI, so only an overview is given here.

Both versions of the program include three models: the first is a Global Model which contains a global or system-wide forecast of customers or land-use by customer class; the second is a Load Model which defines the daily load profile of each customer class; and the third is a Spatial Model which contains up to 65 maps of information on a geographical small-area grid. Spatial data required by both versions includes the base year customer counts or land-use for each customer class.

a. DLF - Load Forecast Module for Rural Areas

DLF is designed for use in rural areas which may include towns and small cities. This is the simpler of the two versions and requires, in the Spatial Model, only a base year customer or land-use map for each customer class, a horizon year customer or land-use map for each class, and a Start Year map telling when growth will start to occur in an initially vacant small-area. The program forecasts five iteration years or forecast years of customers or land-use between the base and horizon years and then converts all years to load maps.

b. SLF - Load Forecast Module for Urban Areas

SLF is designed for forecasting growth in large urban areas. This is the more complex of the two versions and requires more spatial data and data defining the dynamic growth factors that the program uses to decide where the growth will be allocated. The user supplies the base year customer or land-use maps for each customer class, as in the DLF version, but not the horizon year maps because the program will determine where the horizon year growth will be. However, the user must supply other Spatial data such as highway, railroad, and water, maps to help the program define the preferred areas for growth. The user must also define areas of positive or negative attraction for growth and must tell the program how important different growth influences are to the growth of the different customer classes.

Before running the SLF forecast, the user must convert customer counts (if that is the data he is using) into land-use, and must define or compute the vacant-useable land in each small-area for the base year. The program will assign growth of a class to the small-areas having the highest preference for the class, but only if there is land available in those small-areas.

2. SUBSITE - Grid Station Planning

SUBSITE is used to determine the future sizes and locations of Grid Stations, including defining the years that they should be built and/or expanded. The user supplies the substation data, cost and impedance data etc., and the program evaluates the ability of that system to serve the loads, using the LOADSITE load map for the year being studied.

The user defines a set of Grid Stations for a study year, including locations and sizes, and specifies any constraints he wishes to apply, and the program determines the loadings and costs, and estimates voltage drops and losses for the given set of Grid Stations and constraints.

By modifying the Grid Station sizes and locations, based on results of a previous case, in a trial-and-error manner, the user can determine the best set of Grid Stations for the year being studied and for the constraints he wishes to impose.

Normally, the user should determine the best set of Grid Stations for the horizon year first, and then use subsets of the horizon-year-set for the intermediate years, determining when capacity should be added at the different Grid Station locations.

SUBSITE does not require feeder circuit data, but instead synthesizes a feeder network for each case analyzed. Thus, the results are estimates based on that synthesis, and when a plan, perhaps with several alternatives, is completed the results of the short-and-medium-term years should be taken to FEEDERSITE for a more detailed evaluation with the actual feeder system.

3. FEEDERSITE - Feeder Planning with Grid Stations

FEEDERSITE is the module where the Grid Station plan is merged with the feeder circuit data to do the more detailed planning for the short-and-medium-term study periods. It can also be used to analyze the existing system, comparing the existing feeder conductors and switching configuration with other configurations suggested by the program.

FEEDERSITE has the capability of handling a large system representing many feeders, and groups of Grid Stations, and this is the way it should be used. The program can identify a larger number of improvements for the system if a larger number of possible connections are available between feeders of different Grid Stations.

In addition to the existing circuits, the user can identify any number of possible connection points between feeders or between parts of a feeder. The program can then decide which of these possibilities would be beneficial and use them in the solution. Those that are not beneficial will not be used. The same approach is used in new service areas. Possible feeder segments are entered for the area and the program can decide which ones should be built.

Different options are available for the feeder optimization. The program can design a system for minimum load times feeder length (one factor in reliability), for minimum load times impedance (which gives the lowest sum of voltage drops in the system), or for minimum cost (including costs of losses and costs of upgrading feeder conductor types).

Results of the feeder plans from this module can be sent to FEEDERDESIGN for detailed analysis and design.

PAKISTAN
WATER AND POWER DEVELOPMENT AUTHORITY

CADPAD

DISTRIBUTION PLANNING

APPLICATION MANUAL

LOAD FORECASTING
SECTIONS III - VI

VOLUME 2 OF 4

WAPDA
POWER DISTRIBUTION WING
LAHORE, PAKISTAN

JULY 1994

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III. LOAD FORECASTING FOR DISTRIBUTION SYSTEM PLANNING

III. LOAD FORECASTING FOR DISTRIBUTION SYSTEM PLANNING

A. GENERAL

Distribution planning involves determining the locations, capacities, and installation dates of future subtransmission lines, Grid Stations, and feeders. Therefore, distribution load forecasting must predict location, magnitude, and timing of load growth, with sufficient resolution (accuracy and precision) for use in distribution system planning. Three aspects of resolution must be considered when developing a planning study; when, how much and where. The following describes each aspect:

- **Where** Resolution in space is needed in order to locate Grid Stations and feeders.
- **How Much** Resolution of magnitude and density is needed in order to size Grid Stations and feeders, and to help determine voltage levels.
- **When** Resolution in time is needed in order to determine the date of installation of Grid Stations and feeders.

Locating load growth is accomplished by dividing the service area into a number of small-areas and forecasting the growth of load in each one, thereby giving a forecast of all small-area loads.

LOADSITE, the load forecasting module of CADPAD, uses a uniform grid of small-areas which are also called cells. This cellular method is more complex than equipment-based methods (for example by feeder service area) and may even be less accurate in the short term. However, it is much more accurate in the medium and long term and when applied properly is fully capable of providing the required planning resolution.

1. Characteristics of Distribution Growth

For a large area such as a big City or a Circle, the growth over time can be predicted by conventional techniques such as extrapolation and regression. One of the methods is illustrated in Figure III-1.

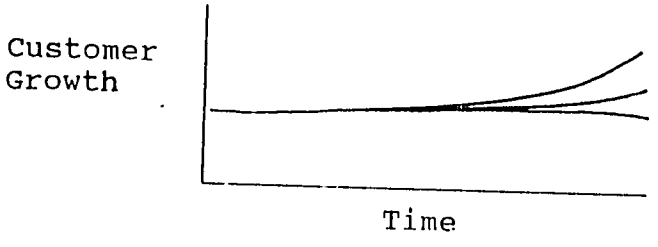


FIGURE III-1 - GROWTH OF A LARGE AREA

As the user begins to subdivide a large area into smaller areas, the growth will begin to look different for different parts of the large area and, as the small-areas get smaller, the differences get more pronounced.

Experience has shown that as the size of a cell gets smaller, the typical growth pattern will change from the smooth, long term growth of Figure III-1 to an "S-curve" pattern shown in Figure III-2. The size of cell giving this desired growth pattern may vary from 10 acres to 160 acres (which corresponds to a cell width of from 1/8 mile or about 200 meters, to a cell width of 1/2 mile or about 1000 meters).

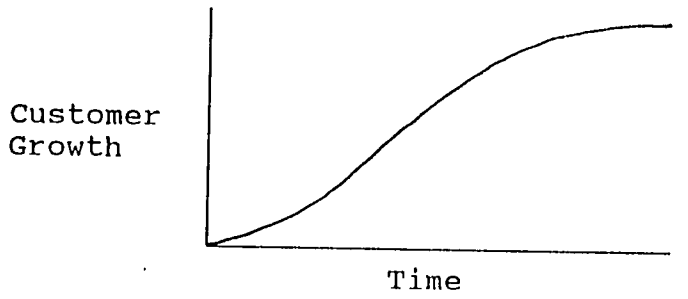


FIGURE III-2 - S-CURVE GROWTH PATTERN OF A TYPICAL CELL

If the cell size is reduced to a very small size, the S-Curve becomes a step function as shown in Figure III-3.

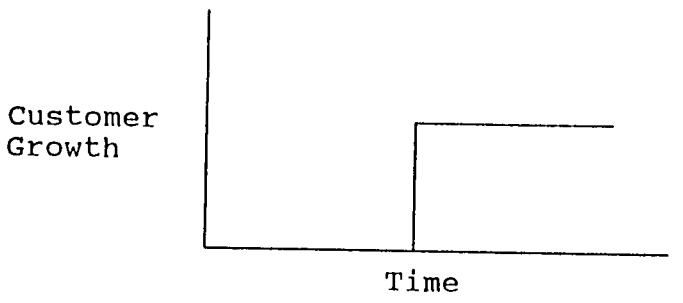


FIGURE III-3 - GROWTH PATTERN OF A VERY SMALL CELL

Different cells will be at different stages of the S-curve development. At the beginning and end of the S-curve pattern, growth will be slow. In the middle of the S-curve pattern growth will be at a maximum. Extrapolation of growth will not work for cells of this size but cells of this size are needed to give the resolution necessary for distribution planning.

The LOADSITE modules are designed to handle the customer and load growth for the appropriate sizes of cells.

2. Densities of Distribution Loads

Load density also varies throughout a study area. The most important determining factor of load density is land-use (or how many and what kind of customers occupy the cell). Industrial, commercial, and residential areas have different load densities and load profiles and these can also be broken down into subcategories of those customer types. In some areas Tubewells may be added as a class.

Load density will be zero for cells with no customers and will peak when the land is fully used or the maximum customers limits are reached, unless the consumption of load per customer is still increasing after customer saturation is reached.

3. Components of Growth for a Class

Load growth has two basic components which are easily and logically separated:

- New customers that are added to the service area, replacing past customers or locating in previously vacant areas. A special case of adding new customers is the electrification of existing villages.

- New or increased uses by present customers. Customers may add new uses such as TV's, heaters, air conditioners, more lighting, etc. They may also extend or alter the time of usage into a time which could add to the peak load. It is also possible that some uses could be deleted or reduced.

4. Factors Influencing Load Growth

Load growth is affected by many factors such as the economy, tariff structures which may include incentives or penalties, making the development of the forecast difficult. This is further complicated on a local distribution level because other factors such as transportation and local employment also have an impact.

Transportation is one key to land development. A new highway or bridge can have a major impact on growth patterns.

Employment is also important. The location of a new factory will influence the location of other kinds of customers.

Other factors can also be important. Availability of amenities, utilities, transportation services, and security can be incentives for development.

When preparing the data and running a forecast, the user must keep the above mentioned factors in mind and make changes and adjustments to data and procedures when appropriate.

Of course development will not occur unless there is land that can be developed or redeveloped to some other use. Therefore land availability is of prime importance.

5. Multi-Scenario Forecasts

It is difficult to predict some of the causal factors of growth, so a multiple scenario approach is recommended. The user should run a base forecast with the factors he thinks are most likely to occur, and then alternate forecasts are analyzed, varying the factors that are most likely to change, or that will have the most impact if they did change from the base forecast. In that way the effect of changes in the basic assumptions can be determined and the impact on the future distribution system plan can be evaluated.

For example: Will the new highway be completed?

Run one forecast for the "yes" scenario and another for the "no" scenario.

For example: Will the Toyota plant be built? Where?

Run one forecast for the "no" scenario.

Will the plant be built at Site A or B?

Run a second scenario using Site A and a third for Site B.

Some possibilities are too important to ignore. Since it is impossible to forecast some of them it is necessary to run alternative scenarios in order to be prepared with knowledge of whichever way it goes. Much of the growth may hinge on which way it goes.

6. Review of Forecasting Techniques

There are a wide number of forecasting methods falling into two broad categories; analytic and non-analytic. Non-analytic should be mentioned because some forecasts for distribution planning have some basis in these methods. For example, the government may decree an economic development plan and predict

what the resulting growth will be in industry, commerce, etc. The global forecast of a study area must take such things into account or even be controlled by them.

a. Trending Methods

A common analytical technique for forecasting is trending, where the forecast is based on some analysis of past growth trends. The simplest trending technique is pure extrapolation where the future rate of increase is assumed to be the same as the latest observable rate of increase. Although this is the simplest technique, it is also the most prone to error because it is based on the least amount of information.

Regression is another form of trending and is similar to extrapolation but is based on more points of information. In this technique a polynomial is fitted to the data for a chosen range of time and then that polynomial is extrapolated to give the forecast. This may be useful in determining a global forecast for the LOADSITE Global Model but should not be used for forecasting individual small-area loads because it does not handle the S-curve growth pattern well, it fails in vacant areas, it does not respond to causal factors and so cannot be used in multi-scenario studies, and the two components of growth discussed in Section III.D cannot be tracked separately. When using this technique it will help to use a logarithmic, cubic function of the form $\log(\text{load}) = at^3 + bt^2 + ct + d$, to use six years of data, and to use a horizon year estimate (even if it is just a guess) as a check and control.

There are other trending methods that are more complex but they all fail to address the needs of small-area load forecasting previously mentioned.

b. Land-Use-Based Methods

These methods use a combination of land-use (customer class) pattern recognition and load curve definition to model changes in load usage. The two load forecasting modules of CADPAD, DLF and SLF, use these methods. Refer to Section III.D and Sections V and VI for details on these modules.

In DLF the user models these by defining the base and horizon year land-use (customer locations) by class, and the base and horizon year load profiles by class.

In SLF the pattern recognition is done by the program algorithm combined with the user definition of the controlling weighting factors and proximity functions, and with the data definition of the physical factors of the study area such as highways and location of the existing customers. The load profile changes through time are modelled by the user in the end-use profile growth rates. These are combined into the class profiles and can be used to model separately the loads and growth rates of different components of growth such as heating, air conditioning, lighting, motors, etc.

In both DLF and SLF the two components of growth in the number of customers and growth of load per customer are decoupled and separately controllable.

Although the land-use based methods are simple in concept, they require a lot of work in data preparation. Without computers the data preparation and forecasting would be much more difficult. With computers the difficulties are justified by the accuracy and usefulness of the resulting long-range planning.

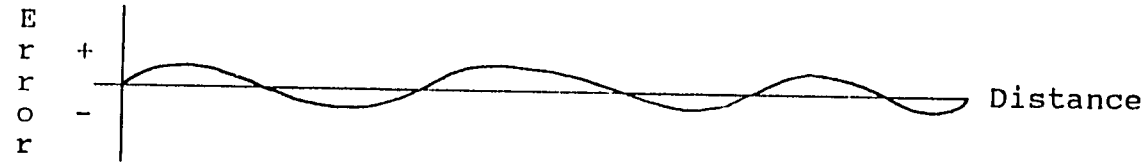
B. REDUCING ERROR IN LOAD FORECASTING

It is said that the first rule of forecasting is that as soon as a forecast is completed, it is wrong. However, if the forecaster recognizes that and understands why it may be wrong, how it may be wrong, and how much it may be wrong, then the forecast can fulfill its purposes completely.

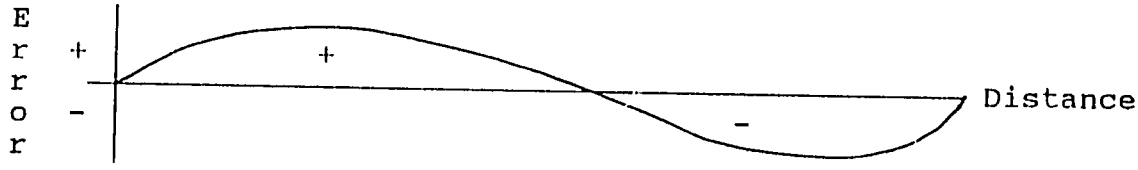
Some kinds of error are serious which can be allowed for or compensated for. The forecaster should attempt to eliminate and reduce those errors that will affect the usefulness of the results but he must also use his time wisely and not waste time on eliminating errors that are not significant or that do not affect the usefulness of the results.

1. Spatial Frequency of Error

Error may be considered to be either positive or negative. Error frequency in this context is a way of expressing the distance spacing between the areas of positive and negative error. Figure III-4-a represents high frequency error and Figure III-4-b represents low frequency error. Low frequency error is more serious even though in both cases it is possible that the sum of all error may be zero or nearly zero.



a. High-Frequency Error



b. Low-Frequency Error

FIGURE III-4 - HIGH AND LOW-FREQUENCY SPATIAL ERROR

Low-frequency error is more serious for two reasons:

- The magnitudes of low-frequency errors tend to be greater in some individual cells.

- The accumulation of error is greater in some areas. This is the most serious case as can be seen by considering the case of one Grid Station located in the center of a large area with positive load error, and another Grid Station in the center of a large area with negative load error. The first Grid Station would be sized too large and the second would be sized too small if such forecast load maps were used to plan the Grid Stations. If there were high frequency error this problem would not occur because within each Grid Station service area the high frequency errors would cancel each other out.

High-frequency error often occurs in the land-use or customer data preparation. For example, if customers are put in an adjacent cell by mistake (or by the decision criteria), the error in one cell would be positive and in the other it would be negative. Even if these errors occur in every cell, it is high frequency error and is not serious. That means that for Grid Station planning, extra time should not be spent trying to get customers in exactly the right cell because the planning results will not be affected and the error will probably be canceled by other errors. For feeder planning, more care should be taken because the feeder elements are more sensitive to load location.

Low-frequency error may occur because of the limitation of the number of classes that can be used. Each class is defined by only one load profile which must represent a range of customers with various characteristics. Thus, it is possible for customers of a certain class in one part of the study system to have different load characteristics from the same class of customers in a different part of the system, resulting in loads that are high in one area and low in the other when compared to metered loads. This would be likely to happen in a study area with both urban and rural areas. If this kind of error is detected adjustment can be made using Map Mathematics to ratio loads up or down in different portions of the load map.

Low-frequency error may also occur due to error in location of new growth. In DLF the user specifies where the growth will occur and then, if he decides that is not correct or if he wishes to look at another growth scenario, he modifies the horizon year maps and reruns the forecast. In SLF, if the user wants to change the location of the future growth, he must modify the factors controlling the creation of the preferences and then rerun the forecast. These factors are normally stored in the file YSPARM.DAT.

2. Timing Error

Error can occur in the timing of forecasted loads in two different ways:

a. Growth Rate Error

The growth rates applied to the overall land-use or customer counts in the Global Model, and to the growth of load-per-customer in the load profiles of the Load Model, can be too high or too low. This affects the forecast of the entire study area and generally affects the entire distribution system plan timing.

Adjusting for overall growth rate error is very simple. If the user decides that the growth rates used for planning the system for an area were too high, or too low he can simply change the installation dates to a year when he thinks that load level should occur. For example, if he thinks the growth rates were 20% too high he might move an installation date from eight years in the future to ten years in the future.

If the user decides that growth rates were wrong for only certain classes, it becomes more complex but the same logic can be applied taking into account the proportion of the total load that comes from the classes he wishes to change the growth rates for.

These techniques can also be used for multi-scenario studies where different growth rates are to be compared. For this, the forecast should be run using the highest of the growth rates being considered.

b. Growth Location Order Error

In SLF the program algorithm uses the factors provided by the user to determine which cells are chosen first to receive the growth. Even if the horizon year results are satisfactory, the user may decide that certain areas should have developed before others. In this case the user should revise the factors and rerun the forecast. In DLF this is not likely to happen.

Multi-scenario studies can also be made in this way. For example if the user wants to create a scenario where a certain area will develop more rapidly he can change the urban pole maps and their weighing factors to give more emphasis or preference to that area. Urban poles are factors of influence defined by the user for affecting the development of certain selected areas. They may be thought of as magnets of different strengths to attract or repel growth of a certain class of customers. Section VI.F.2 discusses the creation of urban poles.

C. LAND-USE VS CUSTOMER COUNTS

1. In DLF

In DLF the Base-Year and Horizon-Year maps can contain either land-use or customer counts with no difference in the procedure because the user provides both the base-year and horizon-year amounts. The one thing that the user must make sure of is that the units agree with the units used for the load profiles. For example, if the user chooses acres as the basic unit then the load profiles must be in kW or kVA per acre. If he chooses to use customer counts then the load profile must be in kW or kVA per customer. Note, if the user chooses kW then the resulting load maps will have to be ratiod up by the inverse of the power factor to get kVA in the load maps.

In some classes the user may want to enter customer count numbers which are proportional to the kVA of connected transformer capacity, if that information is available. For example, for Tubewells he may want to enter kVA of connected transformer capacity and then the load profile units would have to be in kW or kVA per kVA of connected transformer capacity, taking into account the loading factor for Tubewells. This would provide a higher accuracy for the Tubewells class where the size of one customer might vary from

5 or less to 100 or more kVA.

The main point here is that in DLF the units can be anything the user chooses as long as the units are consistent between the land-use or customer counts maps and the load profiles.

2. In SLF

In SLF it does make a difference whether land-use or customer counts are chosen, because the user provides only the base-year amounts and the program needs to know how much land is available for future growth. Customer counts can be used in SLF but they should be converted to land-use, and the amount of vacant available useable land determined, before running the forecast algorithm. As in DLF, the user is responsible for making sure that the land-use units are consistent with the load profile units.

D. DLF VS SLF

DLF and SLF are two different versions of the LOADSITE module of CADPAD. Much of the data required is the same for both but the philosophy of the forecast methods is different.

In DLF the user provides the base year and horizon year land-use or customer counts in each cell and the program fills in the forecast years between the base year and the horizon year.

DLF is well suited to rural areas, towns, and the smaller cities. It can be used for larger cities but puts a larger burden on the user to determine the horizon year land-use or customer locations.

In SLF the user provides the base year land-use for each cell, and also the data and factors needed by the algorithm to determine the locations of the future growth for each forecast year, starting with the base year and ending with the horizon year.

SLF is designed to be used in larger cities where the dynamics of urban growth can be applied and guided by the user, with the program doing the work of determining where the growth should be. The user guides the forecast by choosing and altering the factors that determine the preference values of the cells for the different customer classes.

SLF was used in a mixed urban and rural area, the Kot Lakhpat Division, but methods had to be developed to force growth in the rural areas. It is not recommended that SLF be used for such mixed areas. One possible approach for such areas is to forecast the urban area with SLF and the rural area with DLF and then merge the two forecasts into one for doing the system planning for the integrated area.

The area chosen to be forecast by SLF should include a city and its immediate surrounding area, large enough to allow growth for the forecast period. Although SLF is not designed for part urban and part rural areas, the case of a city immediately surrounded by vacant or rural land is a normal situation for the program. The problem occurs when the rural area is farther away or separate from the city and is not dynamically connected to the city or within its sphere of influence. SLF should also not be used for two separate cities which are not growing together in a dynamically coupled way.

A forecast period of 20 years is recommended even if the user is only interested in the results of a shorter time period. The extra effort is minimal and the insight into the growth trends and patterns are valuable in making decisions for the shorter and intermediate terms.

DLF can create a Spatial database of not to exceed 48 maps and in SLF this value is 65. For DLF databases, create them with DLF and then use SLF to increase the number of maps to 65.

E. LOAD CALIBRATION

Load calibration means to make adjustments to the base year loads, or to the data used to create the base year loads, to make them what they should be, or at least close to what they should be. Ways of knowing what the loads should be, include:

- Comparing the base year computed system load profile shape and magnitude with a metered load profile for that same area. Most important are loads at the system peak hour because those loads will be used for system design.

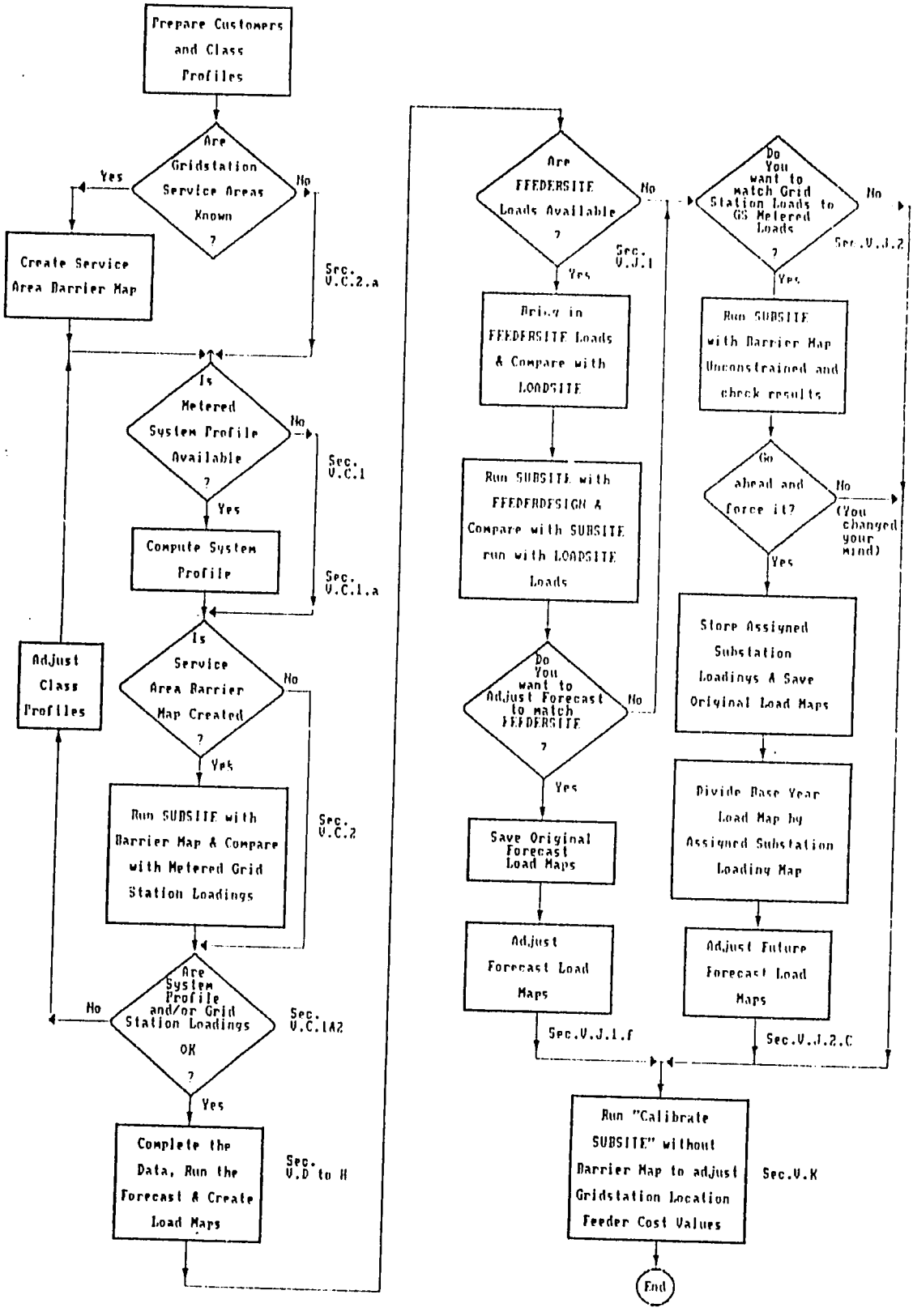
- Comparing the base year computed load map with a load map obtained from FEEDERSITE, FEEDERDESIGN, or WIDGIT database.

- Comparing the base year computed loads in the Grid Station or feeder service areas with actual metered loads for those same areas.

The user will have varying degrees of confidence in the different kinds of data available. He will have to choose which, if any of the data available should be used for calibration. He may reject them all, having more confidence in his own results, or he may use more than one kind of data for calibration. It all depends on what he thinks is the most accurate and reliable information available.

Figure III-5 shows the order or sequence of the different possible load calibration steps and the decisions associated with them. The figure also refers to sections of this manual where details are to be found.

Load Calibration



(a) Adjust the Class Profiles (b) Adjust the Load Maps

Note: Section numbers refer to Sections of the Manual where details are given.

FIGURE III-5 - SEQUENCE OF LOAD CALIBRATION STEPS

"fig3_5cn"

BEST AVAILABLE DOCUMENT

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IV. DATA COLLECTION AND PROCESSING FOR LOAD FORECASTING

IV. DATA COLLECTION AND PROCESSING FOR LOAD FORECASTING

A. STUDY AREA COORDINATES

The LOADSITE program uses two databases: a Global Database and a Spatial Database. The global database contains the information regarding the total number of customers and the customer load profiles through the forecast period. The spatial database consists of maps which contain the spatial information about the geographical location of customers, loads, Grid Stations, etc. For distribution planning, consideration of geographical location is essential.

In order to locate loads and equipment in a spatial database it is necessary to create a consistent coordinate system and refer all locations to that system. When maps are received from the Circles and Divisions, they may use different reference points and coordinate systems. For example, in a single Circle the user may get one Division map with no coordinate reference, one Division map with Lambert coordinates, and another Division map with Geodetic coordinates (longitude and latitude).

All of the maps to be used for a study area must be converted to and located on a single coordinate system. For WAPDA, that system should be the Lambert coordinate system as defined for the Everest Spheroid. By using the CONVERT program, coordinates from other coordinate systems can be converted easily to Lambert coordinates.

EBASCO has previously supplied the CONVERT program to WAPDA. It has also been installed on the PC in the terminal room at LDA plaza, 8th floor, in the subdirectory COORDCON on the D:disk.

The CONVERT User Guide is found in the file CONVERT.DOC with an Addendum in ADDEN1.DOC. These two files are in ASCII format and can be read on-screen using the DOS editor or TYPE command, or a hard copy can be printed out using the PRINT command. A copy of the CONVERT User Guide is included in Appendix E of this manual.

Table IV-1 shows a spreadsheet which was set up to assist in marking the Bahawalpur Division maps with the Lambert coordinates grid. The maps were supplied with Geodetic coordinates (longitude and latitude). This spreadsheet can be used for operating Division of WAPDA. The procedure is as follows:

TABLE IV-1

SPREADSHEET FOR MARKING LAMBERT COORDINATES

bpurxy.wk1 SPREADSHEET FOR MARKING LAMBERT COORDINATES

2000 = CELL WIDTH IN METERS

96.7 = CM BETWEEN LEFT AND RIGHT LONGITUDES (X)

74.3 = CM BETWEEN TOP AND BOTTOM LATITUDES (Y)

COMPUTED VALUES = *

BAHAWALPUR 2971-6

	LOWER LEFT	UPPER LEFT		UPPER RIGHT	LOWER RIGHT	
POINT NO.	12	7		8	13	
LONGTUDE (X	71D 30M	71D 30M	*	72D 00M	72D 00M	*
LATITUDE (Y)	28D 40M	29D 00M	*	29D 00M	28D 40M	*
LAMBERT-X	3085613	3084399		3133121	3134508	
1ST GRID-X *	3086000	3086000		3132000	3134000	
CM TO 1ST-X	1.48	0.44		3.89	2.04	
LAMBERT-Y	495266	532219		533934	496987	
1ST GRID-Y *	496000	532000		532000	498000	
CM TO 1ST-Y	0.77	3.18		2.22	1.00	

	BOTTOM	TOP		LEFT	RIGHT
GRID WIDTH	3.96	3.97		4.02	4.02

X-GRID COORDS	CM FROM LEFT	CM FROM LEFT	Y-GRID COORDS	CM FROM BOTTOM	CM FROM BOTTOM
3084000	-3.19	-0.79	494000	-2.55	6.01
3086000	0.77	3.18	496000	1.48	1.98
3088000	4.72	7.15	498000	5.50	2.04
3090000	8.68	11.12	500000	9.52	6.06
3092000	12.63	15.09	502000	13.54	10.08
3094000	16.59	19.06	504000	17.56	14.10
3096000	20.54	23.02	506000	21.58	18.13
3098000	24.50	26.99	508000	25.60	22.15
3100000	28.45	30.96	510000	29.63	26.17
3102000	32.41	34.93	512000	33.65	30.19
3104000	36.36	38.90	514000	37.67	34.21
3106000	40.32	42.87	516000	41.69	38.23
3108000	44.27	46.84	518000	45.71	42.26
3110000	48.23	50.81	520000	49.73	46.28
3112000	52.19	54.78	522000	53.75	50.30
3114000	56.14	58.75	524000	57.77	54.32
3116000	60.10	62.72	526000	61.80	58.34
3118000	64.05	66.69	528000	65.82	62.37
3120000	68.01	70.66	530000	69.84	66.39
3122000	71.96	74.63	532000	73.86	70.41
3124000	75.92	78.60	534000	77.88	74.43
3126000	79.87	82.57			
3128000	83.83	86.54			
3130000	87.78	90.51			
3132000	91.74	94.48			
3134000	95.70	98.44			
3136000	99.65	102.41			

1. The CONVERT program is used to find the equivalent Lambert coordinates (X and Y) of the Geodetic coordinates (latitude and longitude) of the four corners of a map and these are entered in the spreadsheet. For example, the Lambert X and Y coordinates for a longitude of 72 degrees, 00 minutes and a latitude of 29 degrees, 00 minutes were calculated to be 3133121 and 533934, respectively.

2. For each corner of the map, the longitude, latitude, Lambert X-coordinate, and Lambert Y-coordinate are entered in the spreadsheet. The cell size, in meters, and the distance between the left and right of the map and the top and bottom of the map, in cm, are also entered.

3. The spreadsheet computes which grid lines need to be marked on the map and the distance, in cm, of each grid line from the longitude at the left of the map or from the latitude at the bottom of the map. For example, 3116000 is 62.72 cm along the top of the map from the longitude of 71 degrees, 30 minutes at the left of the map. At the bottom of the map it is 60.10 cm from the same longitude. There are four columns of distances, one each for the top, bottom, left, and right of the map. This is necessary because the Lambert grid system is slightly rotated (clockwise) with respect to the Geodetic system of coordinates.

4. The user marks the grid points on the top, bottom, left, and right sides of the map and draws the connecting grid lines.

For maps that do not have a grid reference, one must be defined. One way to do this is to refer to Survey of Pakistan (SOP) maps, which use the Lambert coordinates grid, to locate reference points on the WAPDA utility map, and then to use those points as a basis for laying out grid coordinates on the map. It is good to choose points as far apart as possible on the map, in both the X and Y directions, because this reduces error that can be introduced in locating the reference points. Good reference points are highway and railroad intersections, villages, mountain peaks, canals, bridges, etc. In rural areas the user can lay down an X or a Y coordinate line by following that line on the SOP maps, noting the locations of villages and other reference points with respect to the line, and transferring the line location at different points onto the Division map. For urban areas, street intersections may be used. If lines are laid down at the top, bottom, right and left of the map, the grid can be filled in between using those as references.

After the Lambert coordinates have been established on the maps, a LOADSITE coordinate system can easily be placed over the study area. First, determine the overall size of the area to be studied and then determine the number and size of cells needed to cover the area and give the desired data resolution. For large urban areas leave a margin of vacant land around the area to allow for twenty years of outward expansion.

The size of a small area or cell is determined by the user. Normally the cell size should be between 250 meters and 2000 meters. Cell sizes for urban areas should be relatively small and for rural areas they may be larger. The reason for this difference is that the two kinds of areas differ in characteristics such as customer density, load density, distribution equipment density, etc. The size of the area also helps determine the cell size because the maximum size of the maps is 264 by 264 cells or small-areas. With a 250 meter cell size, the study area would be limited to 66 km by 66 km. A 2000-meter cell size would allow a study area of up to 528 km by 528 km.

Cell resolution needs to be high enough (cells small enough) that relatively few cells contain multiple feeder nodes, particularly from different feeders. The load assignment algorithm NODESIM can handle a certain number of multiple-node cells but beyond that number the cell loads get lumped onto only one of the nodes in the cell.

After the number and size of the cells is determined, start from some reference point and draw the grid lines on the map. These may or may not be the same lines established for the Lambert grid, depending on the cell size and the Lambert line interval.

The final step is to label the cells. In the LOADSITE coordinate system the left most column of cells will have an x-coordinate of 1 and the numbers increase as the user moves to the right. The uppermost row of cells will have a y-coordinate of 1 and the numbers increase as the user moves toward the bottom. In other words, the upper left cell coordinates will be 1, 1 (x,y) and the lower right cell coordinates will be x-max, y-max.

For reference, Table IV-2 gives dimensions and areas of different cell sizes. Table IV-3 gives some miscellaneous length and area relations for land conversions.

TABLE IV-2
DIMENSIONS AND AREAS FOR DIFFERENT CELL SIZES

------DIMENSIONS------		-------AREAS-------	
MILES	METERS	ACRES	HECTARES
1	1600*	640	256
.62*	1000	250	100
1/2	800*	160	64
.31*	500	62	25
1/4	400*	40	16
5/32*	250	15.6	6.25
1/8	200*	10	4
1/16	100*	2-1/2	1

* = Approximate equivalent

TABLE IV-3
MISCELLANEOUS LAND CONVERSIONS

1 Furlong = 1/8 Mile = 220 Yards = 10 Chains = 660 Feet

1 Acre = 1 Chain X 1 Furlong = 4840 Sq. Yards = 43,560 Sq.Feet

1 Hectare = 100 Meters X 100 Meters = 10,000 Sq. Meters

1 Kanal = 20 marla

B. LOAD PROFILES

The load models are slightly different in the DLF and SLF modules. Therefore they will be discussed separately. Basically, in DLF the class profiles are entered directly, one set for the base year and one set for the horizon year. In SLF the profiles are entered via "end-use" profiles which are combined into class curves by the program when the user issues the command. SLF has only one set of profiles for the base year and, instead of giving a set of horizon year profiles, each "end-use" profile is given a growth rate.

1. Load Profiles for DLF

DLF uses two load profiles for each class, one for the base year and one for the horizon year, in order to provide a way for the load per customer to change through the forecast period. For intermediate years, the program uses a linear interpolation between the base and horizon year curves. Figure IV-1 shows an example of two curves for one class, and a curve for an intermediate year. The value of a point on the interpolated curve is based on the values at that hour in the base and horizon year and depends on how many years there are between the base year and the intermediate year. For example, if at hour 20 the base year value is 12 and the horizon year value is 16 twenty years later, then at five years the value will be 13, at ten years 14, and at 15 years 15, etc.

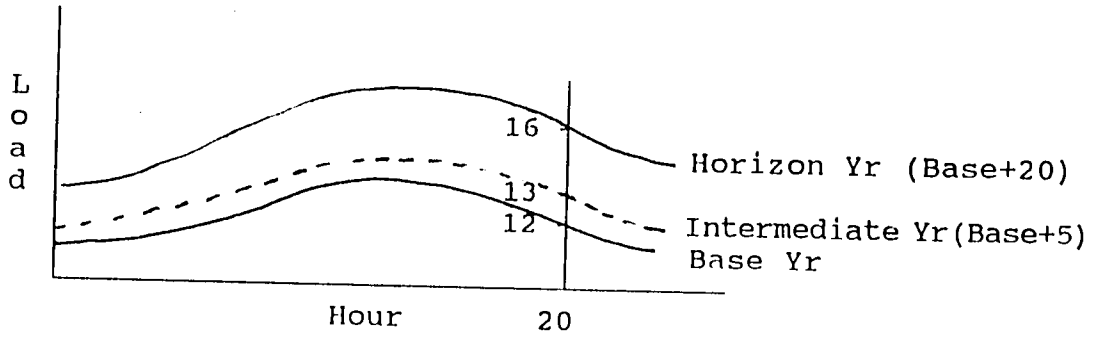

FIGURE IV-1 - DLF LOAD PROFILE FOR BASE, HORIZON AND THE INTERMEDIATE YEARS

2. Load Profiles for SLF

SLF uses only one load profile for each class, but each class can be composed of up to 15 end-use profiles, with each end-use profile having its own growth rate and multiplier. The growth rate is applied from the base year to compute the values for future years. The multiplier is used to scale the profile up and down without having to change all the values of the curve. This makes it very convenient to enter a curve in per-unit values and set the curve magnitude by its multiplier.

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The user can enter a class profile as a single end-use profile, or enter its components as separate end-use profiles and let the program combine them into the class profiles. This is useful if the user wants to investigate the impact of changing the shape, magnitude, or growth rate of a single component, for example the air-conditioning component of residential classes.

Figure IV-2 shows a class profile and some of its components.

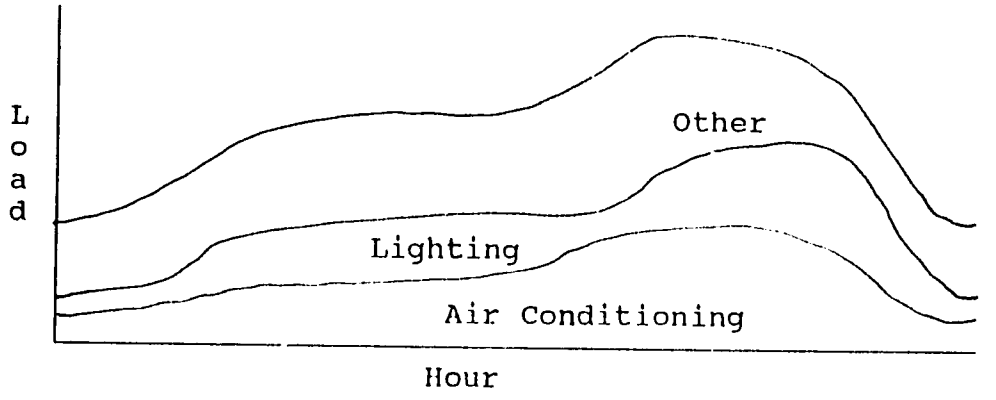

FIGURE IV-2 - COMPONENTS OF A CLASS LOAD PROFILE

C. GLOBAL MODEL DATA

The global model and global model data are almost identical for DLF and SLF. Table IV-4 shows a sample of the Global Model data.

TABLE IV-4
SAMPLE GLOBAL MODEL DATA

****** HARDA CARDAD OUTPUT ******

CUSTOMER CLASS NAME	ANNUAL GROWTH RATE %	1971/ 0 BASE	1974/ 1 2011/ 6	1977/ 2	2000/ 3	2004/ 4	2007/ 5
			CUSTOMER COUNTS FOR YEAR/ITERATION				
DOM-LOW	3.0	37762.0	51752.0 103787.0	64253.4	73323.8	84140.7	92389.2
DOM-MED	3.0	5070.0	6656.6 14076.0	8380.5	9701.4	11349.3	12522.0
DOM-HGH	3.0	376.0	500.5 1118.0	638.9	750.2	874.6	971.8
COM-LOW	3.0	4870.0	6306.8 14420.0	7942.7	9457.9	11478.6	12809.8
COM-MED	4.0	151.0	201.0 524.0	260.2	318.8	394.9	450.7
T-WELL	0.5	2647.0	2811.1 3314.0	2765.6	3072.0	3172.1	3250.0
F-TWELL	1.0	561.0	631.0 844.0	677.6	753.3	790.2	815.8
IND-LOW	3.0	1221.0	1715.4 4255.0	2323.7	2727.5	3424.8	3778.7
IND-MED	3.0	37.0	52.0 130.0	70.4	88.7	103.8	114.5
IND-HGH	4.0	6.0	8.0 21.0	10.4	12.7	15.8	18.0

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Normally the data is entered in the following sequence:

1. Enter the class names and the forecast years. DLF uses a base year, a horizon year, and five intermediate years as shown in the figure. SLF uses a base year and up to ten future iteration years. In all cases, iteration 0 is the base year. Iteration 1 is the first forecast year, iteration 2 is the second forecast year, etc.

2. Enter the base year land-use or customer counts from the base year spatial model maps by using the Load Model Menu. Compute System Profile command and answering "Y" to the prompt that asks if the user wants to store results in the Global Model.

3. Enter the Annual Growth Rates and apply them in the Simple Growth Model Menu. This will apply the growth rates from a user-selected start year to the horizon year. By altering the growth rates and applying them to future years, moving from one iteration to the next, the user can apply different growth rates for each growth period or iteration of the forecast.

D. BASE YEAR CUSTOMER DATA

This section describes a procedure for preparing and ent ring the base year customer data. Subsections D.1 through D.7 cover the seven steps which process the data for six classes of customers; three residential, two commercial, and one industrial. Figure IV-3 shows the flow of data preparation for the six covered classes.

Subsection D.8 covers Industrial B2, Industrial B3, and Tubewell customers. Subsection D.9 covers miscellaneous customers not included above, such as "Other" customers on the batch printouts, and the customers in batches other than one through twenty.

The procedure uses transfer files that have already been created. If they have not been copied into the study directory, that should be done at this point by entering the command "COPY $DISK0:[CADPAD.UTIL]TR*.DAT []" from the study directory. Check the transfer files to make sure they are set up for the right number of classes and that the right maps are used, especially the load maps and land-use/customer maps.

1. Compile Data for Entry Into Spreadsheets

At the Division offices have them mark the Subdivision boundaries on the Division maps.

At the Subdivisions offices, have the meter readers mark on the Division maps the following:

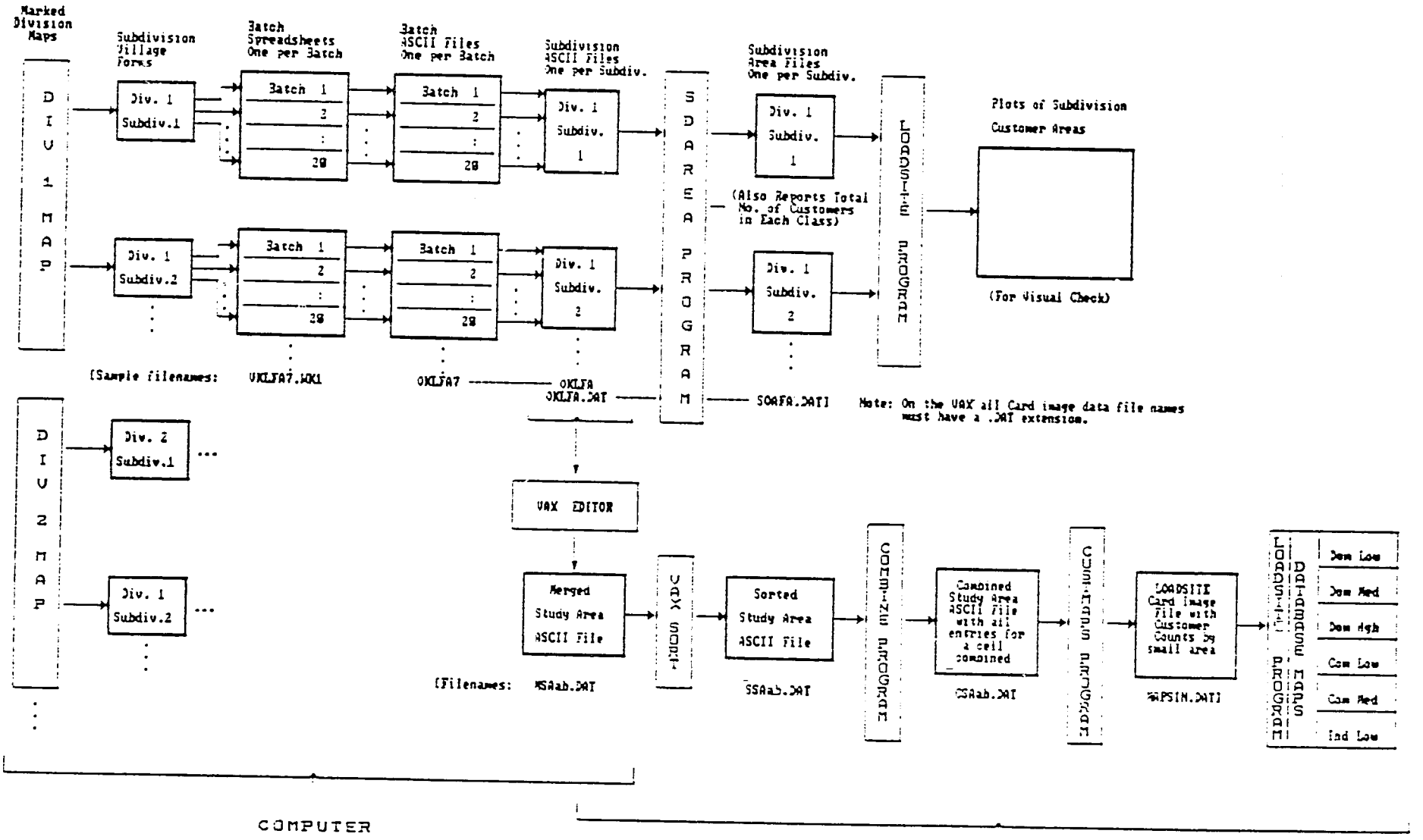

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FIGURE IV-3 - FLOWCHART OF DATA PREPARATION FOR SIX CUSTOMER CLASSES

"divmapcm"

- Batch boundaries. If more than one batch covers an area or if more than one Subdivision covers an area, mark each batch or Subdivision independently on separate copies of the map as if each were the only one covering the area. During the data processing procedure the customers from both will be assigned to the appropriate small areas and then combined.

- Tubewells, giving type and kVA if feasible.

- Industrial B-2 customers and their sanctioned load.

- Industrial B-3 customers and their sanctioned load.

  Industrial B-4 customers and some Industrial B-3 customers may have their own dedicated Grid Stations, in which case they would not be included in the database customer maps or in the loading of the other Grid Stations.

- Grid coordinates and grid lines.

Also, on the forms provided, have the meter readers list all the villages in each batch, along with the number of customers in the different categories on the form. A sample of the form is shown in Figure IV-4.

Identify, in LOADSITE coordinates, the X and Y locations of the villages and write them on the forms. Each village may be assigned to one small area or divided among two, three, or four small areas. If there are villages which cannot be located on the map, assign each one to some likely location so that all of the batch customers are at least assigned to the batch area.

In the more urban areas and towns where there are non-village customers, the user must create "villages" on the village sheets for the entry of the customer data. The villages thus created can be given fictitious names such as "Batch 1A", "Batch 1B", "Batch 2A", etc. Since a village can only have customers assigned to four small areas, more than one "village" will have to be created to distribute the customers for batches that include more than four small areas.

After the customer data are all assembled on maps and on village forms, the data can be entered into the spreadsheet files, processed to create ASCII data file which are transferred to the VAX computer, further processed on the VAX and entered into the LOADSITE database and reviewed. Refer to Figure IV-3 for the overall flow of this data processing.

PAKISTAN WATER & POWER DEVELOPMENT AUTHORITY

DIVISION NAME :

SUB DIVISION :

DATED:

S. NO.	NAME OF VILLAGE OR MUHALLAH	COORDINATES						BATCH NO.	TOTAL DOMESTIC CONSUMER	TOTAL COMMERCIAL CONSUMER	TOTAL NO. OF INDUST.			TOTAL NO. OF T/WELLS			ANY SPECIAL REMARKS
		X	Y	%	X	Y	%				31	32	33	46	49	50	
1																	
2																	
3																	
4																	
5																	
6																	
7																	
8																	
9																	
10																	
11																	
12																	
13																	
14																	
15																	
16																	
17																	
18																	
19																	
20																	

SIGNATURE & STAMP : _____

FIGURE IV-4 - SAMPLE VILLAGE DATA FORM

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2. Enter Village and Batch Data into Spreadsheets

Turn on the PC and go to the directory D:\LOTUS, where Lotus 123 is located. Make sure there is a subdirectory D:\LOTUS\VIL and if there is not, create one with the command "MD VIL" from the D:\LOTUS directory. The spreadsheet VILLDAT.WK1 must be loaded in the D:\LOTUS\VIL subdirectory if it is not already there. It is recommended that files from only one study area be in this subdirectory at a time; otherwise the large number of files becomes unwieldy.

Enter 321 or Z123, to run Lotus 123. If 321 is used the user will be returned to the D:\LOTUS directory when the user exits from Lotus 123. If the user uses Z123 he will be returned to the D:\LOTUS\VIL directory.

There is a blank spreadsheet D:\LOTUS\WK1\AUTO123.WK1 which contains a Macro that is executed when the user enters ALT-L. This spreadsheet is automatically loaded when Lotus 123 is invoked.

Enter ALT-L to load the VILLDAT spreadsheet which is in the D:\LOTUS\VIL subdirectory. This is a spreadsheet which has been prepared to receive all the batch and village data for a single batch and has Lotus 123 Macros to help in the entry and processing of the data.

When the VILLDAT spreadsheet is brought in, an input range is activated and the user is put into an area at the top of the spreadsheet, in an input range data entry mode for entering the spreadsheet header and the batch data.

Enter the spreadsheet header and the batch data. The header identifies the region, the Circle, the Division, the Subdivision, and the batch number for the spreadsheet. For example, for Kot Lakhpat Division, Raiwind Subdivision, Batch 20 the user might enter LHR/LHR3/KL/RWD20. The batch data is obtained from the batch data printout based on the billing data available for each Subdivision. Table IV-5 shows the batch data printout for one Subdivision in LAHORE III Circle.

The month of the batch data should be in the time period for which the batch boundaries are valid. However, the Grid Station and feeder metered loads used in LOADSITE, SUBSITE, and FEEDERSITE should be for the last recorded annual peak time period. If data for that time is not considered dependable, some other time near the peak can be used and adjusted upward to represent the peak.

ANNEXURE-3

REGION: LAHORE
CIRCLE: LAHORE-III
DIVISION: KOT LAKHPAT
SUBDIVISION: RAIWIND

CONSUMER DATA

PAGE NO. 1

BILLING MONTH: 11-92

PEAK MONTH: 5-92

S N O	B A T	DOMESTIC 1 - 200 NO	DOMESTIC 1 - 200 AVG	DOMESTIC 201 - 500 NO	DOMESTIC 201 - 500 AVG	DOMESTIC 501- ABOVE NO	DOMESTIC 501- ABOVE AVG	COMMERCIAL 1 - 300 NO	COMMERCIAL 1 - 300 AVG	COMMERCIAL 301- ABOVE NO	COMMERCIAL 301- ABOVE AVG	IND (B-1) 1- ABOVE NO	IND (B-1) 1- ABOVE AVG	IND (B-2) 1- ABOVE NO	IND (B-2) 1- ABOVE AVG	IND (B-3) 1- ABOVE NO	IND (B-3) 1- ABOVE AVG	T/W(0-1) 0- ABOVE NO	T/W(0-1) 0- ABOVE AVG	T/W(0-2) 0- ABOVE NO	T/W(0-2) 0- ABOVE AVG	OTHERS 0- ABOVE NO	OTHERS 0- ABOVE AVG
1	1	38	113	25	292	3	2348	5	63	0	0	2	669	0	0	0	0	0	0	3	2004	1	27269
2	2	531	35	61	245	14	536	33	47	4	248	10	2713	0	0	0	0	3	4397	3	12	1	0
3	3	193	93	59	263	2	575	131	50	4	783	14	1347	0	0	0	0	0	0	0	0	0	0
4	4	363	103	59	271	5	4222	69	47	0	0	7	1333	0	0	0	0	0	0	1	2514	0	0
5	5	354	93	74	262	4	1015	34	57	1	500	5	6053	0	0	0	0	0	0	0	0	0	0
6	6	131	35	55	269	10	600	174	72	5	473	4	7593	0	0	0	0	0	0	0	0	0	0
7	7	74	38	20	256	2	2094	154	59	2	327	6	34	0	0	0	0	0	0	0	0	0	0
8	8	460	72	70	238	12	681	67	54	1	340	20	572	0	0	0	0	2	522	2	600	18	2391
9	9	267	104	81	270	18	1142	85	51	15	937	30	1781	0	0	0	0	0	0	0	0	0	0
10	10	153	104	83	274	14	831	124	70	4	648	10	4507	0	0	0	0	0	0	0	0	0	0
11	11	258	94	99	271	13	1042	68	56	4	385	3	3368	0	0	0	0	0	0	0	0	15	0
12	12	343	85	106	244	15	1072	32	58	0	0	3	150	0	0	0	0	0	0	0	0	0	0
13	13	531	91	46	255	1	714	12	18	0	0	7	888	0	0	0	0	7	6169	3	1738	27	0
14	14	420	91	21	242	11	961	2	0	0	0	6	542	0	0	0	0	1	5941	3	2924	1	0
15	15	511	93	52	266	2	797	23	21	0	0	6	410	0	0	0	0	6	6317	3	738	1	0
16	16	742	34	75	235	3	731	23	42	0	0	14	2065	0	0	0	0	1	0	1	0	2	0
17	17	293	64	7	220	1	561	7	2	0	0	6	255	0	0	0	0	11	1515	3	213	0	0
18	18	459	73	40	202	4	1127	19	55	0	0	14	8336	0	0	0	0	1	4960	1	0	0	0
19	19	482	78	42	265	7	1040	97	38	2	709	11	832	0	0	0	0	4	511	0	0	0	0
20	20	590	72	29	251	0	0	20	36	1	406	6	2220	0	0	0	0	0	0	0	0	2	0
21	24	0	0	0	0	0	0	0	0	3	354	5	9401	7	22400	5	291024	0	0	0	0	6	25682
SUBDIV TOTAL NO:		7333		1107		147		1206		52		189		7		5		36		23		74	
UNITS:			632473		294425		157132		67225		31743		467090		156805		1455120		129141		25604		224419
AVERAGE:			26		256		1068		55		610		2471		22400		291024		3587		1156		3032

TOTAL NO. OF CONSUMERS: 10179 TOTAL CONSUMPTION: 3632193 AVERAGE CONSUMPTION: 356

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TABLE IV-5 SAMPLE BATCH DATA PRINTOUT

Only the data for three domestic classes, two commercial classes, and one industrial class are processed in the spreadsheet. Entry locations for tubewells and two industrial classes are included for reference and completeness only. Those data are processed by a different method discussed later.

Within the input range, use the arrow keys to move the input cursor from one input data cell to another. The cursor will stop only at data entry cells when in the input range data entry mode. When the batch data entry is complete, use the ESC key to exit from the input-range data entry mode. If the user later needs to change or enter batch data in this area, use the regular arrow keys or enter ALT-O (O for original input range) to re-enter the input-range data entry mode for this area.

Enter ALT-I (I for input) for input range data entry mode in the village data entry area. This activates a data input range for entering all the village data.

Enter the village data from the village data forms. The cursor control and data entry procedure is the same as in the batch data entry above. If a value is 0 there is no need to enter it because the spreadsheet will consider any empty cell as zero. In the X, Y, and % fields, there can be up to four cells for each village. Any unneeded cells should be left blank

Enter ESC to exit from the input-range mode.

Enter F9 to have the spreadsheet compute values for all the cells.

Enter HOME to go to the upper left of the spreadsheet.

Review the totals on lines 11 and 12 to make sure they are correct.

Go to the right side of the spreadsheet and review column X to make sure the value 0.0 appears for each village entered. If a negative number occurs, that means the sum of the % cells for that village is too small by that amount. A positive number means that the number is too big by that amount. For unentered villages the sum will be -100.0. If any entered villages have a non-zero value, correct the % fields.

Because of disk space limitations on the PC it is recommended that the user does not save the spreadsheet files but go directly to the next step of converting the spreadsheet results to an ASCII file. However, if the user decides to save a spreadsheet file, enter ALT-S. The spreadsheet entry

line will display the path and the letter "V" which will be the first character of the filename. Enter the complete filename and hit ENTER. Use the filename convention Vddsssnn, where "V" is for village spreadsheet file, "dd" is a two-character abbreviation for the Division name, "sss" is a two or three-character abbreviation for the Subdivision name; and "nn" a one- or two-digit batch number. For example, for Kot Lakhpat Division, Raiwind Subdivision, batch 20, it would be VKLRWD20.

3. Convert Spreadsheet Results to Subdivision ASCII Files

After the data for a batch has been entered in the spreadsheet and then checked, enter ALT-X to write the results to an ASCII file. A spreadsheet macro will process the data, prepare the results for output, emit a signal, and prompt the user for an output file name.

Enter the output file name, using the name convention of Oddsssnn, where "O" is for output, "dd" is a two-character abbreviation for the Division name, "sss" is a two or three-character abbreviation for the Subdivision name, and "nn" is a one or two-digit batch number. For example, for Kot Lakhpat Division, Raiwind Subdivision, batch 20 it would be OKLRWD20. Table IV-6 shows an example of one of these files.

TABLE IV - 6
SAMPLE OF SPREADSHEET OUTPUT ASCII FILE

(X)	(Y)	(D-L)	(D-M)	(D-H)	(C-L)	(C-M)	(I-L) (VILLAGE NAME)
111	100	31.4	3.3	0.8	6.9	0.8	2.7KATHA
112	111	56.1	5.9	1.4	0.0	0.5	0.5DHONDA
111	100	56.1	5.9	1.4	0.0	0.0	0.5DHONDA
109	110	28.1	3.0	0.7	0.7	0.1	0.3TOODHO
109	111	56.2	5.9	1.4	1.4	0.2	0.5TOODHO
110	110	84.3	8.9	2.0	2.1	0.3	0.8TOODHO
0	111	112.5	11.8	2.7	2.8	0.3	1.1TOODHO
104	103	19.0	2.0	0.5	0.7	0.1	1.5JAMAL PURA
105	103	28.5	3.0	0.7	1.0	0.1	2.2JAMAL PURA
100	100	34.0	3.6	0.8	8.7	1.1	0.0NEW JALAL PURA
107	107	16.1	1.7	0.4	8.7	1.1	0.0AMIN PURA
110	100	11.9	1.2	0.3	0.0	0.0	0.0DERA SHARAF DIN
99	104	28.9	3.0	0.7	0.0	0.0	0.0HAV JUMON
104	99	4.2	0.4	0.1	0.0	0.0	0.0HAV KANWAL
98	99	10.2	1.1	0.2	0.0	0.0	0.0LAHORE ROAD
110	98	3.4	0.4	0.1	0.0	0.0	0.0

Enter ALT-L to bring in the VILLDAT spreadsheet for the next batch or, if the user is finished, enter "/" and then "Y" to exit from the spreadsheet.

If, for some reason the user has saved a spreadsheet and then later needs to send the results to an ASCII output file, he must perform the following steps:

a. Enter Z123 or 123 to get the blank spreadsheet.

b. Enter ALT-L to load the VILLDAT spreadsheet.

c. Hit the ESC key to exit the input range data entry mode.

d. Enter ALT-C to fetch results from a previously completed spreadsheet. Choose from the list of displayed file names.

e. Enter ALT-X to write the results to an ASCII file, as described above, with the user providing an output file name.

f. Repeat steps 2. through 5. above for the rest of the batches in the Subdivision.

g. Exit from Lotus 123.

After all the batches are processed, combine the batch files into Subdivision files, using an editor on the PC as follows:

a. From the DOS prompt and in the directory containing the batch ASCII files (D:\LOTUS\VIL), type NE to enter the editor to merge the files in a blank, unnamed file which will be named in step f. below.

b. Enter ALT-F and then M (for Merge) to bring in the first batch ASCII file for a Subdivision. The user chooses which file he wishes to bring in first.

c. Go to the end of the file, using the arrow keys, and position the cursor at the beginning of the blank line at the end.

d. Enter ALT-F and then M (for Merge) to bring in another batch file. The user chooses which file he wishes to merge.

e. Repeat the previous two steps until all the batches for a Subdivision have been brought into one file. Add one more line to the bottom of the Subdivision file, containing -99 in columns 1 to 3.

f. Save the file by entering ALT-F and then A (for Save As)and then the name of the Subdivision file. Use the same name as for the batch files but without any batch number.

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4. Send Subdivision ASCII Files to the VAX

The following steps use the PC SMARTERM package to send the ASCII files from the PC to the VAX.

PC Prompt	User Entry	Description
C:\>	D:	Go to the D: drive.
D:\>	CD\ST320	Go to ST320 subdirectory.
D:\ST320>	ST320	Enter the SMARTERM menu.
[menu]	<ENTER>	Choose ST320 emulator mode.
[cursor]	<ENTER>	Display the VAX logo and prompt.
username:	KLPT	Example of user name for Kot Lakhpat.
password:	KLPT	Example of password for Kot Lakhpat.
$	KERMIT	Enter the KERMIT program.
KERMIT-32>	RECEIVE filename	Give RECEIVE command and the name to be given to the received file. Add a .DAT extension to the file name.
# N3	ALT-T	Give the TRANSMIT command.
[MENU]	F	Choose FILENAME option.
Filename:	pathname	Give path and filename of the PC file to be sent. Example:D:\LOTUS\VIL\OKLAS.
[menu]	B	Choose BEGIN TRANSMISSION option. The file is transmitted.
[display]	<ESC>	Go back to the menu.
[menu]	E	Return to Emulator Mode.
# N3	CTRL-Y	Go to the $ prompt.

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Repeat the above 9 steps, starting at the $ prompt and entering KERMIT, for each file to be sent.

$	LO	Logout from the VAX
	ALT-X or ALT-SHIFT	Return to the PC Return to the PC temporarily. Use Alt-Shift to reverse.

5. Check Subdivision ASCII Files

Create a Card Image file, SAR51.DAT, defining the service area of the study, according to the format of Table IV-7. Each line sets a block of cells defined by the two sets of X,Y coordinates to the value given in the last field. Set the value to 1 for small-areas in the service area. Values for cells outside the service area will be 0, but they do not need to be entered in the file.

TABLE IV-7
CARD IMAGE FILE DEFINING SERVICE AREA

```
42    51SERVICE AREA                  (format code,map no.)
20    10    98    10   1.             (X1,Y1,X2,Y2,VALUE)
19    11   100    11   1.
17    12   105    12   1.
.
.
.
38   109    87   109   1.
45   110    75   110   1.

90                                    (blank line)
                                      (end of data code)
```

For each Subdivision do the following:

a. Run the program SDAREA by entering the command "R $DISK0:[CADPAD.UTIL]SDAREA". Enter the Subdivision ASCII file name, such as Oddab for the input file name, and an appropriate name for the output file name, such as SDAab, where ab is an abbreviation of the Subdivision name.

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The SDAREA program creates a file for each Subdivision, one for each run, and also computes the total number of customers in each class for each Subdivision run. These totals are displayed on the screen and are also written to the output file. The user should compare these totals to the totals for the Subdivision on the batch printouts. If they do not match, find and correct the problem before proceeding.

b. After the SDAn files are created, use the VAX Editor to modify the first line, entering the map number in columns 6 to 10, right adjusted, and a map name such as the Subdivision name in columns 11 to 20. Map numbers from 21 to 49 can be used because no data is entered in any of the maps at this point. If there are 12 Subdivisions, Maps 21 to 32 could be used.

After running the program SDAREA and modifying the first line of each output file for all Subdivisions, enter LOADSITE and do the following:

a. Go to Map Edit to initialize the maps to be used, starting at Map 21, and going as far as Map 49 if needed, to 0.0, and then read in the files with the Card Image command. If there are more than 19 Subdivisions the user will have to divide them into groups of 19 or less for this checking.

b. Use Map Mathematics, Add/Subtract command to add all the Subdivision maps together in another map, Map 63.

c. Create the Service Area Map, Map 51, if the user does not already have one. Do this in Map Edit by initializing Map 51 to 0.0 and then using Card Image to read in the service area from the file SAR51 created at the beginning of this Section, IV.D.5. Save this map in a Map Backup file MBSA, and then create a border map from the service area map as follows:

   i. Copy the Service Area Map (Map 51) to two other maps, a Service Area Mask Map (Map 52) and a Border Map (Map 50).

   ii. Threshold the Service Area Mask Map with the entry "52,1,1,0,0".

   iii. Run the Proximity function on the Border Map with the entry "50,2,50".

iv. Multiply the two maps, putting the results in the border map, using the entry "50,1,50,52,0".

v. Threshold the Border Map with the entry "50,0,.5,1,.5" to eliminate the noise values generated by the proximity function.

d. Using Map Mathematics, add the Border Map 50 to the combined Subdivisions map, Map 63, created in step b above.

e. Display Map 63 using the color option. This will help the user see visually if there are any overlapping areas or any misplaced or missing data areas. The user should also display the Subdivision maps individually with the border map, using Grey Scale, to see if any customers are outside the service area.

If there are areas of misplaced or missing data, go back to the data files, spreadsheets, village data sheets, etc. and find the reason for the problem. Correct the data, re-process the data if necessary, and display the results again for a check.

There may be some overlap at the boundaries between Subdivisions but normally only in a strip one cell wide. In rare instances, however, two Subdivisions may serve the same area. In that case the displays will show this and the user will just recognize it as the way things are in that area.

6. Convert Subdivision ASCII Files to a LOADSITE Card Image File

After the user is satisfied with the geographical distribution of the Subdivisions customer data, go back to the VAX directory where the Subdivision files are located and combine all the Subdivision ASCII files into one file, using the VAX Editor as follows:

a. Type "EDIT MSAab.DAT", where ab is an abbreviation for the study area, to open a new blank file.

b. Type the command "INCLUDE filename", where filename is the name of the file for the first Subdivision. Repeat this command for all Subdivisions in the study area.

c. Review the file by entering C and then using the cursor control keys.

d. Save the file by entering CTRL-Z and then EX.

e. Sort the customers data by entering "SORT MSAab.DAT SSAab.DAT" from the VMS prompt. The SORT command reads the MSAab.DAT file, sorts it, and stores the results in the SSAab.DAT file. The sorting is done on the first field and then the second field which are the X and Y coordinates. This is done automatically even when the user enters only the command and the file names, without specifying any sort keys.

f. Using the VAX Editor, remove any blank lines at the beginning of the file and all but one of the -99's at the end of the file.

Next, on the combined file, run the program COMBINE by typing "R $DISK0:[CADPAD.UTIL]COMBINE", giving SSAab.DAT as the input file name and CSAab.DAT as the output file. The output file CSAab.DAT will contain the complete customers data with any repeated small areas combined into one line per small area.

Last, to create the LOADSITE input file, run the program CUSTMAPS by entering the command "R $DISK0:[CADPAD.UTIL]CUSTMAPS". Give CSAab.DAT as the input file name and MAPSIN.DAT as the output file name. MAPSIN.DAT will contain the customer data in the correct format for loading into the LOADSITE customer maps for the six classes.

7. Load Card Image Data into LOADSITE Database

Enter LOADSITE and do the following:

a. Use Map Edit to initialize maps 8 to 16 to a value of 0.0.

b. Read in the Card Image file CUSTSIN.

c. Check the maps by displaying them graphically and by reviewing their map statistics.

8. Create and Enter Card Image Data for B2, B3, and Tubewell Customers

Using the VAX Editor, create a file for each class. Each line can represent all the customers in the cell or it may represent one or a group of customers in the cell. The following steps will combine lines if more than one line is used for a cell. Each line should have the following format:

Columns 1-5 = X-coordinate of the cell (right justified)

Columns 6-10 = Y-coordinate of the cell (right justified)

Columns 11-17 = Number of customers in the cell (can be a decimal or integer number).

In order to represent existing industrial and tubewell loads more accurately for a wide range of loading for the same class, represent each customer as a number of customers proportional to the size of the connected transformer size for the customer.

For B2 let each 10 kVA of sanctioned load represent one customer. For example a 180 kVA sanctioned load B2 customer would be entered as 18 customers of class 9.

For B3 let each 100 kVA of sanctioned load represent one customer. For example a 4500 kV sanctioned load B3 customer would be entered as 45 customers of class 10.

For the two classes of tubewells, Fixed Rate and Private, enter the kVA amount for the number of customers.

Run the VAX Sort on each of the files created in the previous step, using the command "R SORT filein fileout", where filein is the name of the file given in the previous step. The SORT keys are handled automatically by the SORT command as given.

Using the VAX Editor, visually inspect each file and combine repeated cell lines by adding all values for the same cell, putting the sum on one line, and deleting the other lines for the cell. When the user is finished, each cell should only be entered on one line. If it is not, the second line will overwrite the previous entry when the file is read into the LOADSITE map. Alternatively, the utility program COMB may be used. See Appendix C for details.

Using the VAX editor, add a header card with the following format:

Columns 1-5 = "40" in columns 4 and 5 (set point to a value)

Columns 6-10 = the map number where the user wants the data to go (right justified)

Columns 11-30 = the map name.

At the end of each file, add a blank line and then a line with "90" in columns 4 and 5.

Enter LOADSITE and use Spatial Model, Map Edit, Card Image to read in the Card Image files.

9. Add "Extra" Batches and "Other" Customers

After identifying the nature of the "Other" and "Batch 24" customers listed on the Subdivision batch printouts, convert them to an equivalent number of one or more classes of customers and add them to the customer maps for those classes.

If the user can identify which small areas they go in, he uses Map Edit to enter them directly into the maps for the appropriate classes. Be careful not to overwrite the values in the small areas with the additional customers. Display the contents of the small areas and then enter the sum of the contents plus the new customers being added.

Check the map statistics before and after the user adds them, to make sure he has added the right amount.

If the user does not know where the additional customers should go he may want to simply ratio up the customers of the class in the Subdivision service area to accomplish the equivalent of adding the customers. This in effect spreads the added customers over the small areas that already have that type of customers, weighted by the number of customers already in the small area. The following procedure uses Map Mathematics to easily do this, if the user has saved the Subdivision Area maps as recommended in the customer data entry procedure.

a. Copy the customer map for the class involved to two work maps, Map 64 and Map 65.

b. Multiply Map 65 times the Subdivision Area Map for the Subdivision involved, storing the results in Map 65.

c. Use Map Statistics to get the total customers remaining in Map 65.

d. Compute a Ratio for the next step as follows:

$$\text{Ratio} = \frac{\text{Total (from Step c)} + \text{Customers to be added}}{\text{Total (from Step c)}} - 1$$

e. Use Add/Subtract to add the ratio times the Map 65 customers in the Subdivision to the original customers map in Map 64.

f. Compare the totals of Map 64 and the original customer map to see if the right number of customers were added.

g. If it is correct, copy Map 64 back to the appropriate customers map.

For an example, the following steps, executed from the Map Mathematics Menu, go through the procedure for adding 330 Domestic Low customers to the Factory Area Subdivision of Kot Lakhpat. The Domestic Low customer map is Map 8.

```
CM                  Copy map
64,8                     to 64 from 8
65,8                     to 65 from 8
/                   end copy maps
MU                  multiply
65,1,65,31,0             Map 65 times Map 31 (the
                         Subdivision area map for
                         Factory area Subdivision)
/                   end multiply
MS                  map statistics
65,65                    for map 65 (Total = 7627)
/                   end map statistics
(Compute Ratio = (7627+330)/7627 -1 = .0432673)
AS                  add/subtract
64,1,64,.0432673,65,0
                         add ratio * Map 65 to Map 64
/                   end add/subtract
MS                  map statistics
64,64                    for map 64 (total = 50936)
8,8                      for map 8  (total = 50606)
/                   end map statistics
(Total for Map 64 should be 330 more than total for
                                Map 8, and it is)
CM                  copy map
8,64                     to 8 from 64
/                   end copy maps
(Repeat for other Subdivisions and classes)
```

Table IV-8 shows a summary of all the kinds of customers encountered in the Kot Lakhpat Division study. The spreadsheet can be adapted to other study areas.

TABLE IV-8
SUMMARY OF CUSTOMERS IN KOT LAKHPAT DIVISION

CLASS	D-L	D-M	D-H	C-L	C-M	T-W*	I-L	I-M*	I-H*
MAP NO.	8	9	10	11	12	13	14	15	16
BATCHES BAS	50592	13661	1462	6571	366	2874	1464	1304	421
LIGHTG EQUIV									
AMER SADHU		76	3						
KHANA		240	9						
OTHER EQUIV									
FACT AREA	330	867	19						
KHANA				616					
RAIWIND				2113	9			80	
TOTAL CUSTS	50922	14844	1493	9300	375	2874	1464	1384	421

* EACH CUSTOMER IN MAPS = 1 KW FOR T-W, 10 KW FOR I-M, 100 KW FOR I

ALL BATCH CUSTOMERS BY SUBDIVISION

SUBDIVISION	D-L	D-M	D-H	C-L	C-M	T-W	I-L	I-M	I-H
AMER SIDHU	6270	3455	376	1444	107	5	152	1	3
FACT AREA	7080	4065	406	1293	80	6	207	16	8
KHANA	15301	3039	329	1412	109	296	505	42	9
K R KISHAN*	14608	1995	204	1216	18	24	411	3	0
RAIWIND	7333	1107	147	1206	52	59	189	7	5
	50592	13661	1462	6571	366	390	1464	69	25

* INCLUDES RAJA JUNG SUBDIVISION AS WELL

BATCH 24 CUSTOMERS BY SUBDIVISION (INCLUDED IN ABOVE)

SUBDIVISION	D-L	D-M	D-H	C-L	C-M	T-W	I-L	I-M	I-H
AMER SIDHU	0	0	0	1	0	0	1	1	3
FACT AREA	0	0	4	7	10	0	7	16	8
KHANA	1	0	0	13	26	0	18	42	9
K R KISHAN*	0	0	0	2	3	0	4	3	0
RAIWIND	0	0	0	0	8	0	5	7	5
	1	0	4	23	47	0	35	69	25

* INCLUDES RAJA JUNG SUBDIVISION AS WELL

NOTE: THIS IS FROM SPREADSHEET KLCUSTS.WK1

E. DLF SPECIAL DATA

In addition to the data that is common to both DLF and SLF, there are two more types of data needed by DLF:

1. S-Curve

The S-Curve is used by DLF as one factor in determining how the growth is distributed to the cells through the forecast period time, particularly in those cells which have no load in the base year but receive load during the forecast period.

S-curve values are entered in the Global Model of DLF, in the Edit/Display Global Data Menu with the Update Growth ("S") Curve command. The program will accept up to 20 values separated by commas. If fewer than 20 values are entered, end the input with a "/". Values are in per unit and range from 0.0 to 1.0. The same command must be used to display the S-curve. To end display enter a "/".

During the forecast, the program is trying to balance several factors including the S-curve, and other factors may conflict with and even override the S-curve. After the forecast is run, examine the growth pattern of the forecast, particularly in those cells which started with zero load. If the growth in these cells do not follow a logical growth pattern, starting in the year they should, and increasing logically to the horizon year, then try modifying the S-curve and run the forecast again. The user may need to do this several times to get a feel for how the S-curve affects the growth in those cells.

The growth in a cell can be displayed easily by using the Spatial Model, Spatial Display, Tabular Display, Scan Maps command, giving the cell coordinates and listing the map numbers of the forecast load maps.

Figure IV-5 shows some possible shapes for the S-curve.

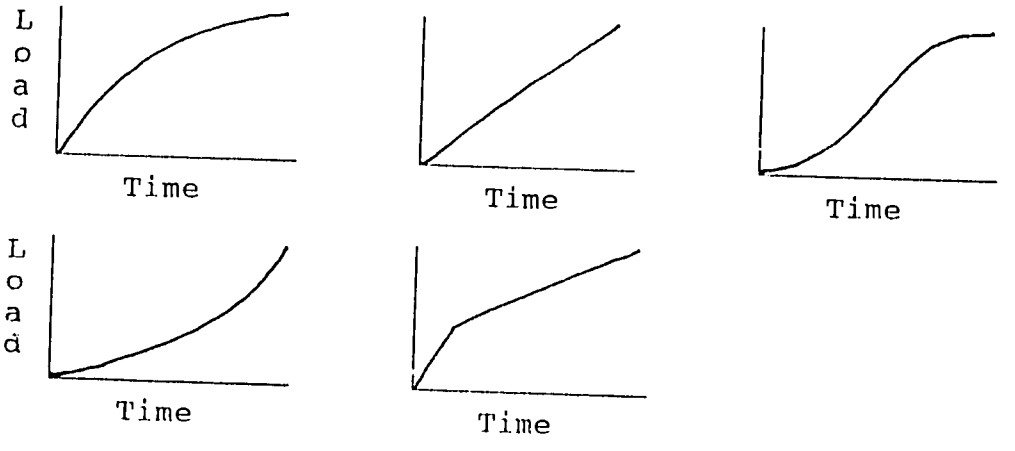


FIGURE IV-5 - POSSIBLE S-CURVE SHAPES

2. Start Year Map

For each cell which has no load in the base year, but does have load in the horizon year, must be given a start year when the load begins to grow in the cell. This is done by entering a start year value in a Start Year map (Map 21) for each of those cells. All other cells must contain a value of zero.

Sections V.F and V.G discuss two different procedures for creating the Start Year map.

F. SLF SPECIAL DATA

In addition to the maps and other data that are common to DLF and SLF, there are other data needed by SLF.

1. Additional Maps

Because SLF assigns locations of future customers based on where existing customers are and also on certain physical or geographical characteristics of the area, the user may provide the following geographical maps if the map information is judged to be relevant by the user. Even if they are not used in the forecast, they may be useful for graphical displays.

a. Vacant-Useable Land (Map 7)

This map is used by the program to see if there is land available for further development. If the value is zero for a cell, the program will not put any growth in it.

As the program allocates growth to the cells, it also deducts the land-used from this map. Section VI.D gives a procedure for developing this map.

b. Zoning (Maps 17-25)

Some areas have strict zoning laws which define where certain classes must locate or where certain classes may not locate. The user can, using Map Edit functions, easily create maps defining these restricted areas. One map is available for each of nine classes. If no zoning is in effect for the area or for the class, the map should be set to 0.0.

c. Railroads (Map 26)

Using Map Edit, Set Line to a Value, enter a value of 1.0 where railroads are located. If a railroad or section of a railroad has particular importance, enter a larger number such as 2.0.

d. Highways (Map 27)

Using Map Edit, Set Line to a Value, enter a value of 1.0 where highways are located. If a highway has particular importance to the local area, give it a larger value such as 2.0 or 3.0.

Do not enter all streets or even all highways. Enter only those which the user thinks will attract future development or future customers. A common mistake is to enter too many highways.

e. Highway Intersections (Map 28)

Using Map Edit, Set Point to a Value, enter a value of 1.0 where a highway intersection exists, where two or more highways intersect. Larger values may be entered at more important intersections. Enter only those intersections which may attract future growth. Commercial development is especially attracted to intersections because they have access to a larger area and can draw on a larger potential customer base.

f. Water (Map 29)

This is actually another type of land-use and should be entered in the same units as maps 7-16. Map Edit functions such as Set Block to a Value, Set Line to a Value, and Set Point to a Value can be used for entry.

g. Urban Pole Maps (Maps 30-32)

There are three Urban Pole maps, one each for residential, commercial, and industrial. These maps can be created in two ways.

i. By entering the pole definitions in the control parameters Card-Image file, YSPARM, and

ii. By using the Map Mathematics, Urban Poles function.

In either case, the user can enter as many poles as he wants in each map, and each pole consists of an X/Y location, a magnitude, and a radius.

These poles are one factor in determining which cells have higher preference for locating new growth.

2. Control Parameters

A Card Image file, YSPARM, is created by the user and contains all the control parameters which govern the forecast algorithm. Details are discussed in Section VI.G.

V. LOADSITE DLF - RURAL LOAD FORECAST PROCEDURE

V. LOADSITE DLF - RURAL LOAD FORECAST PROCEDURE

The following procedure, summarized in Figure V-1, was developed to help the user in the application of the DLF load forecast program. This procedure was used by WAPDA engineers in performing the revised forecasts of Sheikhupura and Gujranwala III Divisions. Transfer files were developed to speed up the process and to reduce the errors. Transfer files are described and listed in Appendix A, along with sample output from running the transfer files. Several small utility programs were also written, in FORTRAN, to assist in processing the data and the results. Descriptions of these programs are given in Appendix C.

Table V-1 summarizes the DLF load forecast procedure.

A. PREPARE THE BASE YEAR DATA.

Enter Global Data, Load Data, and Base Year Customer Data (Maps 1-10). The methodology for collecting, preparing, and entering data for this phase is covered in Section IV and the report "Procedure for Development of Load Forecasts for Town and Rural Areas."

B. CHECK FOR BASE YEAR OUT-OF-BOUNDS (OOB) CUSTOMERS.

The steps for detecting and correcting customers outside the service area are as follows:

1. Create Service Area Card Image File

Using the VAX Editor or a spreadsheet, prepare a Card Image file SAR64.DAT defining the service area. Use the "Set Block to a Value" format, putting 1's for cells inside the service area. Cells outside the service area will contain 0's. The file must specify Map 64 on the first line. This file is the same as SAR51.DAT of Table IV-7, except for the map number.

2. Check for Out-of-Bounds Customers

Enter DLF and open the databases by running the transfer file <u>TROB</u> from the Setup Menu. Then, from the Primary Menu, run the transfer file <u>TRCBB</u>, which does the following:

a. Modifies map names for display.

b. Initializes Map 64 to 0.0 and reads into it the service area from the file SAR64.DAT .

c. Combines all the customer maps for the base year (in Map 65) and sets cells to 1 where there are base year customers.

TABLE V-1
SUMMARY OF DLF LOAD FORECAST PROCEDURE STEPS

A. Base year data setup

B. Check/fix base year out-of-bounds customers
   1. Create service area Card Image file
   2. Check for out-of-bounds customers
   3. Look at results
   4. Get information about out-of-bounds customers
   5. Print information for out-of-bounds customers
   6. Get and print more information, if wanted
   7. Print out the map, if wanted
   8. Fix any problems
   9. Recheck for out-of-bounds customers after changes

C. Calibrate the LOADSITE data

D. Create horizon year customer maps
   1. Check TRX1 transfer file limits, etc.
   2. Run TRX1 to separate the primary peaks
   3. Print results and transfer them to the spreadsheet
   4. Transfer spreadsheet results to TRX2
   5. Run TRX2 transfer file to grow customers
   6. Transfer results to the spreadsheet
   7. Create output from "grown + pri peaks" maps
   8. Print output from "grown + pri peaks" maps
   9. Add "new cell" customers to printouts
   10. Create CUSTn files to read in added customers
   11. Run TRX3 to read in added customers
   12. Review results

E. Check/fix horizon year out-of-bounds customers (same procedure as B. above except skip step 1.)

F. Create start year map - Option 1 - Manual method
   1. Run TRX4 to identify new customer cells
   2. Review results
   3. Print "new cell locations" map
   4. Add start years to "new cell locations" map printout
   5. Create Card Image file and enter start years
   6. Read Card Image file into start year map

G. Create start year map - Option 2 - Automated method
   1. Run TRX4 to identify new customer cells
   2. Review results
   3. Run TRX5 - Assign values with Convolution
   4. Run WRR program to scatter values
   5. Change map number to 21 in Card Image file
   6. Modify TRX6
   7. Run TRX6 to load values, convert to start years
   8. Verify results

H. Run load forecast algorithm

d. Creates a map (Map 63) with 1's where there are out-of-bounds customers, 2's where there are vacant cells inside the boundary, and 3's where there are customers inside the boundary.

e. Creates a map (Map 62) which identifies what customer classes are in each out-of-bounds cell, and dumps the map to a Map Backup file OUTBAS.DAT.

f. Creates maps (Maps 31-40) containing the number of customers in the out-of-bounds cells, one map for each class, and dumps the maps to a Map Backup file MB3140.

3. Look at Results

Display Map 63, using Graphical Display, Color option, to get a visual picture of where out-of-bounds customer cells are located.If a printout of this map is wanted, dump it to a Map Backup file MB63 before exiting from DLF.

4. Generate Information About OOB Customers

Exit DLF and type the command "R $DISK0:[CADPAD.UTIL]PROOB", which executes a utility program that creates a listing of the coordinates of the cells which are outside the boundaries, and the classes of customers that are in those cells. The name to enter for the input file is OUTBAS. The results are output to the file OOBOUT.DAT. An example is shown in Table V-2.

5. Print Information About OOB Customers

Print the output results file by typing the command "PRINT OOBOUT.DAT".

6. Get More Information About OOB Customers

More information about the number of customers of each class in the out-of-bounds cells may be gotten by doing the following:

a. Type the command "R $DISK0:[CADPAD.UTIL]PRHZ", which executes a utility program that creates a listing of the number of customers in the out-of-bounds cells, by class. Enter MB3140 for the input file name.

b. Print the file TEMOUT.DAT by typing the command "PRINT TEMOUT.DAT". See Table V-3.

7. Print OOB Customers Map, If Wanted

If a printout of Map 63 dumped out in step I.B.3 is wanted, run the utility program by typing the command "R $DISK0:[CADPAD.UTIL]PRMB2". Enter MB63 for the input file name and OMB63 for the output file name. Print the file with the command "PRINT OMB63.DAT".

TABLE V-2
EXAMPLE OF OOBOUT.DAT FILE

MAP -- 62 CLASSES IN OUT-OF BOUNDS CELLS

OUT-OF-BOUNDS CELLS -- 1 => CLASS IN THE CELL
0 => CLASS NOT IN THE CELL

X	Y	VALUE	CLASSES 1	2	3	4	5	6	7	8	9	10
111	42	136.	0	0	0	1	0	0	0	1	0	0
111	43	136.	0	0	0	1	0	0	0	1	0	0
119	50	43.	1	1	0	1	0	1	0	0	0	0
147	82	64.	0	0	0	0	0	0	1	0	0	0
129	87	32.	0	0	0	0	0	1	0	0	0	0
129	88	32.	0	0	0	0	0	1	0	0	0	0

TABLE V-3
EXAMPLE OF TEMOUT.DAT FILE
NUMBER OF CUSTOMERS IN OUT-OF-BOUNDS CELLS

```
 40    3100B CUSTS DOM-LOW
119    50    8.00

 40    3200B CUSTS DOM-MED
119    50    2.00

 40    3300B CUSTS DOM-HGH

 40    3400B CUSTS COM-LOW
111    42    3.00
111    43    4.00
119    50    2.00

 40    3500B CUSTS COM-MED

 40    3600B CUSTS TUB-PRI
119    50    1.00
129    87    6.00
129    88    3.00

 40    3700B CUSTS TUB-PR
147    82    1.00

 40    3800B CUSTS IND-LOW
111    42    3.00
111    43    1.00

 40    3900B CUSTS IND-MED

 40    4000B CUSTS IND-HGH

 90
```

8. Fix Any Problems

Use the outputs from the above steps to either move the out-of bounds customers or the boundaries. If the out-of-bounds customers are to be moved or removed, the TEMOUT.DAT file from step 6 can be modified to edit the customer maps, setting the customer counts to 0 in the out-of-bounds cells and adding lines of data adding customers to cells that are inside the service area. To do this, first change the map numbers in the file to the map numbers of the customer maps (Maps 1-10), change the customer counts to 0 into out-of-bounds cells, add more lines of data with X and Y coordinates and the number of customers wanted in cells that are in-bounds, and then, in DLF, using Map Edit, Card Image, read in the Card Image file TEMOUT. Remember, when adding customers to the in-bounds cells that those cells may have customers already and the values added to the TEMOUT.DAT file for those cells must include those already in the cells.

9. Recheck After Changes

Repeat steps V.B.1 to V.B.3 above to verify if all the out-of-bounds problems have been fixed. If not, repeat the rest of the steps.

C. BASE YEAR CALIBRATION OF LOAD PROFILES

Figure III-5 shows the flow of decision making and procedures involved in calibrating the load profiles and load maps to the metered system profile and the metered Grid Station loads. This section goes into detail about the procedure to follow.

Figure III-5 shows, on the left side of the figure, the use of both the metered system profile and the Grid Station loadings from SUBSITE being used simultaneously in the calibration.

In other words the user computes the system profile and runs SUBSITE, and then, looking at the results of both together to decide what changes to make to the load profiles. He then repeats the process until he is satisfied with the results.

The procedure below does the same thing but in a slightly different order. The user adjusts the load profiles, looking only at the system profile, until he is satisfied. He then adjusts the load profiles, looking only at the results of running SUBSITE, until he is satisfied. He must then recheck the system profile to see if that is still acceptable.

The user can choose which method to use. The procedure below may be simpler to use but may take more iterations of the procedure to give the desired results.

1. Calibrate to Metered System Load Profile

If the base year system load profile is available or if the user can create one from the Grid Station or Grid Station transformer profiles, he should consider doing the following to adjust the class load profiles so that the computed system profile in the Load Model of LOADSITE is close to the observed or metered system profile.

a. Compare Computed and Metered System Profiles

Compute the system profile for the base year and compare it to the system profile obtained from measured Grid Station information. The steps for computing the system profile are:

i. Enter DLF and open both databases.

ii. Enter LM to enter the Load Model, and then CS to compute the system profile.

iii. In answer to the prompt, enter P for the Present year profile.

iv. The program gives three choices of Customer Count input. If the global model data has been previously entered, enter GM for Global Model. If it has not been previously entered, choose LM and the program will compute the customer counts from the customer maps after the user verifies or enters the map numbers of the customer maps. When the program asks if the user wants to store total class counts in the global database, answer Y. Answer 0 (zero) for the Iteration Number of the base year.

To display the system profile, enter DL to go to the Load Data Display Menu, and then enter either PS to plot the system profile or TS to tabulate the system profile. Either one can be sent to the CRT or the printer. If the plot is sent to the CRT, it can also be sent to the plotter.

b. Adjust Load Profiles

If the computed system profile is different from the measured system profile by a significant amount, adjustments can be made to the computed system profile. At this stage, the customer maps are assumed to be correct. If the user is not sure, these are to be checked out now before proceeding. The things that can be adjusted now are the shapes and magnitudes of the class load profiles.

When comparing the computed system load curve with the metered system load curve, be sure that they are equivalent. For example, if the metered load profile is diversified to a certain level (to a Grid Station level, for example) and includes losses, then the computed curve should reflect the same conditions.

The following are hints on how to adjust data to modify the computed system profile:

i. If the shape of the system profile is correct but the magnitude is too low, adjust all the values of all the classes upward proportionally.

ii. If the system peak is too high or too low, but other parts of the curve are alright, adjust the magnitude of the classes that peak at that time.

iii. If the system load is too high or too low at some hour of the day, adjust the values of the load curves that contribute to the system loading at that hour.

This is a trial-and error process but the improved results can be well worth the effort.

2. Calibrate to Metered Grid Station Loadings Using SUBSITE

After adjusting the load class profiles to approximate the system profile, the user may then use SUBSITE to further adjust the load class profiles and match the Grid Station loadings to the metered loadings.

To do this the user needs a map showing the service area boundaries of the Grid Stations or some way of approximating them. The user also needs the Grid Station metered loadings for the study area. If the user has this information, then he proceeds with the following steps:

a. Create Grid Station Service Area Boundary Map

Construct a barrier map by setting the value of the cells on the boundaries between Grid Stations to a value of 999. One easy way to do this is to create a transfer file where each line of data defines a line which is part of a boundary between Grid Station service areas. After the boundaries are entered, the transfer file should add 1 to complete map so no cells are set to zero. Run the transfer file from the Primary Menu and then display the map graphically to make sure it is correct and complete with no gaps in the barriers. If it's not correct, fix

the transfer file data and rerun it. The user will now have a barrier map with 1's every where except on the Grid Station division boundary lines where the values will be 1000.

b. Enter Metered Loads in Grid Station Data

In the Substation data, add to each Grid Station a fictitious capacity step year which is earlier than the base year of the forecast. For the capacity of this step enter the metered loading of the Grid Station for the year to which the user intends to calibrate the load maps, normally the base year.

c. Create Load Map

Create the load map using the Spatial Distribution command of the LOADSITE Load Model Menu.

d. Compute Grid Station Loadings

Run SUBSITE, in unconstrained mode, with the barrier map created in step 'a' above for the feeder cost map, and using the load map created in step 'c' above. This will give the loading of each Grid Station using customers from the actual Grid Station service area combined with the class profiles.

e. Compare Results and Adjust Load Profiles

Compare the resulting SUBSITE Grid Station loadings with the metered Grid Station loadings and then, after examining the differences, try to determine a pattern of what kinds of areas have high loads and what kinds of areas have low loads. If the user can see that loads in areas containing a particular class or group of classes are too low, then he increases the magnitude of the load curve for that class or those classes. Also lower other classes needed to balance out the total load.

Rerun SUBSITE and compare the results again with the metered Grid Station loadings. Make further adjustments if needed and recheck the results, repeating until satisfied with the results.

D. CREATE THE HORIZON YEAR CUSTOMER MAPS.

Refer to Figures V-1 and V-2 for an overview of the procedure and what it does with the cell customer counts.

1. Set Customer Limits in TRX1

Review the transfer file TRX1.DAT and verify the limits, which are the maximum number of customers allowed per cell, for each class. For Gujranwala III the limits were as shown in Table V-4. Each limit is determined by assuming that the entire 300m X 300m cell is completely filled with customers of that class. If changes are made to these limits, they must be made in three places in TRX1.DAT: 1) in the "**CUT OFF PRIMARY PEAKS...", 2) in the "**CUT OFF PRIMARY BASE...", and 3) in the "**LOWER PRIMARY PEAKS..." sections of the transfer file, using the VAX Editor.

2. Separate the Primary Peaks Using TRX1

Enter DLF, open the databases, using the transfer file TROB from the Setup Menu. Then, from the Primary Menu, run the transfer file TRX1, which does the following:

a. Prints the Global Model table.

b. Updates map names for display.

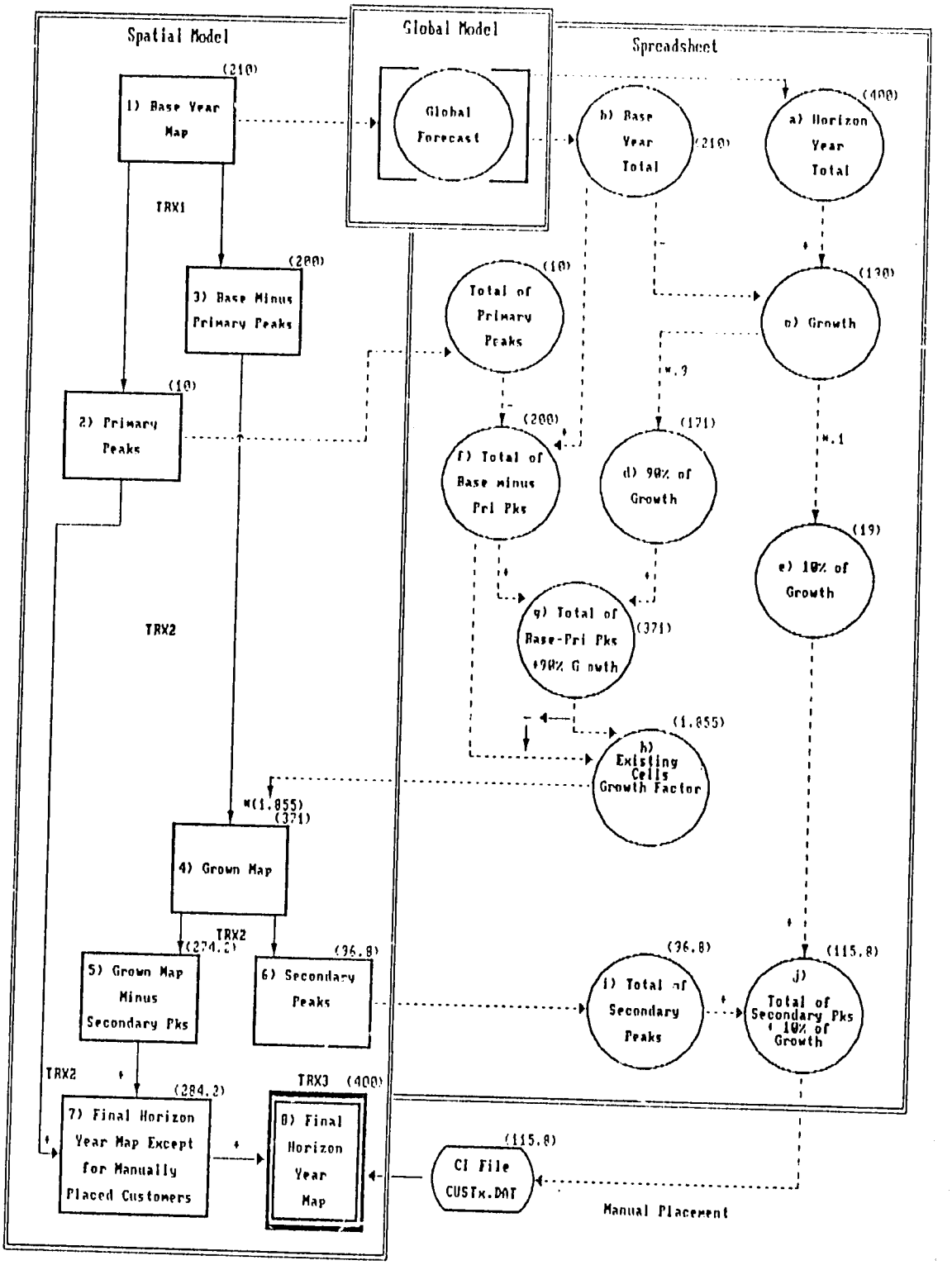
c. Prints Map Statistics of the Base Year maps.

d. Copies the Base Year Maps 1-10 to Maps 31-40 and 41-50.

e. Removes the Primary Peaks from Maps 31-40. Primary Peaks are the customers in excess of the limits, the maximum customers per cell.

f. Removes everything except the Primary Peaks in Maps 41-50.

g. Prints the Map Statistics of Maps 41-50 and Maps 31-40.



BEST AVAILABLE DOCUMENT

FIGURE V-1 - CHART OF PROCEDURE FOR CREATING HORIZON YEAR CUSTOMER MAPS

(This procedure is followed for each Customer Class)

"hycmap"

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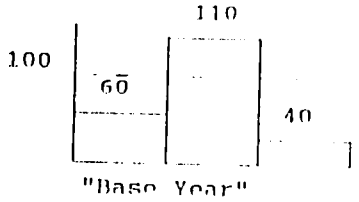
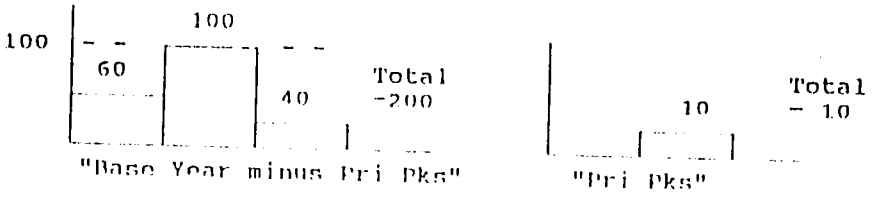
The base year map is created from customers data:



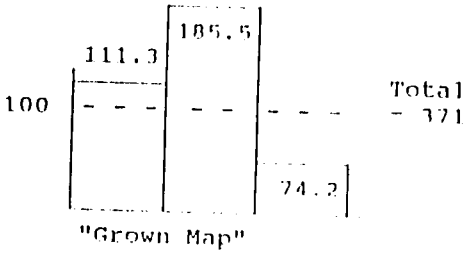
Base year total customers - 210

Horizon Year total customers - 400
Growth - 190

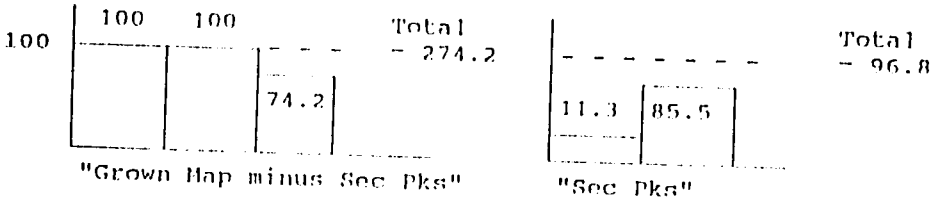
The base year is separated into "Base Year minus Primary Peaks" and Primary Peaks" maps.



Growth Factor is applied to the "Base Year minus Pri Pks" map.



This is separated into "Grown Map minus Secondary Peaks" and "Secondary Peaks" maps.



The "Primary Peaks" are put back on the "Grown Map minus Sec Pks" map, and the "Secondary Peaks" total plus "10% of Growth" are manually added to the map, via a Card Image file, to complete the "Horizon Year" map.

Sec Pks + 10% Grth = 96.8+19=115.8
Manually Added = 60+40+15.8 =115.8

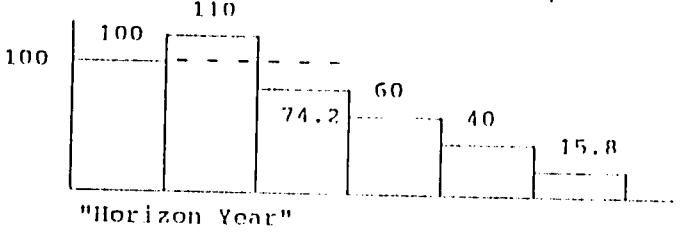


FIGURE V-2 - THREE-CELL EXAMPLE OF CREATING THE HORIZON YEAR CUSTOMER MAP FOR A CLASS WHOSE LIMIT PER CELL IS 100 CUSTOMERS

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TABLE V-4
EXAMPLE OF MAXIMUM CUSTOMERS PER CELL

GUJRANWALA III MAXIMUM CUSTOMERS PER CELL

Class	1	DOM-LOW	450
Class	2	DOM-MED	100
Class	3	DOM-HGH	11
Class	4	COM-LOW	200
Class	5	COM-MED	10
Class	6	TUB-PRI	3
Class	7	TUB-FR	3
Class	8	IND-LOW	40
Class	9	IND-MED	4
Class	10	IND-HGH	2

3. Transfer Results to Spreadsheet and Compute Growth Factors

Exit DLF, print the output file (the name the user gave when entering DLF, plus a .DAT extension), and enter the information from the printout (see Appendix B for sample printout) into columns B, C, and E of the Lotus spreadsheet **GRW3GRTH**, shown in Table V-5. The spreadsheet computes columns F through J.

The spreadsheet in this example presumes that 90% of the growth from the base year to the horizon year will be added to the cells where there are customers of that class in the base year, and that 10% of the growth will be applied manually to cells chosen by the user. He may choose vacant cells or cells that already have customers.

To change this 90% to 10% ratio, the spreadsheet columns G and H formulae, headings and footers can be changed.

4. Enter Factors in TRX2

Using the VAX Editor, enter the factors from column J of the spreadsheet into TRX2.DAT, in the "**Grow the Base..." section. Also, if changes were made in step D.1 above, change the limits of the maximum number of customers per cell in three places: 1) in the "**CUT OFF SECONDARY PEAKS...", 2) in the "**CUT OFF SECONDARY BASE...", and 3) in the "**LOWER SECONDARY BASE..." sections.

TABLE V-5
EXAMPLE OF CUSTOMER GROWTH SPREADSHEET

GUJRANWALA GROWTH

A class	B base	C pr pks	D base-pp	E horiz	F growth	G 90%grth	H 10%grth	I grwn map
1	39962	333	39629	89468	49506	44555	4951	84184
2	5070	201	4869	12260	7190	6471	719	11340
3	376	4	372	909	533	480	53	852
4	4870	76	4794	8729	3859	3473	386	8267
5	151	2	149	293	142	128	14	277
6	2649	139	2510	3116	467	420	47	2930
7	561	0	561	732	171	154	17	715
8	1221	81	1140	3421	2200	1980	220	3120
9	37	2	35	94	57	51	6	86
10	6	0	6	18	12	11	1	17
n	TRX1 30+n	TRX1 40+n	=B-C 30+n	TRX1	=E-B	=.9*F	=.1*F	=D+G 30+n

class	J factor	K sec pks	L grwn-sp	M map3n	N sp+10%	O total	P diff chk	Q limit
1	2.12431	9098	75086	75419	14049	89468	0	450
2	2.32902	1359	9981	10182	2078	12260	0	100
3	2.28952	114	738	742	167	909	0	11
4	1.72447	726	7541	7617	1112	8729	0	200
5	1.85772	38	239	241	52	293	0	10
6	1.16745	90	2840	2979	137	3116	0	3
7	1.27433	2	713	713	19	732	0	3
8	2.73684	618	2502	2583	838	3421	0	40
9	2.46571	17	69	71	23	94	0	4
10	2.80000	5	12	12	6	18	0	2
	=I/D	TRX2 50+n	=I-K 30+n	=L+C 30+n	=K+H	=M+N	=O-E	INFO

NOTE: THIS IS FROM SPREADSHEET GRW3GRTH.WK1

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5. Grow and Adjust Customers Using TRX2

Enter DLF, open the databases using the transfer file TROB from the Setup Menu. Then, from the Primary Menu, run the transfer file TRX2 which does the following:

a. Updates map names for display.

b. Grows the peakless base year maps, in Maps 31-40, according to the ratios computed in step D.J. above.

c. Copies Maps 31-40 to Maps 51-60.

d. Removes the Secondary Peaks from Maps 31-40. Secondary Peaks are the customers that exceed the maximum customers per cell, after the base year customers have been "grown".

e. Stores the Secondary Peaks in Maps 51-60.

f. Prints Map Statistics of Maps 51-60 and 31-40.

g. Adds the Primary Peaks from Maps 41-50 to the Secondary Base maps in Maps 31-40. This is done so that the cells exceeding the limits in the base year would still exceed the limits in the horizon year by the same amounts.

h. Prints out Map Statistics for Maps 31-40. These maps now contain the horizon year customers except for those which are added manually in step 6. below.

i. Backs up Maps 1-10 in file MB0110 and Maps 31-40 in file MB3140.

j. Updates map names for display.

k. Creates Backup Map files MB31, MB32, etc. for printing out Maps 31-40 individually.

6. Determine the Total Remaining Horizon Year Customers to be Manually Added

Exit DLF, print the output file (the name the user gave when entering DLF, plus a .DAT extension) and enter information from the printout (Shown in Appendix B) from step 5.f above, into column K of the Lotus Spreadsheet. Also, compare the printed results (also shown in Appendix B) from step 5.h, with the values in column M of the spreadsheet. The spreadsheet

computes, in column N, the total number of customers to be manually added. It also compares different columns and displays any discrepancies in Column P. If the discrepancies are too great, go back and check the previous steps and redo those steps found to be in error.

7. Convert Customer Maps to Printable Format

Enter the command "R $DISK0:[CADPAD.UTIL]PRMB5" to execute a utility program which outputs the maps in a form that can be used in step 9 below. The program will prompt for the input file name (answer MB31 or MB32 or ...), the output file name (answer OMB31 or OMB32 or...), the X-dimension of the map (220 for GRW3), and the Y-dimension of the map (100 for GRW3).

8. Print Customer Maps

Print the output files from step 7 with the command "PRINT OMB31.DAT" or "PRINT OMB32.DAT" or etc.

9. Add "Manual" Customers to Printout

On the printouts from step 8, manually write the number of customers to be **added** to each cell. This is done on the printout for each class, and the sum of all the customers added to the printout of a class should be the same as the number in column N of the spreadsheet for the class.

10. Create Card Image Files with New Customer Counts

For each class, using the VAX editor, create a file named CUSTn.DAT, where n is the class number. In each file, put the locations and values of all the customers added to the map printouts in step 9 above. See Table V-6 for instructions on using the VAX editor, and Table V-7 for the file format.

TABLE V-6
PROCEDURE FOR USING THE VAX EDITOR

1. Enter the directory where the user wants to create or edit a file.

2. Type EDIT FILENAME.EXT, where FILENAME is the name of the new file to be created or edited (limit 6 characters for files that will be read by CADPAD) and EXT is a filename extension (limited to 3 characters). For CADPAD files the extension must be DAT.

3. The editor will start out in the "line" mode indicated by a "*" prompt in column 1. To change to full screen mode, enter "C".

4. In full screen mode, enter the data or changes using keyboard keys (arrows, return, etc).

5. When finished with the changes and additions, save the file by first entering "Control-Z" and then enter "EX" or "EXIT" at the "*" prompt. If the user does not want to save the changes, he enters "QUIT" instead of "EX".

TABLE V-7
FORMAT FOR CUSTn.dat FILES

```
                    111111
Column: 123456789012345 ...

Line 1      40    41MAP NAME                 Control line*.

Line 2      71    43  7      |Field 1:DLF X-Coordinate,
  .         75    44  12     |        right adjusted, columns 1-5.
  .        102   111  113    |Field 2:DLF Y-Coordinate,
  .        117    62  24     |        right adjusted, columns 6-10.
            .      .   .     |Field 3:Number of customers to add to
            .      .   .     |        the cell, columns 11-17,
            .      .   .     |        using any columns of the field
           207    33  4      |

Blank line                                Blank line means end of map

Last line  90                             90 means end of file
```

* 40 in columns 4 and 5 define file format, columns 6-10, right adjusted is the map number for loading the data. Use Map 41 for Class 1, 42 for Class 2, ..., 50 for Class 10

11. Load New Customer Counts Using TRX3

Enter DLF, open the databases using the transfer file TROB from the Setup Menu. Then from the Primary Menu, run the transfer file TRX3 which does the following:

a. Copies Maps 31-40 to Maps 11-20.

b. Initializes Maps 41-50.

c. Reads in the CUSTn.DAT Card Image data files, bringing the manual customer additions into Maps 41-50.

d. Adds Maps 41-50 to Maps 11-20.

e. Prints out Map Statistics for Maps 11-20 (Horizon year).

f. Sets up Maps 41-60 for displaying base and horizon year service areas.

g. Updates map names for display.

12. Review Results

Using Map Statistics, or the printout from TRX3, check to see if the map totals of Maps 11-20 equal the horizon year totals in the spreadsheet and/or the Global Model. Then, using the following Graphical Display, Map Display procedure, visually check the geographical distribution of the new cells. Repeat the steps for each class.

a. Display any map (for example Map 1) using the Black color of the Grey Scale option. This is only to work around a LOADSITE bug which shifts screen coordinates of other maps with respect to the first map.

b. Display the horizon service area cells (Map 50 + n, where n is the customer class number) with a color (eg. Red).

c. Display the base year service area cells (Map 40 + n) with a different color (eg. Green). New cells will remain as red.

E. CHECK FOR HORIZON YEAR OUT-OF-BOUNDS CUSTOMERS.

The steps for doing this are as follows:

1. Check for Out-of-Bounds Customers

Enter DLF, open the databases by running the transfer file TROB from the Setup Menu. Then, from the Primary Menu, execute the transfer file TRCBH, which does the following:

a. Modifies map names for display.

b. Reads in the Card Image file SAR64.DAT which defines the service area (in Map 64). SAR64.DAT was prepared before, in step V.B.1.

c. Combines all horizon year customer maps (in Map 65) and sets cells to 1 where there are horizon year customers

d. Creates a map (Map 63) containing 1's where there are out-of-bounds customers, 2's where there are vacant cells inside the boundary, and 3's where there are customers inside the boundary.

e. Creates a map (Map 62) which identifies what customer classes are in each out-of-bounds cell, and dumps the map to a Map Backup file OUTBAS.DAT.

f. Creates maps (Maps 31-40) containing the number of customers in the out-of-bounds cells, one map for each class, and dumps the maps to a Map Backup file MB3140.

2. Look at Results

Display Map 63, using Graphical Display, Color option, to get a visual picture of where out-of-bounds customer cells are located. If a printout of this map is wanted, dump it to a Map Backup file MB63 before exiting from DLF.

3. Generate Information About OOB Customers

Exit DLF and type the command "R $DISK0:[CADPAD.UTIL]PROOB", which executes a utility program that creates a listing of the coordinates of the cells which are outside the boundaries, and the classes of customers that are in those cells. The name to enter for the input file is OUTHOR. The results are output to the file OOBOUT.DAT. See the example in Figure V-2.

4. Print Information About OOB Customers

Print the output result file by typing the command "PRINT OOBOUT.DAT".

5. Get More Information About OOB Customers

More information may be obtained about the number of customers of each class in the out-of-bounds cells follows:

a. Type the command "R $DISK0:[CADPAD.UTIL]PRNZ", which executes a utility program that creates a listing of the number of customers in the out-of-bounds cells, by class. MB3140 is the input file. TEMOUT.DAT is the output file.

b. Print the file TEMOUT.DAT by typing the command "PRINT TEMOUT.DAT". See Figure V-3.

6. Print OOB Customers Map, If Wanted

To print Map 63 dumped out in step V.E.2, run the utility program by typing the command "R $DISK0:[CADPAD.UTIL]PRMB2". Enter MB63 as the input file name and OMB63 as the output file name. Print it with the command "PRINT OMB63.DAT".

7. Fix Any Problems

Use the outputs from the above steps to either move the out-of bounds customers or the boundaries. If the out-of-bounds customers are to be moved or removed, the TEMOUT.DAT file from step 5 can be modified to edit the customer maps, setting the customer counts to 0 in the out-of-bounds cells and adding lines of data adding customers to cells that are inside the service area. To do this, first change the map numbers in the file to the map numbers of the customer maps (Maps 11-20), change the customer counts to 0 into out-of-bounds cells, add more lines of data with X and Y coordinates and the number of customers wanted in cells that are in-bounds, and then, in DLF, using Map Edit, Card Image, read in the Card Image file TEMOUT. Remember, when adding customers to the in-bounds cells that those cells may have customers already and the values added to the TEMOUT.DAT file for those cells must include those already in the cells.

8. Recheck After Changes

Repeat steps V.E.1 and V.E.2 to verify if all the out-of-bounds problems have been fixed. If not, repeat the rest of the steps.

F. CREATE START YEAR MAP - OPTION 1 - MANUAL PROCEDURE.

This procedure is good if there are not too many new cells, say less than 100 cells.

1. Identify New Customer Cells Using <u>TRX4</u>

Run the transfer file <u>TRX4</u>, which performs the following steps:

a. Updates map names for display.

b. Combines the Base Year service area maps created by <u>TRX3</u> in step D.11, Maps 41-50, into one Base Year service area map (Map 64).

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c. Combines the Horizon Year service area maps created by TRX3 in ster D.11, Maps 51-60, into one Horizon Year service area map (Map 65).

d. Copies Map 65 to Map 62 for use with Option 2 below in case that option is chosen.

e. Thresholds both of the above service area maps to values of 1 for non-zero cells.

f. Subtracts the Base Year service area map from the Horizon Year service map and stores the result in Map 63. This map now contains a value of 1 for each added cell that requires a start year.

g. Creates a Card Image Map Backup file, MB63, containing the map data.

2. Review the New Customer Cells

Review the results by displaying Maps 65, 64 and 63 using Graphical Display/Map Display using the same procedure as given in V.D.12.

3. Print Out New Customers Map

Exit DLF and run the Print Map Backup program, using the Command "R $DISK0:[CADPAD.UTIL]PRMB5". Enter MB63 for the input file and OMB63 for the output file name. Enter the proper X and Y dimensions as requested. Print the file using the command "PRINT OMB63.DAT".

4. Determine Start Year of Each New Customer Cell

On the printout of OMB63, write the start year for each cell that has a printed value of 1. Start years should be distributed geographically and through time in as smooth a manner as is practical. The load will start to grow in each cell in the given start year, but load will not appear until the next year when it has had a year to grow.

5. Create Card Image File of Start Years

Use the command "R $DISK0:[CADPAD.UTIL]PRNZ" to run the utility program which creates a file containing only the non-zero cells from a Map Backup file. Enter MB63 as the input file name. The output file name is TEMOUT.DAT and it will contain one line for each cell which requires a start year. Transfer the start years, from the marked up printout of step 4 above, to the TEMOUT.DAT file, replacing the value of 1 with the Start Year for each cell. Then change the map number 63

in Columns 9 and 10 of the first line to 21 so the data will be read into the Start Year map in the next step.

6. **Load the Start Years**

Enter DLF and perform the following steps:

a. In Map Edit, initialize Map 21 to 0.

b. In Map Edit, use the Card Image option to read in the TEMOUT file data prepared in step 5 above.

c. In Spatial Display/Tabular Display use Display Map Statistics for Map 21 to verify that the data was entered correctly.

d. In Spatial Display/Graphical Display, display the Map 21 using Color option to verify the geographical locations of the start year cells. An enhanced display can be created by copying Map 21 to a workspace Map 61, using Copy Map (61,21), subtracting 1984 from the map using Add/Subtract (61,1,61,0,61,-1984), and thresholding it (61,0,0,9999,9999). When this is displayed with the color option, different years will be displayed in different colors.

e. If errors are found go back and repeat steps.

G. CREATE START YEAR MAP - Option 2 - AUTOMATED PROCEDURE.

This option is easier than the Manual Option if there are many new cells, say more than 100 cells.

1. **Identify New Customer Cells Using <u>TRX4</u>**

Run the transfer file <u>TRX4</u>, which does the following steps:

a. Updates map names for display.

b. Combines the Base Year service area maps created by <u>TRX3</u> in step C.11, Maps 41-50, into one Base Year service area map (Map 64).

c. Combines the Horizon Year service area maps created by <u>TRX3</u> in step D.11, Maps 51-60, into one Horizon Year service area map (Map 65).

d. Copies Map 65 to Map 62 for use later in this procedure.

e. Thresholds both of the above service area maps to values of 1 for non-zero cells.

f. Subtracts the Base Year service area map from the Horizon Year service area map and stores the result in Map 63. This map now contains a 1 in each cell that requires a start year, in other words, each cell with no customers in the base year but having customers in the horizon year.

g. Creates a Card Image Map Backup file, MB63, containing the map data.

2. Review the New Customer Cells

Review the results by displaying Maps 65, 64 and 63 using Graphical Display/Map Display, using the same procedure given in V.D.12.

3. Assign Values to New Customer Cells Using TRX5, Which Uses the Convolution Function of Map Mathematics

Run the transfer file TRX5 from the Primary Menu. TRX5 performs the following steps:

a. Convolves the Total Customers map. See the Users Manual for a description of Map Mathematics functions.

b. Masks out all but the new cells

c. Scales the map from 0.0 to 21.0

d. Takes the map to the power of 3

e. Dumps Map 62 to a Map Backup file MB62

4. Scatter the Values Using the WRR Utility Program

Exit DLF and run the WRR program, using the command "R $DISK0:[CADPAD.UTIL]WRR". Enter input file name MB62, output file name MB21W, and the appropriate map dimensions (220 & 100 for GRW3). This program will rank the cells, using the Weighted Random Ranking method, choosing the order in which the cells should be developed.

5. Prepare File for Loading

Using the VAX editor, change the map number in MB21W.DAT in columns 9 and 10, line 1, to 21.

6. Prepare Transfer File TRX6

In TRX6.DAT, use the VAX editor to enter the horizon year minus the base year minus 1 in field 3 of the Scale command. Enter the base year in field 6 of the Add/Subtract command,

and enter the base year plus .001 in field 3 of the Threshold command.

7. **Load Scattered Values and Convert to Start Years Using TRX6**

Enter DLF and run the transfer file TRX6 from the Primary Menu. TRX6 performs the following steps:

a. Reads in MB21W into Map 21.

b. Converts the ranking into start years based on the base year and the last forecast year entered in TRX6.

8. **Review Results**

Perform the steps in V.E.6.c. through e., to verify and modify results.

H. ENTER THE S-CURVE

In the DLF Global Model, in the Edit/Display Global Data Menu, use the Update Growth ("S") Curve option to enter the twenty values defining the curve. See Section IV.E.1 for more details.

I. RUN THE DLF FORECAST AND CHECK RESULTS

Follow the instructions in the DLF Users Manual, Section 5.2, to run the forecast.

In DLF, some cells which were vacant in the base year but do have customers in the horizon year, may have negative growth in the last years of the forecast because they grew too fast in the earlier years. This should be checked by using the Scan Maps display in the Tabular Displays menu. Choose Maps 23 through 29 for display and then display the values of selected cells, one at a time, until it has been verified if the load growth patterns are right or not.

If only a few cells behave in this manner, and not too seriously, then an adjustment can be made using the TRDNG transfer file which deletes negative growth from the load maps. See Appendix A for details. If a class, such as Tubewells, is decreasing in future years, then **do not** use the transfer file to make this adjustment.

If the growth pattern problem is serious, and if cells with base year customers are either growing too fast in the early years and decreasing at the end, or growing too slowly in the early years and jumping up at the end, then the forecast should be re-run using the alternate DLF forecast procedure given in Section V.J below.

J. ALTERNATE DLF FORECAST PROCEDURE USING TRANSFER FILE XTRDLF

The data preparation for this DLF load forecast procedure is the same as when the program algorithm is used, except that the Start Year map is not used. If the program algorithm has been run, then nothing more needs to be done with the database data.

The first step in this procedure is to use the spreadsheet XTRDLF.WK1 on the PC to compute the values that need to be entered in the transfer file XTRDLF.DAT. The spreadsheet requires the user to enter the following data:

- The years of the forecast iteration years. These will be the same years entered in the DLF Global Model.
- The customer counts for each customer class for each forecast iteration year. These will be the same customer counts that were entered in the DLF Global Model.
- The kVA per customer at the system peak load hour for each customer class, both for the base year and the horizon year. These will be the same values as were entered in the LOADSITE Load Model in the class profiles data for that hour.

The spreadsheet computes the kVA per customer values for the intermediate years, for the peak load hour, for each customer class. It also computes the map multipliers, which represent the portion of the total forecast period customer growth that will occur between the base year and each intermediate forecast iteration year, for each class.

The second step of the procedure is to enter the values computed by the spreadsheet, into the transfer file. The transfer file has a section for each forecast iteration year. The map multipliers are not needed for the base and horizon years, iterations 0 and 6, because the transfer assumes that they are all 0.0 for the base year and 1.0 for the horizon year.

The third and last step is to enter DLF and invoke the transfer file from the Primary Menu, and then check the results. Use Map Statistics to compare the load map totals with the total loads computed in the spreadsheet. Also use Scan Maps to check some of the cells in Maps 23-29, as was done in Section V.I above.

K. ADJUST LOADS TO MATCH FEEDERSITE OR METERED GRID STATION LOADS

After the forecast is completed and the load maps are created, make sure that they are in the right units, normally in kVA. Then the maps can be adjusted, if the user wishes; a) so that the base year load map matches the loads from FEEDERSITE or b) so that the base year loadings of the Grid Stations match the metered loadings of

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the Grid Stations. Either of the two adjustments can be chosen, but not both.

1. **Adjust to FEEDERSITE Loads**

If the FEEDERSITE loads are available and the user wants to consider adjusting the forecast to match those loads in the base year, he may do the following:

a. In FEEDERSITE, dump a Card Image file to LOADSITE, including the loads.

b. Using NODESIM in the Load Model of SUBSITE, bring in the loads from the Card Image file from FEEDERSITE, storing them in any available workspace map.

c. Using Map Mathematics, Map Statistics and Graphical Display, compare the FEEDERSITE load map with the LOADSITE Base Year load maps and study the differences.

d. Run SUBSITE unconstrained with the Grid Station Service Area Boundary/Barrier map with each of the two load maps and study the differences in the SUBSITE Grid Station loadings results.

e. Decide if the differences in steps 'c' and 'd' are significant and decide which is the most appropriate to use. If the user prefers to use the map computed by LOADSITE, skip step 'f'.

f. If the user decides to adjust load maps to the FEEDERSITE loads, do the following:

i. Save the original forecast load maps to a Map Backup file.

ii. Using Map Mathematics Add/Subtract, Subtract the base year forecast load map from the FEEDERSITE load map and store the difference in an available workspace map.

iii. Add the difference map from step ii. to all the load maps from the forecast, including the base year load map. The user now has a load forecast that matches the FEEDERSITE loads in the base year, and the load growth from the forecast is added to that in each successive year of the forecast.

2. **Adjust to Metered Grid Station Loads**

If the user did not adjust to the FEEDERSITE loads then he may adjust the forecast loads to the base year Grid Station

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metered loadings. The user should choose one or the other (or neither) but not both.

To force the loads in the service area of each Grid Station to match the metered loading of each Grid Station in the base year, do the following:

a. Run SUBSITE unconstrained with the Grid Station service area boundaries barrier map, using a year previous to the base year, in which are stored, as capacities, the metered loadings of the Grid Stations for the base year, and using the base year LOADSITE load map.

b. Review the results and decide if the user wants to go ahead and force the load map to match the metered loadings. If he decides not to, then skip 'c'.

c. If the user decides to adjust load maps to the metered loadings of the Grid Stations, do the following:

   i. Store the Assigned Substation Loading results in a map in SUBSITE, Store Results. If the user uses the transfer file TRSR, it will be stored in map 48.

   ii. Save the original forecast load maps to a Map Backup file.

   iii. Using Map Mathematics, Add/Subtract function, compute and store in workspace maps the growth between each successive set of forecast years. For example save the growth between the base year and the 1st iteration year in a map, between the 1st and 2nd iteration years in another map, etc.

   iv. Using Map Mathematics, Divide function, divide the base year load map by the Assigned Substation Loading Map saved in step i.

   v. Using Mathematic, Add/Subtract function, add the growth between successive years to the first year's load map to get the next. For example to get the 1st iteration load map add the base year load map, from step iv. above, to the map of growth from the base year to the 1st iteration year, as computed in step iii. above, to get the load map of the 1st iteration. The load map of the 2nd iteration will be the load map of the 1st iteration plus the growth between the 1st and 2nd iterations, etc.

The user now has a load forecast that matches the base year metered Grid Station loadings, and the load growth

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from the forecast is added to that in each successive year of the forecast.

L. CALIBRATE FEEDER COST MAP VALUES AT GRID STATION LOCATIONS

After the previous steps, the load profiles and load maps have been calibrated and adjusted to match the conditions of the Grid Stations serving loads **in their actual base year service areas.** During the SUBSITE study, however, the Grid Station service area boundary map will not be used and the Grid Station loadings may be very different, even in the base year.

The user may do one more thing, if he thinks it is needed, to help the program come closer to the metered loadings in the base year, when the service area boundary map is not used. Instead of the service area boundary map, use the feeder cost map representing the cost of building a feeder across each small-area. The values in this map are the basis for the feeder cost figures summarized in the SUBSITE results output. They are also used by the SUBSITE algorithm to determine Grid Station service areas.

This calibration helps to bring the base year solution closer to the actual Grid Station loading. The feeder cost changes made in the calibration should be left in the Feeder Cost map for the future years also.

This calibration does not need to be exact. Loadings that approximately match the metered loadings are sufficient.

With this calibration it is not practical to try to shift loadings between widely spaced Grid Stations because the loads at the service area boundary are normally sparse, and large cost changes would be needed to change loadings significantly. On the other hand, small changes in costs at Grid Stations that are close together may have a big effect on loadings.

There are two ways to calibrate or adjust the values in the Feeder Cost map at the Grid Station locations:

1. Calibrate SUBSITE Command

When Calibrate SUBSITE is run from the SUBSITE Primary Menu, the program adjusts the values in the Feeder Cost Map, at the Grid Station locations, to increase or decrease the Grid Station service areas in order to increase or decrease the loads so they match the loads given in the load history data for the year specified by the user. The load history data must be previously entered. The program will attempt, for several iterations, to adjust the feeder cost value in the Grid Station small-area locations of the feeder cost map, so

that the load served by each Grid Station is the same as the loads given in the load history for the Grid Stations.

2. Manual Calibration of Feeder Cost Map Values

An alternative to using Calibrate SUBSITE is to manually adjust the cost values in the Feeder Cost map for the locations of the Grid Stations where the user wishes to raise or lower the loads assigned by SUBSITE. The user increases the cost to decrease the service area and load, and lowers the cost to increase the service area and load. The user can change one or more Grid Station cells at a time and then run SUBSITE to see the effect of the changes on the Grid Station loadings. Several iterations will probably be needed.

The manual method is more flexible because it lets the user decide which station loads to adjust and lets him decide when the results are good enough.

VI. LOADSITE SLF - URBAN LOAD FORECASTING PROCEDURE

VI. LOADSITE SLF - URBAN LOAD FORECASTING PROCEDURE

SLF is designed to be used for load forecasting in urban areas. Although it is not recommended, SLF can also, with the aid of special procedures, be used for areas that are part urban and part rural. This section describes the procedures to be followed for both situations. The procedures are the same for both, up through Section VI.G.13. The rest of the Section VI.G gives the standard procedure, and Section VI.I gives the special procedure to be followed from that point onward. Table VI-1 gives a summary of the overall procedure.

The special SLF procedure was developed for applying SLF to a mixed urban and rural area, the Kot Lakhpat Division of the Lahore III Circle. As with the DLF program, transfer files were used to speed up processing and to reduce errors. See Appendix-A for descriptions and listings of the transfer files. The WRR Utility Program, developed for use with DLF, was also used in the SLF procedure. See Appendix-C for details.

Because SLF is designed for use on urban areas, special procedures had to be developed to adapt its use to the Kot Lakhpat area, which has a large proportion of rural land. Even with these special procedures it is not recommended that WAPDA use SLF on other similar areas.

However, some or all of the special procedures developed for this area can also be used for aiding in the forecast of an urban area, giving the user more control over the results for an urban area forecast.

For an area that is part urban and part rural (a city surrounded by a margin of rural land does not fit in this category), SLF encounters two kinds of problems:

- The first is that SLF is designed to forecast growth of a city into the surrounding area but not into a large rural area with scattered towns. If run normally, the program will forecast growth only for the city and ignore the rest of the area.

- The second problem is that SLF looks for the most preferred small area for a class and then uses all of the available land in that small area for growth of that class. Then it looks for the second most preferred small area and uses that, etc. until all growth for the class is allocated. This is repeated for all classes and the result is that growth is concentrated in a small number of cells with the highest preference values. This may be alright for a city but in a mixed urban and rural environment the growth needs to be more spread out.

TABLE VI-1
SUMMARY OF SLF LOAD FORECAST PROCEDURE STEPS

A. Base year data setup

B. Check/fix base year out-of-bounds customers

1. Create service area Card Image file
2. Check for out-of-bounds customers
3. Look at results
4. Get information about out-of-bounds customers
5. Print information about out-of-bounds customers
6. Get and print more information, if wanted
7. Fix any problems
8. Print out the map, if wanted
9. Recheck for out-of-bounds customers after changes

C. Convert Customer maps to land-use maps

1. Compute the customer map and end-use profile multipliers
2. Apply customer map multipliers to convert them to land-use
3. Enter end-use profile multipliers to keep units consistent
4. Create a "water" land-use map using Map Edit

D. Create a vacant available land map

1. Add all land-use maps together, including water
2. Add vacant-unusable land, if available, to the same map
3. Subtract result from a total land map
4. If vacant-unusable land map was not available, ratio down the map of step 3 by some percentage (say ten percent) representing unavailable land

E. Calibrate the base year LOADSITE data

F. Add highways, railroads, highway intersections, and zoning maps

G. Prepare the control parameter file, YSPARM

H. Run the SLF forecast in the standard way
or
I. Run the special SLF forecast procedure

th of the above problems are addressed by following the special ocedure of Section VI.I to "scatter" the high preference small eas and to limit land development of a small area in any given recast iteration.

t Lakhpat was chosen to be the first area studied with SLF, in ite of its nature, because at the time it was deemed the best ea with an urban component where data could be readily obtained the time. It was decided that the problems were outweighed by e need to give WAPDA engineers some experience with the data quirements and the running of SLF.

se year customer data for SLF is collected, prepared, and entered the same way as for DLF, as described in Section IV. Nine isses may be used with the standard SLF algorithm, which is what PDA will use; three domestic, three commercial, and three lustrial. Some flexibility is allowed but basically the classes e treated as such in the standard algorithm. For Kot Lakhpat, e of the commercial classes was used for Tubewells.

e major differences between DLF and SLF are as follows:

- SLF does not require or use horizon year customer maps as DLF does. SLF builds on the previous forecast year according to the standard forecast algorithm and the parameters and data supplied by the user.

- SLF does not use an "S-Curve" or a Start Year map as DLF does.

- SLF provides the capability of combining "end-use" curves to make up the class load profiles. Each "end-use" curve has its own multiplier and growth rate. If the user does not want to supply different components of class load curves separately, he can simply supply one "end-use" curve containing the complete composite class curve.

- The SLF program requires a map of vacant-useable land, and adds new customers only where there is vacant available land. The program keeps track of what land has been used and what is still available. The Vacant-Useable Land map can be created from the customer class land-use maps plus a vacant-unusable land map, a water map, etc. If customer count maps are used they should be converted to land-use maps before creating the vacant-useable land maps.

- The SLF program uses Zoning and Preference Maps to determine where growth should occur. Preference maps are developed by the program using land-use maps, highways, water, railroad, zoning, etc. Zoning maps are entered by the user if they are to be used in the forecast.

- SLF is suited to Urban areas and DLF to Rural areas and towns.

The procedure for applying SLF is as follows:

A. PREPARE THE BASE YEAR DATA

Enter Global Data, Load Data, and Base Year Customer Data (in maps 8-16) as in DLF. Section IV of this manual covers the preparation of these data and the report "Procedure for Development of Load Forecasts for Town and Rural Areas" is also given as a reference.

B. CHECK FOR BASE YEAR OUT-OF-BOUNDS CUSTOMERS

The procedure for this is the same as that for DLF given in Section V.B. of this manual. It is repeated here for completeness and continuity. Only the Figure numbers have been changed.

The steps for detecting and taking care of customers outside the service area are as follows:

1. Using the VAX Editor or a spreadsheet, prepare a Card Image file SAR64.DAT defining the service area. Use the "Set Block to a Value" format, putting 1's for cells inside the service area. Cells outside the service area will contain 0's. The file must specify Map 64 on the first line. This file is the same as SAR51.DAT of Table IV-7, except for the map number.

2. Enter DLF and open the databases by running the transfer file <u>TROB</u> from the Setup Menu. Then, from the Primary Menu, run the transfer file <u>TRCBB</u>, which does the following:

   a. Modifies map names for display.

   b. Initializes Map 64 to 0.0 and reads into it the service area from the file SAR64.DAT .

   c. Combines all the customer maps for the base year (in Map 65) and sets cells to 1 where there are base year customers.

   d. Creates a map (Map 63) with 1's where there are out-of-bounds customers, 2's where there are vacant cells inside the boundary, and 3's where there are customers inside the boundary.

   e. Creates a map (Map 62) which identifies what customer classes are in each out-of-bounds cell, and dumps the map to a Map Backup file OUTBAS.DAT.

f. Creates maps (Maps 31-40) containing the number of customers in the out-of-bounds cells, one map for each class, and dumps the maps to a Map Backup file MB3140.

3. Display Map 63, using Graphical Display, Color option, to get a visual picture of where out-of-bounds customer cells are located. If a printout of this map is wanted, dump it to a Map Backup file MB63 before exiting from DLF.

4. Exit DLF and type the command "R $DISK0:[CADPAD.UTIL]PROOB", which executes a utility program that creates a listing of the coordinates of the cells which are outside the boundaries, and the classes of customers that are in those cells. The name to enter for the input file is OUTBAS. The results are output to the file OOBOUT.DAT. An example is shown in Table VI-2.

5. Print the output results file by typing the command "PRINT OOBOUT.DAT".

6. More information about the number of customers of each class in the out-of-bounds cells may be gotten by doing the following:

   a. Type the command "R $DISK0:[CADPAD.UTIL]PRNZ", which executes a utility program that creates a listing of the number of customers in the out-of-bounds cells, by class. Enter MB3140 for the input file name.

   b. Print the file TEMOUT.DAT by typing the command "PRINT TEMOUT.DAT". See Table VI-3.

7. If a printout of Map 63 dumped out in step I.B.3 is wanted, run the utility program by typing the command "R $DISK0[CADPAD.UTIL]PRMB2". Enter MB63 for the input file name, and OMB63 for the output file name. Print the file with the command "PRINT OMB63.DAT".

8. Use the outputs from the above steps to either move the out-of bounds customers or the boundaries. The TEMOUT.DAT file from step 6 can be modified to edit the customer maps, setting the customer counts to 0 in the out-of-bounds cells. To do this, first change the map numbers in the file to the map numbers of the customer maps (Maps 1-10), change the customer counts to 0, and then, in DLF, using Map Edit, Card Image, read in the Card Image file TEMOUT.

9. Repeat steps VI.B.1 to VI.B.3 above to verify if all the out-of-bounds problems have been fixed. If not, repeat the rest of the steps.

TABLE VI-2
EXAMPLE OF OOBOUT.DAT FILE

MAP -- 62 CLASSES IN OUT-OF BOUNDS CELLS

OUT-OF-BOUNDS CELLS -- 1 => CLASS IN THE CELL
0 => CLASS NOT IN THE CELL

X	Y	VALUE	CLASSES 1	2	3	4	5	6	7	8	9	10
111	42	136.	0	0	0	1	0	0	0	1	0	0
111	43	136.	0	0	0	1	0	0	0	1	0	0
119	50	43.	1	1	0	1	0	1	0	0	0	0
147	82	64.	0	0	0	0	0	0	1	0	0	0
129	87	32.	0	0	0	0	0	1	0	0	0	0
129	88	32.	0	0	0	0	0	1	0	0	0	0

TABLE VI-3
EXAMPLE OF TEMOUT.DAT FILE
NUMBER OF CUSTOMERS IN OUT-OF-BOUNDS CELLS

```
 40   3100B CUSTS DOM-LOW
119   50    8.00

 40   3200B CUSTS DOM-MED
119   50    2.00

 40   3300B CUSTS DOM-HGH

 40   3400B CUSTS COM-LOW
111   42    3.00
111   43    4.00
119   50    2.00

 40   3500B CUSTS COM-MED

 40   3600B CUSTS TUB-PRI
119   50    1.00
129   87    6.00
129   88    3.00

 40   3700B CUSTS TUB-PR
147   82    1.00

 40   3800B CUSTS IND-LOW
111   42    3.00
111   43    1.00

 40   3900B CUSTS IND-MED

 40   4000B CUSTS IND-HGH

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```

C. CONVERT CUSTOMER MAPS TO LAND-USE MAPS AND LOADS

After the customer maps are completed and checked, the user may then convert them to land-use maps for use with the SLF algorithm. SLF requires a Vacant Available Land map and the easiest way to use it is to convert customers to land-use and then determine how much land is left over, allowing for some of the vacant land to be unusable. If information for creating an vacant-unusable land map are available, go ahead and create a map of vacant-unusable land. If information is not available, the user can assume a percentage of available land as unusable, say ten percent, and ratio down the amount of available land by that amount.

The spreadsheet KLAREAS.WK1, shown in Table VI-4, was used to determine the multipliers needed to convert the nine classes of Kot Lakhpat to land-use figures. The resulting units of land-use, using this spreadsheet, is percent of a 500m x 500m small area. The spreadsheet can be modified to covert to acres, hectares or any other area unit because the program does not care what units are used as long as the units are consistent throughout the database. If these units are changed, the load profiles and global model data must also be changed to match. Table VI-5 shows the land-use, load profiles, and loads with these multipliers applied, verifying that the multipliers are correct.

The map multiplier is computed by dividing the square feet of area occupied by one customer, by the number of square feet in one small area, and multiplying by 100.

The per-customer load curves must be divided by this multiplier, after adjusting the multiplier to account for the curves being per customer and some class customer counts being in kVA.

The global model figures for the base year can be computed by the program by selecting the "land-use maps" option when computing the system profile, and answering "yes" to whether the user wants results to be put into the global model.

Create a land-use map for water, Map 29, including rivers, lakes, etc. Minor lakes, ponds, canals, etc can be ignored.

The load curves in SLF were in units of kW per customer and the metered loads at the Grid Stations were in MVA and included losses. Therefore, the load maps from the forecast will need to be ratiod up to be on the same basis as the metered loads.

For example, the 1992 metered loads attributable to the Kot Lakhpat Division on the three Grid Stations totalled 58.98 MVA. The load map for the base year 1992 was ratiod up from 43,209 kW to 58.98 MVA (a ratio of 1.365) which would be equivalent to a power factor of 0.80 and a loss rate of 9.2% or a power factor of 0.85 and a loss rate of 16%. (43.209 * 1.092/0.80 = 58.98 or 43.209 * 1.16/0.85 = 58.98).

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TABLE VI 4
KOT LAKHPAT CUSTOMER-TO-LAND-USE CONVERSION FACTORS

CELL SIZE : 500 METERS SQ 250000 SQ MTRS 2690966.8 SQ FT 61.776 ACRES
ONE ACRE 43560 SQ FT

CLASS		CUSTOMERS AND LOADS	CUSTOMER SIZES		LAND USE		CONVERT CUSTOMERS TO LAND USE: MAPS MULTIPLIER	END USE PROFILE MULTIPLIER
1 D L	Act	50922.0	50.000	x-ft en cust				
O O	Ent	50922.0	50.000	y-ft	1076	max custs		
M W	@Pk	0.250	2500.000	sqft en cust	2923	acres this class	0.092903	10.7638674
	Ld	12730.5	0.0574	acres en	47.31	small areas		
2 D M	Act	14844.0	50.000	x ft en cust				
O E	Ent	14844.0	100.000	y-ft	538	max custs		
M D	@Pk	0.800	5000.000	sqft en cust	1704	acres this class	0.185807	5.3819337
	Ld	11875.2	0.1148	acres en	27.58	small areas		
3 D H	Act	1493.0	140.000	x-ft en cust				
O O	Ent	1493.0	180.000	y-ft	107	max custs		
M H	@Pk	1.700	25200.000	sqft en cust	864	acres this class	0.936166	1.0678440
	Ld	2538.1	0.5785	acres en	13.98	small areas		
4 C L	Act	9300.0	50.000	x ft en cust				
O O	Ent	9300.0	70.000	y ft	769	max custs		
M W	@Pk	0.150	3500.000	sqft en cust	747	acres this class	0.130065	7.6884767
	Ld	1395.0	0.0803	acres en	12.10	small areas		
5 C M	Act	375.0	150.000	x ft en cust				
O E	Ent	375.0	200.000	y ft	90	max custs		
M D	@Pk	2.000	30000.000	sqft en cust	258	acres this class	1.114841	0.8969889
	Ld	750.0	0.6887	acres en	4.18	small areas		
6 T A	Act	390.0	660.000	x ft en kva				
/ L	Ent	2874.0	660.000	y ft	6	max custs		
W L	@Pk	3.750	435600.000	sqft en kva	28740	acres this class	16.187490	0.0083830
	Ld	1462.5	10.0000	acres en	465.23	small areas		
7 I L	Act	1464.0	50.000	x-ft en cust				
N O	Ent	1464.0	70.000	y-ft	769	max custs		
D W	@Pk	1.500	3500.000	sqft en cust	118	acres this class	0.130065	7.6884767
	Ld	2196.0	0.0803	acres en	1.90	small areas		
8 I M	Act	69.0	20.000	x-ft en 10 kva				
N E	Ent	1383.8	60.000	y ft	2242	max custs		
D D	@Pk	30.000	1200.000	sqft en 10 kva	38	acres this class	0.044594	1.1181572
	Ld	2070.0	0.0275	acres en	0.62	small areas		
9 I H	Act	24.0	150.000	x ft en 100 kva				
N G	Ent	420.7	200.000	y ft	90	max custs		
D H	@P	530.000	30000.000	sqft en 100 kv	290	acres this class	1.114841	0.0511749
	Ld	12720.0	0.6887	acres en	4.69	small areas		
		47737.3	Total Load		35681	Total Acres Used		
					577.59	Total Small Areas Used		
					3680	Total Available	NOTE: THIS IS FROM	
					15.70	% of Land Is Used	SPREADSHEET KLAREAS WK1	

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TABLE VI-5
KOT LAKHPAT CUSTOMER-TO-LAND-USE CONVERSION SUMMARY

A	B	C	D *	E	F=E/26910 *	G=D*F	H	I=C/D/F *	J=H*I	K=G*J
MAP NO.	CLASS	NO. OF CUSTS ACTUAL	NO. OF CUSTS ENTERED	SQ FT/ CUST ENTERED	CUST-TO-LAND-USE CONVERSN MULTIPLR	EQUIV LAND USE TOTAL % CELL	END-USE PROFILE @ HR 21 KW/CUST	END-USE PROFILE MULTIPLR	CLASS PROFILE @ HR 21 KW/% CELL	CLASS LOAD @ HR 21 KW
8	D-L	50922	50922	2500	0.09290341	4730.83	0.25	10.7639	2.6910	12730.5
9	D-M	14844	14844	5000	0.18580682	2758.12	0.80	5.3819	4.3055	11875.2
10	D-H	1493	1493	25200	0.93646638	1398.14	1.70	1.0678	1.8153	2538.1
11	C-L	9300	9300	3500	0.13006477	1209.60	0.15	7.6885	1.1533	1395.0
12	C-M	375	375	30000	1.11484093	418.07	2.00	0.8970	1.7940	750.0
13	T-W	390	2874	435600	16.1874904	46522.85	3.75	0.0084	0.0314	1462.5
14	I-L	1464	1464	3500	0.13006477	190.41	1.50	7.6885	11.5327	2196.0
15	I-M	69	1383.8	1200	0.04459363	61.71	30.00	1.1182	33.5447	2070.0
16	I-H	24	270.67	30000	1.11484093	301.75	530.00	0.0795	42.1535	12720.0
TOTALS		78881				57591.48				47737.3

* NOTES:

COLUMN D: FOR TUBEWELLS, 1 ENTERED CUSTOMER MEANS 1 KVA OF XFMR CAPACITY.
AN AVERAGE ACTUAL CUSTOMER IS ABOUT 7 KVA.
FOR B2, 1 ENTERED CUSTOMER MEANS 10 KVA OF XFMR CAPACITY.
AN AVERAGE ACTUAL CUSTOMER IS ABOUT 21 KVA.
FOR B3, 1 ENTERED CUSTOMER MEANS 100 KVA OF XFMR CAPACITY.
AN AVERAGE ACTUAL CUSTOMER IS ABOUT 18 KVA.

COLUMN F: THE NUMBER OF SQUARE FEET IN ONE PERCENT OF A SMALL AREA IS 26909.6684.

COLUMN I: BECAUSE THE CUSTOMER MAPS WERE CONVERTED TO LAND-USE MAP BY THE CUSTOMER-TO-LAND-USE FACTOR, THE END-USE PROFILE MULTIPLIER MUST BE THE INVERSE OF THE CUSTOMER-TO-LAND-USE FACTOR SO THAT THE PRODUCT OF THE TWO DOES NOT CHANGE. IN ADDITION, THE END-USE PROFILES MULTIPLIERS MUST REFLECT THE FACT THAT THE END-USE PROFILES WERE CREATED TO REPRESENT ONE AVERAGE ACTUAL CUSTOMER, BUT THREE OF THE CLASSES ARE ENTERED IN CUSTOMER COUNTS THAT REPRESENT THE SIZE OF THE CUSTOMERS. THE MULTIPLIERS FOR THESE 3 CLASSES MUST BE MULTIPLIED BY THE RATIO OF THE ACTUAL TO THE ENTERED NUMBER OF CUSTOMERS.

THIS IS FROM SPREADSHEET KLCUS2LU.WK1

The years selected for the forecast were 1992 (Base year), 1994, 1997, 2002, 2007, and 2012 (Horizon year). This gives spacing between forecast years of 2,3,5,5, and 5 years, which is a spacing which we would recommend be used in other SLF forecasts also.

To ratio the load maps go to Map Mathematics, Add/Subtract function and enter:

1,1.365.1,0,1,0 to ratio Map 1, the 1992 load map
2,1.365.1,0,2,0 to ratio Map 2, the 1994 load map, etc.
through map 6 for the year 2012.

This assumes that the power factors and loss rates are the same for future years as in the base year. If the user has reason to believe one or both will change in future years, different ratios can be applied to the future years load maps.

D. CREATE A VACANT-USEABLE LAND MAP

Basically the vacant available land is all land that is not being used for any of the customer classes, and not covered by water, unless it is unusable because it is in a category such as swampland, cemetery, park, airport runway, steep hill or mountainside, river flood plain, etc.

Map Mathematics can be used to create a vacant available land map in the following steps:

1. Add all the customer class land-use maps together in one map, say Map 65.

2. Add the water map to the same map, Map 65.

3. Create a vacant-unusable land map, if information is available from city maps, SOP maps, etc., and add that map to Map 65. If information is not available, go on to step 4.

4. Initialize the vacant-useable land map, Map 7, to a value that represents 100% of possible land-use. If land-use units are in percent of total land (as in the Kot Lakhpat study) then initialize the map to 100. Another example, if land-use units were in acres and each small area was 1/4 mile x 1/4 mile, each small area would contain a total of 40 acres so the map would be initialized to 40.

5. Subtract Map 65 from Map 7 and store the results in Map 7. The input at the Add/Subtract prompt would be 7,1,7,-1,65,0. Display the map statistics of Map 7. If any cells have a value less than zero, it means that the sum of the land-used in that cell is greater than the total land in the cell. If only a few cells are negative do not worry about it. It just

means that the customer sizes are too big in that cell. They may also be too big in other cells but leaving the size alone will help the program maintain some normal open space in otherwise fully developed areas.

6. If not too many cells in step 6 were negative, say 10 or 20, use threshold to eliminate the negative values from Map 7. The input at the Threshold prompt would be: 7,0,0,99999,99999. If too many cells were negative, adjust the customer sizes and repeat the process at the beginning of the previous section C.

7. Delete the vacant-useable land that is outside the service area by multiplying the map times the service area map. The response to the Map Mathematics, Multiply prompt would be 7,1,7,64,0.

8. If the information was not available for creating a vacant-unusable land map in step 3 above, the user can approximate the effect of vacant-unusable land by assuming a certain percentage of all vacant land as being unusable and reducing the vacant available land in Map 7 by that percentage. For example, if the user assumes that 10% of vacant land is unusable, use Add/Subtract with the response 7,.9,7,0,7,0 which reduces the available land of Map 7 by 10%. Do not do this step if the vacant-unusable land in Step 3 above has been taken care of.

E. BASE YEAR CALIBRATION OF LOAD PROFILES

The procedure for this is the same as that for DLF in Section V.C of this manual. It is repeated here for completeness and continuity.

Figure III-5 shows the flow of decision making and procedures involved in calibrating the load profiles and load maps to the metered system profile and the metered Grid Station loads. This section goes into detail about the procedure to follow.

Figure III-5 shows, on the left side of the figure, the use of both the metered system profile and the Grid Station loadings from SUBSITE being used simultaneously in the calibration.

In other words the user computes the system profile and runs SUBSITE, and then, looking at the results of both together to decide what changes to make to the load profiles. He then repeats the process until he is satisfied with the results.

The procedure below does the same thing but in a slightly different order. The user adjusts the load profiles, looking only at the system profile, until he is satisfied. He then adjusts the load profiles, looking only at the results of running SUBSITE, until he

is satisfied. He must then recheck the system profile to see if that is still acceptable.

The user can choose either procedure but the one below may be simpler to use. The user should follow the procedure below and then later, if he wishes, try the slightly different procedure of Figure III-5.

1. **Calibrate to Metered System Load Profile**

   If the base year system load profile is available or if the user can create one from the Grid Station or Grid Station transformer profiles, he should consider doing the following to adjust the class load profiles so that the computed system profile in the Load Model of LOADSITE is close to the observed or metered system profile.

   a. Compute the system profile for the base year and compare it to the system profile obtained from measured Grid Station information. The steps for computing the system profile are:

      i. Enter DLF and open both databases.

      ii. Enter LM to enter the Load Model, and then CS to compute the system profile.

      iii. In answer to the prompt, enter P for the Present year profile.

      iv. The program gives three choices of Customer Count input. If the global model data has been previously entered, enter GM for Global Model. If it has not been previously entered, choose LM and the program will compute the customer counts from the customer maps after the user has verified or entered the map numbers of the customer maps. When the program asks if the user wants to store total class counts in the global database, answer Y. Answer 0 (zero) for the Iteration Number of the base year.

   To display the system profile, enter DL to go to the Load Data Display Menu, and then enter either PS to plot the system profile or TS to tabulate the system profile. Either one can be sent to the CRT or the printer. If the plot is sent to the CRT, it can also be sent to the plotter.

   b. If the computed system profile is different from the measured system profile by a significant amount, adjustments can be made to the computed system profile.

At this stage, the customer maps are assumed to be correct. If the user is not sure, he should check them out now before proceeding. The two things that can be adjusted now are the shapes and magnitudes of the class load profiles.

When comparing the computed system load curve with the metered system load curve, be sure that they are equivalent. For example, if the metered load profile is diversified to a certain level (to a Grid Station level, for example) and includes losses, then the computed curve should reflect the same conditions.

c. The following are hints on how to adjust data to modify the computed system profile:

   i. If the shape of the system profile is correct but the magnitude is too low, adjust all the values of all the classes upward proportionally.

   ii. If the system peak is too high or too low, but other parts of the curve are alright, adjust the magnitude of the classes that peak at that time.

   iii. If the system load is too high or too low at some hour of the day, adjust the values of the load curves that contribute to the system loading at that hour.

   This is a trial-and error process but the improved results can be well worth the effort.

2. Calibrate Class Load Profiles to Metered Grid Station Loadings Using SUBSITE

After adjusting the load class profiles to approximate the system profile, the user may then use SUBSITE to further adjust the load class profiles and match the Grid Station loadings to the metered loadings.

To do this the user needs a map showing the service area boundaries of the Grid Stations or some way of approximating them. The user also needs the Grid Station metered loadings for the study area. If he has this information then he proceeds with the following steps:

a. Construct a barrier map by setting the value of the cells on the boundaries between Grid Stations to a value of 999. One easy way to do this is to create a transfer file where each line of data defines a line which is part of a boundary between Grid Station service areas. After the boundaries are entered, the transfer file should add

1 to the complete map so no cells are set to zero. Run the transfer file from the Primary Menu and then display it graphically to make sure it is correct and complete with no gaps in the barriers. If it's not correct, fix the transfer file data and rerun it. The user will now have a barrier map with 1's every where except on the Grid Station division boundary lines where the values will be 1000.

b. In the Substation data, add to each Grid Station a fictitious capacity step year which is earlier than the base year of the forecast. For the capacity of this step enter the metered loading of the Grid Station for the year to which the user intends to calibrate the load maps, normally the base year.

c. Create the load maps using the Spatial Distribution command of the LOADSITE Load Model Menu.

d. Run SUBSITE, in unconstrained mode and with the barrier map created in step 'a' above for the feeder cost map, using the load map created in step 'c' above. This will give the loading of each Grid Station using customers from the actual Grid Station service area combined with the class profiles.

e. Compare the resulting SUBSITE Grid Station loadings with the metered Grid Station loadings and then, after examining the differences, try to determine a pattern of what kinds of areas have high loads and what kinds of areas have low loads. If the user can see that loads in areas containing a particular class or group of classes are too low, then increase the magnitude of the load curve for that class or those classes. Also lower other classes needed to balance out the total load.

   Rerun SUBSITE and compare the results again with the metered Grid Station loadings. Make further adjustments if needed and recheck the results, repeating until satisfied with the results.

F. CREATE MAPS FOR HIGHWAYS, RAILROADS, AND ZONING

The creation of these maps is discussed in Section IV.F.1, items b,c,d, and e.

1. Railroads and Highways Maps

The highways and highways intersections maps (Maps 27 and 28) are always used because they always influence growth but the others may or may not be used, depending on whether or not the

planner thinks they will have any influence on growth patterns.

Railroads will affect different classes or not, depending on their use. If they are used for hauling freight and goods then they will affect commercial and industrial growth. If they are used mainly for passenger service, they may have only negligible influence on growth if the terminal areas are already fully developed.

2. Zoning Maps

A zoning map may be used in two ways:

- As an influencing factor for where growth of a class will take place.
- As a restriction, controlling where a class may and may not locate.

Section G shows how to specify which way the user wants zoning to be used.

Normally, zoning is an influencing factor because, even though there may be zoning laws, the zoning laws can be changed or variances can be obtained if the incentives are strong.

In some areas, however, zoning laws are strictly enforced and no variances allowed. In such areas the laws can change also, but not often, and when they do a new forecast can be run with the new zoning changes. For this kind of area, zoning will be a controlling factor with growth allowed only in the areas zoned for the class.

G. PREPARE SLF CONTROL PARAMETERS FILE, YSPARM

SLF can accept its algorithm control parameters from the user, via keyboard entry, or via a Card Image file, usually named YSPARM.DAT. It is recommended that the Card Image file be used to avoid unnecessary keyboard entry and to reduce errors. Table VI-6 shows the YSPARM file that was used for Kot Lakhpat. The data file contains seven data sections. They are, in order:

1. Header

One line of up to 40 characters describing the data in the file. During the forecast procedure, the program will display this line and ask the user if this is the correct file.

TABLE VI-6

ALGORITHM CONTROL PARAMETERS FILE - YSPARM.DAT

```
YSPARM FOR KOT LAKHPAT SLF

 70   22   12  100.
 59   32    8   60.
 45   60   12   20.
 19   85   10   20.

 50   60   10   50.
 20   84   10   25.
 63   20    7  100.

 31   57    8   20.
 62   17    8  100.
 64   25   14   60.

 2    1.   1.

 5    0.   2.   5.   4.   3.                                  .1 .

 2    2.   1.                                                  .1

 2    2.   1.                                                  .1

 1    1.                                                       .1

 2    1.   1.                                                  .1

 8    8.   7.   6.   5.   4.   3.   2.   1.

 6    3.   3.   2.   2.   1.   1.

 4    6.   5.   4.   3.

 1    1.

   0.   2.5   5.   0.   0.   50.   25.   5.   2.5   0.
  10.   0.    0.   1.
  1.8  17.5   0.   0.   0.   35.1  17.5  1.8  10.5  0.
  15.8  0.    0.   1.
   5.   25.   0.   0.   0.   25.   25.   0.   12.5  0.
   7.5  0.    0.   1.
   4.5  4.5   0.   2.3  0.   11.4  11.4  2.3  45.4  0.
   0.   18.2  0.   1.
  16.7  3.3   0.   3.3  0.   10.   8.3   1.7  33.3  0.
   0.   23.3  0.   1.
   0.   0.    0.   0.   0.   0.    0.    0.   0.    100.
   0.   0.    0.   1.
   3.1  1.5   0.   0.   0.   0.    1.5   31.3 31.3  0.
   0.   0.    31.3 1.
  15.   2.5   0.   5.   0.   1.2   1.2   25.  25.   0.
   0.   0.    25.  1.
  26.3  1.3   5.3  13.2 0.   0.    0.    26.3 1.3   0.
   0.   0.    26.3 1.
   5    3    9    8    2    4    7    1    6
```

2. Urban Pole Map No. 1

Data for calculating urban pole map No. 1 (Map 30) -- One line for each pole in the map: (The map can have as many poles as desired). This map will be used for the residential classes.

Columns	Data
1 - 5	X-coordinate of the pole center (I), Integer field.
6 - 10	Y-coordinate of the pole center (I)
11 - 15	Radius of the pole in number of small-areas (I)
16 - 23	Magnitude of the pole (F), Floating Point field.

A blank line ends the data section.

Urban poles are used to represent the general drawing power or attraction of an area for the respective classes. For example, one pole might be used to cover the entire map, with its center at the middle of the city to represent the attraction of new customer toward the city. A secondary pole with smaller influence might be placed at a locally developing area to show local attraction to that area.

Poles can center outside the study area, as long as the influence extends into the area. Magnitudes can be negative to represent an area people would like to avoid. Appendix B of the Users Manual has an explanation of urban poles.

3. Urban Pole Map No. 2

Data for calculating urban pole map No. 2 (Map 31) -- One line for each pole in the map: (The map can have as many poles as desired). This map will be used for the Commercial classes. The format is the same as for the previous urban pole map.

4. Urban Pole Map No. 3

Data for calculating urban pole map No. 3 (Map 32) -- One line for each pole in the map: (The map can have as many poles as desired). This map will be used for the Industrial classes. The format is the same as for the previous urban pole maps.

5. Proximity and Surround Factors

Data for calculating the 10 proximity and surround factors listed in Table VI-7 -- Twenty lines in this data section, two lines per factor:

Line 1 --

Columns	Data
1 - 5	Factor radius in number of small-areas. max. 12 (I)
6 - 13	Operator value for point 1 (F)
14 - 21	Operator value for point 2 (F)
22 - 29	Operator value for point 3 (F)
30 - 37	Operator value for point 4 (F)
38 - 45	Operator value for point 5 (F)
46 - 53	Operator value for point 6 (F)
54 - 61	Operator value for point 7 (F)
62 - 69	Operator value for point 8 (F)

Line 2 --

Columns	Data
1 - 8	Operator value for point 9 (F)
9 - 16	Operator value for point 10 (F)
17 - 24	Operator value for point 11 (F)
25 - 32	Operator value for point 12 (F)
65 - 72	Threshold value (F)
77 - 77	1 to multiply, 0 to add (I)

TABLE VI-7 THE TEN FORECAST FACTORS USED IN THE SIMULATION LOAD FORECAST ALGORITHM
1. Very close to highways 2. Somewhat close to highways 3. Close to railroads 4. Close to highway intersections 5. Close to water 6. Residences in neighborhood 7. Residences in general area 8. Industries in neighborhood 9. Commercial land-use in area 10. Existing hirises in area

The two fields at the end of the second line of each class factor data are used to specify additional handling and use of the factor maps after they are created by the program.

a. Columns 65-72 are a field for entering the threshold value which the program will use to threshold the proximity function maps (Maps 33-37) after the proximity function is performed. The proximity function generates noise data which remains in some cells which should be zero. The program will set any cell to zero if it has a value less than the number entered in this field. This field can be left blank for the surround functions (maps 38-42).

b. Column 77 is a 1-digit integer field for entering a flag telling the program whether to multiply by the map or to add the map when creating the preference maps. Adding means that the factor is added to all the other factors and is one component of the total. Multiplying is much stronger, meaning that the results of all the other factors will be multiplied by this factor. If this factor is zero for a cell then that will wipe out any other factors in that cell.

The factors must be entered in the order as listed in Table VI-7. The first two lines of this data section contain data for the "Very Close to Highways" factor..... and the last two lines contain data for the "Existing Hirises in Area" factor.

The number of operator values that the user needs to input is the same as the number of small-areas specified for the factor radius. For example, if the factor radius is 3 then the user only needs to input the operator values for points 1, 2, and 3; the user can fill in the columns allocated for the rest of the operator values (points 4 through 12) with blank spaces.

6. Factors Weighting Coefficients

Coefficients are entered for calculating the overall preference rankings -- Eighteen lines in this data section, two lines for each land-use class (entered in the order of land-use class numbers, class 1 first, class 2 second, etc.):

Line 1 -- Coefficients for the 10 factor maps as listed in Table VI-7

Columns	Data
1 - 8	Coefficient for factor 1 (F)
9 - 16	Coefficient for factor 2 (F)
17 - 24	Coefficient for factor 3 (F)
25 - 32	Coefficient for factor 4 (F)
33 - 40	Coefficient for factor 5 (F)
41 - 48	Coefficient for factor 6 (F)
49 - 56	Coefficient for factor 7 (F)
57 - 64	Coefficient for factor 8 (F)
65 - 72	Coefficient for factor 9 (F)
73 - 80	Coefficient for factor 10 (F)

Line 2 -- Coefficients for urban pole and zoning maps.

Columns	Data
1 - 8	Coefficient for urban pole 1, map 30 (F)
9 - 16	Coefficient for urban pole 2, map 31 (F)
17 - 24	Coefficient for urban pole 3, map 32 (F)
25 - 32	Coefficient for the corresponding zoning map (F)

These coefficients define to the program how important each factor is to each of the customer classes in creating the preference maps which govern the growth pattern of the classes.

Within a class the coefficients are relative in magnitude. If one coefficient is twice as big, the factor will have twice as much influence in making up the preference map for that class. So, it does not matter if the coefficients are in percent, per unit, or any other units, as long as the relative values are consistent. If desired, the coefficients can be ratiod so that their sum, for a class, is equal to 100 percent. However, that makes it harder to see relative values between different classes for any given factor.

7. Allocation Priorities

The allocation priorities are on one line containing <u>all</u> land-use class numbers in the order that their growth will be allocated:

Columns	Data
1 - 5	Class number of the first class to be allocated (I)
6 - 10	Class number of the second class to be allocated (I)
11 - 15	Class number of the third class to be allocated (I)
16 - 20	Class number of the fourth class to be allocated (I)
21 - 25	Class number of the fifth class to be allocated (I)
26 - 30	Class number of the sixth class to be allocated (I)
31 - 35	Class number of the seventh class to be allocated(I)
36 - 40	Class number of the eighth class to be allocated (I)
41 - 45	Class number of the ninth class to be allocated (I)

The classes should be ordered by what class would be able to spend the most money or exert the most influence to obtain the land. Normally the higher classes of commerce and industry come first.

H. RUN THE SLF FORECAST - STANDARD PROCEDURE

After the data is entered and the YSPARM file is set up, the user starts the execution of the standard Simulation Load Forecast Algorithm by entering "10" or "SF" in the Spatial Model menu. The Algorithm guides the user through a series of steps to accomplish a load forecast. These steps are summarized into the following tasks:

a. Input the city-zoning data

b. Set up the urban poles

c. Calculate a set of 10 factors, which usually have some impact on the local growth characteristics.

d. For every land-use class, combine a, b, and c into an overall preference ranking of all small areas.

e. Based on the rankings in d, determine where and how the projected total growth (from the Global Model) should logically be distributed among the small areas -- The most preferable areas that are available will be developed first.

f. Convert the land-use development in e. to small-area loads, and assign these small-area loads to load pick-up points (feeder nodes) along the distribution network (via the Load Model).

The steps in the Algorithm and the nature of the forecast factors are predetermined by the program; the user cannot alter them. He can skip over certain steps, but he cannot change a step to do something else. He can quantify a factor, but he cannot change what it means. For example, he can, and must, specify how close to a highway intersection a small area must be to be considered close, and how important it is to be close to highway intersections. However, he cannot change that "close to highway intersection" factor to mean something else (for example, where the government has offered incentives). The following is a step by step description of the Algorithm, run in the standard manner. Table VI-8 gives a summary of the steps. A special procedure for scattering growth into more areas, and restricting the amount of land that can be developed in an iteration, is covered in Section I of this chapter.

TABLE VI-8
SUMMARY OF SLF STANDARD ALGORITHM STEPS

1. Verify that the right maps are being used.
2. Choose whether or not to compute Preference Maps (If they are already computed skip to step 14.)
3. Set up the zoning maps.
4. Choose the source of forecast control parameters (Choose 1 - Card Image File)
5. Enter forecast control parameters file name.
6. Set up urban pole maps.
7. The program prepares maps for creating factor maps.
8. The program computes factor maps selected by the user.
9. Review the factor maps.
10. The program reads in the user-supplied weighting factors.
11. The program reads in the user-supplied allocation priorities.
12. The program computes the Preference Maps.
13. Review the Preference Maps.
14. Confirm the iteration land-use growth from the Global Model.
15. Allocate iteration growth.
16. Review new land-use maps.
17. Convert land-use to load.
18. Continue to next iteration or exit from the algorithm.

1. Verify that the Right Maps are Being Used

Since the Simulation Load Forecast Algorithm requires that certain data be stored in specific maps, the user will be asked to confirm that his data is in the proper maps as shown in Table VI-9. If the user enters "N" to that confirmation prompt, the program will return to the Spatial Model menu where corrections can be made in Map Edit. If the user enters "Y" the Algorithm will proceed.

TABLE VI-9
CONFIRMING THE CONTENTS OF THE SPATIAL DATABASE MAPS

Please confirm these map assignments:

```
Maps  1 -  6: LOADS (BASE+ForECAST YRS)
Map   7     : VACANT-USABLE LAND
Maps  8 - 16: LOAD-BEARING LAND-USES (9)
Maps 17 - 25: CLASS ZONINGS/PREFERENCES
Maps 26 - 28: RAILROAD,HIGHWAY,&HWY INT.
Map  29     : WATER/RIVER
Maps 30 - 32: URBAN POLES
Maps 33 - 42: PROXIMITY, SURROUND FACTorS
Maps 43 - 45: WorK-SPACES
Map  46     : FOR NODES/NODE ASSIGNMENTS
Map  47     : FEEDER COST (NODESIM)
Map  48     : WorK SPACE

OK to continue (Y or N)?
```

2. Choose Whether or Not to Compute Preference Maps

The user can choose whether to compute new preference maps, i.e. rankings of all small areas, or to use those that have already been created. The first time the algorithm is run, they must be computed.

Construct new pref. functions (Y or N)?

If the user enters "N" he will do Step 11 next, skipping tasks a,b,c, and d of Section VI.H. If the user enters "Y" he will do Step 3 next, performing tasks a,b,c, and d.

3. **Set Up Zoning Maps**

Because the zoning data in maps 17 to 25 is overwritten with the preference rankings once they are calculated, the user has to restore the zoning data to the database. The program will issue this message:

Please reconstruct zoning maps (17-25) using edit

After which, the Map Edit menu will appear. The user should keep his zoning data in a card-image file so that he only needs to read the file into the database at this point. Even if zoning is not used, it is a good idea to set the zoning maps to zero with Initialize Map or with zero-filled maps in a Card Image file. When the user leaves the Map Edit menu, he will return to the Algorithm, Step 4.

4. **Choose Source of Forecast Control Parameters**

The user is to choose where the program will get the forecast control parameters. (The forecast control parameters include the quantification of how close would be "close", how important a particular factor is, etc.) The program can read from an already-created Card Image data file such as YSPARM; or the user can enter the data interactively as the Algorithm is executing. The structure and format of the card-image file is described in Section VI.G.

The program will display:

```
Enter preference parameters from
1 - Card Image File, or
2 - CRT?
Enter 1 or 2:
```

The user enters "1", so the program will read the data from the file specified in Step 5. If the user enters "2", he is expected to enter data interactively. This choice is not recommended because it is prone to errors. However, if the user wishes to try it he can refer to the Users Manual for details.

5. **Enter Forecast Control Parameters File Name, and Verify**

The user will be prompted for the file name:

Please enter input file name:

If the program cannot open this file successfully, it will display an error message and return to Step 4. If the program has opened the file successfully, it will display the first card of the file and ask for the user's approval to continue:

```
Header of data file is:  SAMPLE DATA FOR THE SIMULATION
                         LOAD FORECAST ALGORITHM
OK to use (Y or N)?
```

If the user enters "N" here, the program will return to Step 4 above. If the user enters "Y" here, the Algorithm will continue with Step 6.

6. Set Up Urban Pole Maps

The user creates the urban poles in this step. (Note: Urban Pole maps are normalized to 100. That is, the user data is modified such that the greatest value in the resulting map is set to 100 and the relative magnitudes of the poles remain the same.)

The Algorithm allows the use of three urban pole maps (Maps 30,31,32). The program will display one pole map at a time.

```
Urban Pole Map 1
Construct new poles (Y or N)?
```

If the urban pole map has already been created and the user does not want to change it, he enters an "N" here and the program will proceed to the next map. Otherwise, the user enters a "Y". If the user has specified a card-image file in Step 4, the program will compute the urban pole map with the data in that file. If not, the program will prompt the user for the data.

7. Program Prepares Maps For Creating Factor Maps

After the urban poles, the program will prepare for the calculations of the forecast factor maps by summing up all the residential, all the commercial, and all the industrial land-uses in every small area. This process usually takes a few minutes; therefore the program will display this message:

```
Preparing for factor maps...
```

8. Compute Factor Maps

This step calculates the ten factor maps (maps 33-42) that usually have some impact on the local growth characteristics. As mentioned earlier the nature of these factors are predetermined in the program.

All factor maps are normalized to 100, in other words, the maximum value in each factor map is 100.

One factor at a time, the program will ask the user whether he wants to calculate a new one or use the existing one:

New " ..... " Factor (Y or N)?

The description of the factor will be spelled out with the prompt. If the user enters a "Y", the program will recalculate the factor map. It will do so with the data from the card-image file specified in Step 4.

9. Review the Factor Maps

After calculating the factor maps, the user can review the intermediate results before continuing with the forecast. He will be prompted:

Want to look at factor maps (Y or N)

If the response is "N" the Algorithm will continue with Step 10 below.

If the response is "Y" the Spatial Data Display menu will appear. The user has access to a variety of display functions from that menu; these functions are described in Section 8.5 of the Users Manual. After the user leaves the Spatial Data Display menu, he will be prompted:

OK to continue (Y or N)?

The user can choose to leave the Algorithm at this point by entering an "N" here, and the program will return to the Spatial Model menu. (Maybe the user has found some errors in the data from reviewing the factor maps; and he wishes to correct those errors before continuing with the forecast.) The Algorithm will continue with Step 10 if the response is "Y".

10. Specify Weighting Factors

Since the user has specified a card-image file for data input in Step 4 above, the data will be read from the card-image file.

11. Specify Allocation Priorities

Since the user has specified a card-image file for data input, the program will read these numbers from that file instead of asking the user to enter them.

12. Compute Preference Maps

This step will not be performed if the user has answered "N" in Step 2 above. It calculates the preference rankings of small areas as specified in Step 10. Maps 17 to 25 will be used to store these rankings. (Note: These maps were used to store the zoning data; therefore the zoning data will be deleted from the database. **For this reason the user must keep a Card Image Backup file of his zoning data**, so he can quickly restore it in the database.)

This step usually takes a few minutes. To let the user know the program is in the calculation process, this message will be displayed:

Constructing preference maps ...

13. Review Preference Maps

This step allows the user to review the calculated preference rankings before using them to determine where the growth will be. The user will see this prompt on the screen:

Want to look at preferences maps (Y or N)?

If the user enters "N", the Algorithm will proceed to Step 14 below.

If the user enters "Y", the Spatial Data Display menu will be displayed, and he can choose from the functions of that menu to examine the results so far.

When he leaves that menu, he will be asked if he wishes to continue with the forecast:

OK to continue (Y or N)?

If he enters "N", the program will return to the Spatial Model menu. If he enters "Y" the Algorithm will proceed.

14. Confirm Land-Use Growth from Global Model

This step confirms the system-wide total growth data. First, the user has to enter the iteration year, i.e. the calendar year he is trying to forecast:

Calendar year of this iteration:

The year entered must be one of the years specified in the Global database, excluding the base year. If not, the program will issue an error message and repeat the above prompt.

Second, the program will display the expected total growth of that year from the previous iteration as shown below. (For example, if the year entered above is 1990, and the iteration years in the Global database are 1985, 1987, 1990, 1995, etc., the numbers displayed here are the difference between the 1987 customer counts and the 1990 customer counts.)

Total Land-Use Growth is:

Class	1	2	3	4	5	6	7	8	9
Growth	24.8	3082.5	364.1	69.7	460.6	16.4	379.2	162.1	9.0

Then, the user is asked to confirm the data:

OK to continue (Y or N)?

If the user enters "Y" the Algorithm will proceed to Step 15 below. If the user enters "N", the program will display this message:

Please enter data in global model.

And the Global Model menu will appear. The user can modify the customer count data there. After the user leaves the Global Model he is again asked:

OK to continue (Y or N)?

If the answer is "N" the forecast process will stop, and the program will return to the Spatial Model menu. If the answer is "Y", the program will again ask for the year being forecasted, repeating this Step 14 from the beginning.

15. Allocate Growth

Based on the calculated preference rankings, the program allocates the total growth in every land-use class to the most desirable areas that are available. During this process a display similar to the one shown in Table VI-10 will appear on the screen. Each line of the display shows three numbers:

TABLE VI-10
DISPLAYS DURING ALLOCATION OF GROWTH IN SLF

```
Class 6: Threshold Preference= 0.58E 02, Acres Allocated = 0.16E 02
Class 5: Threshold Preference= 0.76E 02, Acres Allocated = 0.46E 03
Class 3: Threshold Preference= 0.72E 02, Acres Allocated = 0.36E 03
Class 9: Threshold Preference= 0.88E 02, Acres Allocated = 0.90E 01
Class 2: Threshold Preference= 0.48E 02, Acres Allocated = 0.31E 04
Class 4: Threshold Preference= 0.82E 02, Acres Allocated = 0.70E 02
Class 8: Threshold Preference= 0.80E 02, Acres Allocated = 0.16E 03
Class 1: Threshold Preference= 0.64E 02, Acres Allocated = 0.25E 02
Class 7: Threshold Preference= 0.74E 02, Acres Allocated = 0.38E 03
```

a. Class Number

The user should notice that the order in which the class numbers appear on the screen is the same as that entered in Step 11.

b. Threshold Preference

This number is the lowest preference ranking among those small areas that have been assigned some growth. In other words, all available areas with preference rankings higher than this number have been allocated, while none of the areas with lower rankings have. (Areas with equal rankings may or may not have been allocated.)

If this number is zero, the user may have been too restrictive when ranking the small areas -- He should check the data used in the calculation of preference map.

(Note that areas with zero or negative rankings are regarded as not-available.)

c. Acres Allocated

This number should match the total growth shown in Step 14. If not, there are two possibilities. (1) The preference may be too restrictive. In this case the threshold preference shown on the same line would be zero. (2) The vacant-usable land (Map 7) may have run out. Note that the user might still see some vacant areas on map 7, but those areas must have non-positive preference ratings.

The program will add the growth to the corresponding land-use map (maps 8 - 16) and subtract it from the vacant-usable map (Map 7). **The user must keep card-image files of the base year land-uses and vacant-usable data** so that he can restore the data to the database. He should also keep card-image files of the land-use maps for each iteration in case he wants to start again at some intermediate year.

16. Review New Land-Use Maps

After the land-use growth allocation, the program will give the user a chance to review the new land-uses before converting them to electric load. The user will see this prompt:

Want to look at small area land-use (Y or N)?

If the user answers "N" the Algorithm will proceed to Step 17. If he answers "Y", the Spatial Data Display menu will appear, and he can use the display functions in that menu to examine the data. The Algorithm process will resume after he leaves that menu.

17. Convert Land-Use to Load

The user will be given the option of converting the land-uses to load:

Land-use to electric load (Y or N)?

If the answer is "N" the program will proceed to Step 18. If the answer is "Y", the Load Model menu will appear. The user may use the "Spatial Distribution" command to do the conversion or do it as part of the NODESIM procedure.

Usually the user would invoke NODESIM (Command "60" or "NS" in the Load Model menu), which does the following:.

a. Compute Loads

First, NODESIM will compute a map of small-area loads, combining the land-use data in maps 8 through 16 and the load profile data in the Load Model database. The small-area loads will be stored in maps 2-6, depending on the year of iteration that has been entered earlier -- iteration 1 in map 2, iteration 2 in map 3, etc. (Note: After the user has converted land-use to load five times, the program gives the user the option of storing the loads in a default map or of specifying a map number:

On iteration 6 or greater the results will be stored in map 6. If not OK enter a map:

b. Assign Loads to Buses

Second, NODESIM will ask for the bus location data, and assign the small area loads to the "closest" buses, simulating the lowest-cost lateral network. In the Algorithm Map 46 will be used to store the bus location data initially and to store the bus assignments data at the end. Map 47 must contain the Feeder Cost/Effort information.

c. Send Results to Other CADPAD Modules

Third, and finally, NODESIM allows the user to output the bus loads to the FEEDERSITE and the FEEDERDESIGN programs.

18. Continue to Next Iteration

The user will have just completed one iteration of the forecast. He will be asked whether he wants to forecast for another year:

Another iteration of forecast (Y or N)?

If the answer is "Y" the algorithm procedure will repeat, beginning from Step 2. If the answer is "N" the program will display this message showing how many iterations have been completed:

**** 3 Iterations of the forecast completed

And the program will return to the Spatial Model menu.

Note that if the user has already completed 5 iterations (converted land-uses to electric load 5 times), the program will not ask whether the user wants to forecast for another year; the program will return to the Spatial Model menu automatically.

I. RUN THE SLF FORECAST - SPECIAL PROCEDURE

After the data is entered and the YSPARM file is set up, the user proceeds with the steps outlined in this section. This procedure uses transfer files, in which the user enters the powers, ratios, multipliers, map numbers, file names, etc. to control the forecast. The procedure is iterative, allowing the user to modify the controlling factors, run an iteration, review the results, modify the controlling factors again etc. for each iteration year. Figure VI-1 shows the flow of the procedure.

1. Create Factor and Preference Maps

This is done by entering "10" or "SF" in the Spatial Model Menu, and following the program prompts through the procedure until the preference maps are created. Sections VI.II - 1 through 13 give the details. If the preference maps have been created previously, skip this step.

2. Modify the TP1nn Transfer File

Enter the values in the TP1nn.DAT transfer file, where nn is the last two digits of the iteration year or the Base year. The following items need to be checked and/or modified.

a. Map 22 is assumed to be the Preference Map for Tubewells and the transfer file selects all cells adjacent to existing Tubewell cells to be possible future Tubewell sites. If this is not the case for this study, the user must modify the transfer file.

b. A power must be entered for each non-Tubewell class. The transfer file will take the initial Preference map for each class, as developed in step VI.I.1 above, and raise it to the power entered here. The power must be less than 4.0 or the values will be too large to handle in later steps. Entering a power greater than 1.0 will cause growth of the class to be more in the higher preference areas of the initial Preference Map. Powers less than 1.0 will cause growth to be more scattered. In the first try, set all powers to 1.0 and in later tries adjust the powers depending on the results.

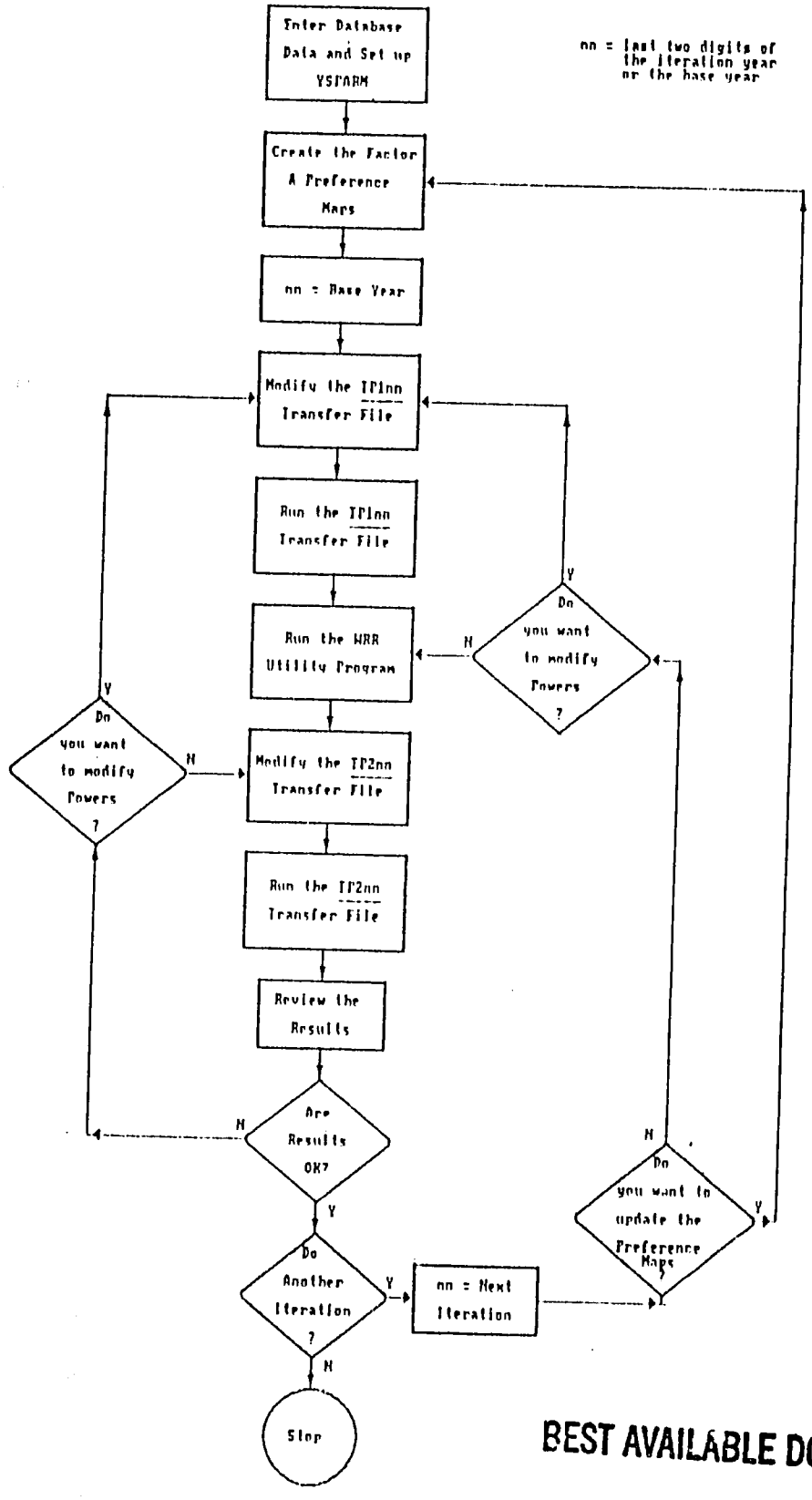

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FIGURE VI-1 - FLOW DIAGRAM OF SLF SPECIAL FORECAST PROCEDURE

"fig6_1cm"

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3. **Run the TP1nn Transfer File**

Running TP1nn saves the initial Preference Maps and then modifies the Preference Maps with the powers that the user provided. It then dumps the Preference Maps to Map Backup files to be processed by the WRR program.

4. **Run the WRR Program**

Run WRR on each of the modified Preference Maps dumped to Map Backup file. For each file, the program reads in the modified preference values and then, using a weighted random ranking process, assigns a ranking to each small-area, representing the order in which the small-areas will be used for new customer growth. The chance of a small-area being chosen first is directly proportional to the value read in for that small-area. That is why raising the map to a power greater than 1.0 increases the chances of the higher preference cells being chosen first. The user must record the maximum ranking number for each class as given at the end of each run.

5. **Modify the TP2nn Transfer File**

Enter the following in the TP2nn transfer file:

a. The file name of the file from WRR must be entered for each class, for reading in the rankings.

b. Using the figures recorded in step VI.I.4, the user must enter the maximum ranking number +1 for each class in one section of the transfer file, and the maximum ranking number for each class in another section. These are used in converting the rankings back into preference orders.

c. A Service Area map must exist, in Map 51, with 1's in the service area and 0's outside the service area.

d. For each class, define areas of the map where the user wants to raise or lower Preference values, and enter the ratioing values for those areas. By using this, the user can shift growth into or out of any given area.

e. For each class, enter the per-unit amount of vacant-useable land that can be used by the class in the current iteration year. (For example, if the user wants only 25% of the vacant-useable land to be used by a class in the iteration year, enter a per-unit value of 0.25). By using this, the user can prevent all the vacant-useable land of a small-area from being used in an iteration year. This also helps to spread the growth out over more small-areas and more parts of the service area.

f. For each class, enter the amount of land-use growth for the class for that iteration. This growth can be taken from the Global Model forecast by taking the difference between the forecast for this iteration year and the previous iteration year.

g. The user must enter the proper Map Backup file names for the previous iteration year land-use (at the beginning of the transfer file), and for storing the land-use and preference maps from this iteration (at the end of the transfer file).

h. The user must enter the year, peak hour, and load map number for the Spatial Distribution of loads (at the end of the transfer file).

6. Run the <u>TP2nn</u> Transfer File

Running this transfer file forecasts the land-use and loads for the current iteration, based on all the controlling factors entered by the user.

7. Check the Results

The user must analyze the results by comparing the new land-use maps (Maps 8-16) with the previous iteration land-use maps (temporarily stored in Map 56-65 by the transfer file). He can subtract the two and analyze the growth in different areas, using Map Mathematics, to decide if the growth is going to the right areas.

To see how much growth is in a certain area, create a "mask" map with 1's in that area and 0's outside that area, and then multiply the growth map times the mask. Use Map statistics to get the amount of growth, the maximum growth in a small-area, and the number of small-areas receiving new growth. The user should look at the same statistics for the growth map for the complete service area.

After analyzing the growth results for each class, the user must decide if the growth pattern for each class is acceptable or not. If not, he must decide how he wants the growth to change, modify the controlling factors, and re-run the iteration year.

The first iteration after the base year is the one that will take the most trials and effort because all of the factors are being adjusted in that iteration. In later iterations the user may not need to change the powers, update the initial Preference Maps, etc., and maybe only one or two tries will be needed, with minor adjustments.

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WATER AND POWER DEVELOPMENT AUTHORITY

CADPAD

DISTRIBUTION PLANNING

APPLICATION MANUAL

GRID STATION AND FEEDER PLANNING
SECTIONS VII - XII

VOLUME 3 OF 4

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JULY 1994

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VII. GRID STATION PLANNING

VII. GRID STATION PLANNING

A. BASIC APPROACH

When conducting Distribution studies, Grid Station planning plays a very important role as far as design, optimum utilization of funds and timing are concerned. Construction of a Grid Station involves huge sums of monies as well as a lead time of 3 to 4 years. Factors like siting or locating, determining capacities, areas to be served, and voltage levels to be maintained are so critical that if the Grid Station facilities are not designed and sited for optimum use a continuous generation of inherent built in losses on the Distribution network would have to be borne by WAPDA. Other factors which should be taken into consideration, and are equally vital include Transmission and Sub-Transmission on the high voltage side of the Grid Station, and feeder consideration on the low voltage side of the Grid Station.

Study also includes reliability, contingency analysis, cost of land, geographical features, GOP policies etc. as some of the critical considerations during the design and implementation stages. It is all the more important that alternate scenarios are always proposed as completion and implementation of a normal Grid Station normally takes 3 to 4 years.

The tool available with WAPDA to conduct an in-depth analysis is the CADPAD module SUBSITE. The SUBSITE program frees the user from going into the minute Feeder network details and concentrates on optimizing the very vital piece of the Distribution System planning, that is the design of Grid Stations itself. SUBSITE is used for long-range Grid Station planning and is concerned with the economics and feasibility of different alternative plans to answer the different options available to choose from:

- What is the best location to build new Grid Stations?
- Where should additional capacity be added?
- How much capacity is needed?
- What voltage drop levels are to be maintained?
- How can unserved loads be picked up?
- In which year should additional capacity be added?
- What voltages should be used?
- What should the service areas be?

- What are the most economically viable solutions?

- What are the contingency problems and how to handle them?

Grid Station planning should be considered in the medium and long-range context. The time required for planning increases toward the generation plants and decreases toward the end user, that is the consumer. Generation requires the longest-range planning, followed by transmission, bulk Grid Stations and sub-transmission, distribution Grid Stations, feeders, distribution transformers and services. Grid Station planning is generally accomplished for a five to twenty year time frame.

Grid Station planning is needed for budgeting and for planning of the bulk power supply system, as well as for distribution of power at the Grid Station and feeder levels.

The following information is needed to plan Grid Stations effectively.

- Accurate and up-to-date cost information on construction and expansion costs.

- Possible Grid Station transformer types generally in use and available.

- Availability of bulk power at potential sites and/or the cost of bringing bulk power to the potential sites.

- Availability, suitability, and cost of land at potential sites

- Possible "extra" costs at potential sites.

- Spatial load and growth patterns represented in load maps for the appropriate future planning years.

- Data on socio-economic constraints and prevalent government priorities; studies on energy and power planning.

The amount of detail needed for long-range planning is less than is needed for operation, design, and short-range planning. A corollary is that the amount of effort needed to set up the data for long-range planning is less. The feeder configuration for 10 or 15 years in the future may or may not be similar to the existing system and general estimates as well as plans would suffice. For long-range Grid Station planning, reduction of data requirements can be bought with a reduction of feeder details without having any major impact on the long-range results.

Planning should be continuous and satisfy all intermediate time periods. At the Grid Station level, plans should be reviewed every few years or when there are significant changes in the planning assumptions such as load growth patterns (for example, a new highway plan), equipment costs, etc. For a utility with many areas to plan it is critical to keep the amount of data to a minimum as well as updated in order to do timely planning. It is considered necessary for a good planner that before making any major investments the plans are thoroughly reviewed for any changed conditions.

Long-range planning should anticipate alternative scenarios and provide plans for events that may happen to change the development pattern. At times as an example in the coming years new highways are proposed or large industrial estates are forthcoming. The planner should consider both situations; that is in case GOP plans do not materialize, as well in case these plans do materialize and then evaluate the implications.

An across-the-board increase or decrease in growth rates would simply move the installation date of Grid Station earlier or later in time but a spatial change in load growth would impact locations as well as timing of certain Grid Stations.

The suggested approach to Grid Station planning should be to first plan the horizon year Grid Stations, including location and size of new Grid Station as well as expansion of existing Grid Stations. Then the intermediate year plans should be made, taking subsets of the horizon year plan for the intermediate year plans. Again the plans are made based on the forecasted load maps and using simplified feeder representation.

The planner needs to consider capital costs, operating costs, and cost of losses. Generally, to reduce the cost of losses requires investing capital and there is an optimum plan which depends on different factors including capital cost of equipment and energy costs. The parameters will be different for each utility.

If energy costs are high then more investment in equipment can be justified. If energy costs are low then equipment should be utilized to capacity. For example, if energy costs are low then smaller conductors with higher losses can be justified. However, sufficient capacity should be installed to serve the anticipated future loads under the utility guidelines.

Long-range planning is planning for beyond equipment lead time. It is a guide and reference for short-range planning where the users can save big money if done right (or lose money if not done right). Manual methods cannot effectively consider the many parameters effectively for large interrelated areas or groups of Grid Station.

B. INTRODUCTION TO SUBSITE

SUBSITE is an interactive module of CADPAD attached to the load forecasting program LOADSITE . The reason for this attachment is that the forecasted load data of the study years from the LOADSITE program forms a basic input for SUBSITE in designing Grid Station locations and capacities. Some of the additional features and utilities from LOADSITE are also available to SUBSITE such as Map Edit and Map Mathematics.

SUBSITE provides the capability to plan the growth of Grid Station capacity, including the growth, location, sizing and timing of new Grid Stations and expansion of existing Grid Stations. It gives the ability to quickly review, change and compare alternative expansion plans. It can also be used to study voltage conversion options and evaluate contingency conditions.

SUBSITE is accessed from the Primary Menu of LOADSITE but has its own database in addition to having access to the LOADSITE Spatial Model database. The menu structure of SUBSITE is consistent with that of LOADSITE.

1. Program Capacities

The SUBSITE database is dimensioned to handle the following amounts of data:

250 Grid Stations

6 capacity steps per Grid Station (year and capacity)

4 voltage levels

4 Grid Station cost curves (one per voltage level)

20 data points per Grid Station cost curve

4 feeder cost curve (one per voltage level)

20 data points per feeder cost curve

2 complete data sets (called the Base Case and Study Case)

20 planning years in a Grid Station plan

The SUBSITE program is limited to the use of the number of spatial maps set up in LOADSITE. The maximum number is 65.

If the Feeder Capacity map option is used, up to 100 feeder types and 7000 feeder nodes (buses) can be read in from FEEDERSITE.

2. Data Requirements

Following is a discussion of the various types of input data required by SUBSITE and how it is used:

a. Load Maps

A small area load map for each study year is provided by the LOADSITE program. Normally there will be a load map for the base year, the horizon year, and several intermediate years (5 in the case of DLF). The study years are normally spaced out over a period of 20 or so years, with gaps of unstudied years. The study years are normally separated by 2 to 5 years with 2 or 3 year separations only near the base year, if at all. For long term, every 5 years is sufficient.

The loads data in the study year maps is expected to be in kVA, each small area or cell in the map contains a load value in kVA for that particular small area. The SUBSITE requires an area-based power factor value to calculate the kW and kVAR components.

b. Feeder Restrictions Map

The user has the option of defining a "Feeder Restriction" map, also called a "Feeder Cost" map, "Feeder Effort" map, or "Barrier" map, used to represent the cost of building a feeder through each small area. Table VII-1 shows the steps for creating this map.

This map will inhibit the program from picking up loads across inaccessible terrain or areas such as lakes, rivers, mountains, super highways, airports, restricted areas, etc. Conversely this can also be used to define preferred feeder routes or right-of-ways such as along highways, canals etc. In some cases the planner may want to use this map to restrict Grid Station service areas, areas restricted to a particular voltage level, etc., by putting in high cost values at the boundaries.

TABLE VII-1
PREPARING A FEEDER RESTRICTION MAP

The values shown are reasonable, but the user may change the multipliers and adders to suit the study area.

- Set all cells in the map to 1.

- Add the following to each cell, based on its land-use content: (This example uses the standard SLF land-use types.)

  .1 * fraction of cell filled with low res.
  .2 * fraction of cell filled with medium res.
  .4 * fraction of cell filled with high res.
  .2 * fraction of cell filled with low com.
  1.3 * fraction of cell filled with medium com.
  5.0 * fraction of cell filled with high com.
  .1 * fraction of cell filled with low ind.
  .4 * fraction of cell filled with medium ind.
  2.0 * fraction of cell filled with high ind.

- Add 100 to each cell completely covered by airport runways, taxiways, and terminals.

- Add 999 to each cell filled with a cemetery.

- Add 999 to each cell covered with uncrossable parks, etc.

- Add 999 to each cell that is covered with water too wide to cross with normal construction.

- Multiply the entire map with the normal cost of building a feeder across a small area.

The user should check for bridges across wide rivers, etc. If pipe ducts can be built under those bridges, the cells containing the bridge should have a lower value, maybe 5.

Also, the cell where a Grid Station is located should not be assigned a very high value. The implication of doing that is that it will cost a lot to serve any load out of the Grid Station and the service area and load of that Grid Station will be reduced.

c. Site Cost Map

A "Site Cost" map may be used to represent the initial purchase and development cost of potential Grid Station land. If all site costs are approximately the same this map could be ignored. Another possible use of this map is to modify the Grid Station costs as determined from the Grid Station cost curve data. For example if the user wishes the cost summary not to include a cost for an existing Grid Station, he can enter the negative of the Grid Station cost, as determined from the cost curve, into the site cost map at the location of the Grid Station. A similar approach can be used to have the summary include only the expansion cost at existing Grid Stations.

d. Feeder Capacity Map

A "Feeder Capacity map" can be created by bringing in the actual circuit data from the FEEDERSITE program. The actual feeders network itself is not imported into the SUBSITE database, but values representing the power flow capability of all feeder conductors in a small area are computed and entered into this map. This map can then be used by SUBSITE to help determine routings and capacities of the synthetic feeder system that it builds.

However, in practice, because of the approximations and assumptions that are made in computing the feeder capacity in a cell, the use of this map can introduce problems into the solution. Particularly in urban congested areas, the resulting map will contain values of capacity which are too high and which will overwhelm the other factors in the solution. This problem is also multiplied as the size of the small area increases and its use should be avoided, especially since at this stage it is not intended to bog down the planner with the network details, yet leaving him enough flexibility to simulate Grid Stations for optimum applications.

At some future stage of planning, if the user decides to use this map, it is recommended that this map be used only when:

i) a comparative analysis between the actual feeder capacities versus the synthetic feeder is desired

ii) in rural areas and with small area sizes such that a small area would contain, at most, only two feeders.

e. Grid Station Data

Grid Station data consists of a Grid Station ID number and name, X and Y location in LOADSITE map coordinates, voltage level, permissible feeder length limit, and up to six capacity steps defining the amount of capacity and the year the capacity is available for each step.

In FEEDERDESIGN and FEEDERSITE the Grid Stations are sometimes broken up into several source nodes. However, in SUBSITE a Grid Station should be represented by only one node; that is, the Grid Station capacity signifies the total of all Grid transformers capacities at any one site.

SUBSITE will only recognize one Grid Station in a small area, and if the user tries to get around that limitation by putting Grid Stations in adjacent small areas, additional service area and capacity constraints are imposed which may limit the solution unnecessarily.

The use of different voltage levels is obviously beneficial where different Grid Stations are feeding different feeder voltage levels. Each Grid Station is assigned the appropriate voltage and the Grid Station and feeder cost curves for that voltage are used, and other calculations are based on that voltage.

Voltage levels may also be used in other ways. For example if the planner wants to represent different feeder costs in urban and rural areas he could create two voltage levels with different feeder cost curves, one level called 11.00 KV and another called 11.1 KV, just to differentiate. Another example might be different Grid Station costs depending on different transformer size combinations having the same total capacity.

The feeder length limit required for each Grid Station is the maximum length of a feeder the program is allowed to build in its feeder synthesis, when running a constrained solution. The length entered is in small area widths; in other words if the length is given as 30 and the small area size is 500 meters on a side, then the length would be 15 kilometers. During an unconstrained solution this limit is ignored but in a constrained solution no loads could be served at a distance greater than 15 kilometers from the Grid Station for this specific case under discussion. If the planner is not interested in restricting the length of the feeders, a way around this is to simply enter a large number such as the maximum dimension of the Spatial map.

Capacity steps are used to define different capacities for a Grid Station at different stages in the coming years. When a run is made for a given year the program checks the steps of each Grid Station and determines from the step years what the capacity is for the year of the run. Since there are six steps available, a Grid Station can have different capacities in the base and horizon years plus different capacities effective in up to four other intermediate years.

Another use for the Grid Station capacities is to enter the base year metered loads of all the Grid Stations into a year numerically less than the base year. For example if the base year is 1990, the metered loads can be entered as 1989 capacities. SUBSITE can then be used to calibrate the base year load maps to match the metered loads in the Grid Station service area, assuming that the Grid Station service areas can be defined in a feeder barrier map. This procedure is described in Section V.C.2.

f. Other Setup Data

Other Setup Data includes Grid Station and Feeder cost curves, cost of losses, power factor, and impedance characteristics of a typical feeder.

i. Grid Station Cost Curves:

A Grid Station cost curve consists of 20 values for the cost of a Grid Station, equally spaced at 10 MVA intervals with values for 10 MVA, 20 MVA, ..., to 200 MVA. Costs from this curve or table are used by the program in adding up all the Grid Station costs for a run. The program gets the capacity for the appropriate year for each Grid Station and then gets the cost of each Grid Station by retrieving the cost from the Grid Station cost curve. If the capacity is a multiple of 10 MVA the cost will be the value from the curve at that capacity. If it is not a multiple of 10 MVA the program will get the value from the curve at the next multiple of 10 MVA above the Grid Station capacity. For example the cost for a 26 MVA Grid Station will be the cost entered for 30 MVA.

Also remember that the program will use the Grid Station cost curve that is defined for the voltage level of the Grid Station. Thus it is possible to represent two different costs for the same capacity by assigning a voltage of 11 kV to Grid Station with a single 26 MVA transformers and by assigning a voltage of 11.1 kV to a Grid Station with two 13 MVA transformers. At any given site these costs can be nullified in the cost summary by entering the negative of the cost in the Site Cost map. For Grid Station capacities above those normally used it is recommended what the highest previous cost be used.

ii. Feeder Cost Curves:

A feeder cost curve consists of 20 values for the cost of a feeder at 2 MVA intervals with values for 2 MVA, 4 MVA, ..., up to 40 MVA. Costs from this curve or table are used to sum up a cost estimate for simulated feeders built by the program, depending on the flows through the segments of the simulated feeders and their lengths.

As with Grid Stations, different costs can be entered for slightly different voltages to represent different costs in different parts of the system, such as rural and urban areas.

iii. Costs of Losses:

The cost of losses is used by the program to calculate the total costs of the computed losses. This cost of losses includes both energy costs and equipment demand costs in Rs/kVA in annualized terms. The energy component of the cost represents the cost of fuel for generating 1 kW for one year or 8760 kW Hours. The equipment cost is the cost to build up the system capacity to serve 1 kVA of additional load. This cost includes different system components from distribution services and transformers, distribution feeders, Grid Stations, transmission even up to generation plants. When this capital cost is determined it is then annualized by multiplying by a carrying charge rate representing the cost of investment in equipment. Table VII-2 shows details of the Cost of Losses calculation.

TABLE VII-2
CALCULATION OF COST OF LOSSES

C = D + 8760 * LF * E = 8000 rupees/kW/Year

C = Cost of Losses (Rs/kW/Year)

D = Levelized Annual **Demand** Cost of Losses (Rs/kW/Year)

This is the cost to build up the system to serve one kW of demand (usually taken as the peak kW). This includes the cost up through the feeders to the 11 kV Grid Stations. Some utilities also include some of the Grid Station, sub-transmission, transmission, and generation costs.

8760 = Number of hours per year

LF = Loss Factor = a * Load Factor + (1-a) * Load Factor ** 2

Load Factor	a	Loss Factor
.5	.15	.29
.5	.30	.33
.6	.15	.40
.6	.30	.43
.7	.15	.52
.7	.30	.55

E = **Energy** cost (Rs/kWhr)

iv. Power Factor:

The power factor, entered in percent, is used in converting the kVA loads into their kW and kVAR components. The loads developed in the load maps during the development of a Load Forecast are assumed to be kVA.

v. Feeder Impedance:

The feeder resistance and reactance, entered in per unit on a 100 MVA base per width of a small area, are used for calculating voltage drops and losses by the SUBSITE program. Since there is only one set of values this must represent all feeders in the study area. These do not have to be the

impedances of any particular feeder type but could represent a composite of several predominant types. As an example, the impedances for Dog conductor type could be used to represent an area with a lot of Dog, some Rabbit, and a little of Osprey conductor. Or, impedances might be increased slightly to represent additional existence of Gopher feeders. Alternatively a length-weighted average of impedances could be used.

g. **Historical Load Data**

Historical load data can be entered for up to six years, the base year and the previous five years. Summer and winter peaks can be entered for each year for each Grid Station as well as for the system. This is used in the Calibrate SUBSITE function, with the user specifying which year of historical data to use.

3. **How SUBSITE Works:**

a. The basic algorithm of SUBSITE is a fast linear dynamic optimization routine which designs a synthetic feeder system around a given set of Grid Stations sites. The Grid Stations, both the existing as well as the proposed, are taken from the Grid Station data for the given study year. The synthesized feeders are not a detailed feeder system to be displayed and reviewed; in fact the planner cannot see details of the synthesized feeders designed to pick up the loads, the main reason being not to get the planner involved in unnecessary details of the feeders. The synthesized feeder network is sufficient to give a reasonable representation of the general character and factors of the feeder system.

b. Since SUBSITE is a long range planning tool, it is primarily concerned with issues pertaining to Grid Stations. However, any changes in Grid Station parameters will certainly also impact the feeder system so the feeder syntnesis is invoked for each case to estimate the impacts on costs, losses, voltage drops, etc. in sufficient detail for planning purposes. The planner can move Grid Stations, change capacities, delete sites, etc. and SUBSITE will automatically re-synthesize the feeder system.

c. Synthesis of the feeder system frees the planner from having to provide details of the feeder network, and frees him from having to worry about the details of the feeders. It allows him to concentrate on problems and

finding solutions at the Grid Station level, but assures him that the issues associated with the feeders are, at the same time, still included in the analysis. After a SUBSITE study is completed then the results can be taken to FEEDERSITE and a detailed study of the feeders and Grid Stations combined can be done there. This is not normally done for times far in the future, but is beneficial in the short and medium term of up to 10 years.

d. When invoked, SUBSITE begins developing a synthesized feeder system to serve the loads, starting at each Grid Station and extending feeders outward, thus expanding the service area of each Grid Station. Feeders and service areas are expanded until one or more of the following conditions is encountered:

   i. A Grid Station capacity limit is encountered.

   ii. A feeder length limit is encountered.

   iii. The service area of another Grid Station is encountered.

   iv. No more load can be served by a Grid Station.

e. The resulting feeder system gives the lowest cost system, within the approximations of the algorithm, that "makes sense" from engineering and operating perspectives.

   After creating the feeder system, the program evaluates the system for economics, served and unserved load, Grid Station loading, and voltage drops.

f. SUBSITE can be run in two modes, "Unconstrained" and "Constrained".

   i. Unconstrained Solution

   In the Unconstrained mode, SUBSITE will build the minimum cost feeder system to serve all the loads. Capacities and distance limits are ignored so there will be no unserved load. This represents the "ideal" system that should be used if the user could have any size of Grid Station and feeders could reach to any distance. This is what the system should naturally be, based on the given Grid Station locations, feeder characteristics and economic factors. This solution gives the ideal desired capacity of each station.

ii. Constrained Solution

It is a law of optimization that by imposing a constraint the cost of the solution will increase or remain the same. It will never go down when compared to an Unconstrained case. However there are good reasons to use a constrained solution. Feeders are sometimes limited in length and Grid Station capacities are not unlimited. If a Grid Station can serve more load than its capacity, as indicated by running an unconstrained case, and the capacity cannot be increased or the user wants to see what the solution is if the capacity is not increased, then a constrained case must be run. The program will then determine the best way to serve the loads which are now blocked from the preferred Grid Station. Probably the program will serve the load from an adjacent Grid Station unless adjacent Grid Stations are also at their capacity limit. In that case some of the load may be unserved, which is not an acceptable solution and more capacity must be added by augmentation of an existing Grid Station or adding a new one.

It is often desirable to run both the "Constrained" and the "Unconstrained" cases to see what the system should be and what the system will have to be under certain constraints. If the results are the same in both the constrained and unconstrained cases, that is ideal and the user has the best solution for the given set of parameters.

4. SUBSITE Outputs

a. Case Study Report

Case Study reports can be for either the base or study case. These reports include, for each Grid Station, the input data of Grid Station ID, Grid Station name, X and Y location, capacity for the year of the run, distance limit, voltage levels and percent utilization. It also includes, for each Grid Station, the calculated values of assigned load, Grid Station cost, load center X and Y, maximum voltage drop, amount of load served at voltages below the user-specified low voltage criteria, and losses.

b. Case Summary Report

Case Summary report for the base and study cases together. This shows the system-wide Grid Station costs,

feeder costs, cost of losses, capacity, load served, load unserved, maximum voltage drop, and a total of all costs combined.

c. **Store Results in Maps**

Case results can be stored in spatial maps for the following:

i. Grid Station Locations. Each cell where a Grid Station is located will contain the Grid Station ID number. For graphical display purposes it is useful to threshold this map so all Grid Station locations contain the same value, such as 1. Cells with a low value compared to the maximum value may not show up on the graphical display and thresholding the map will solve that problem.

ii. Grid Station Assignments. Each cell will contain the Grid Station ID of the Grid Station that the cell is served from. Thresholding with Map Mathematics may be needed to give a useful display if the range of Grid Station ID numbers is very wide. Each Grid Station area may be thresholded separately to an appropriate value.

iii. Grid Station Boundaries. This map shows the boundaries between the Grid Station service areas and boundaries of areas with unserved load. It also shows Grid Station locations and load center locations. This is a very useful map for visually reviewing and evaluating the results of cases. It may also be useful to threshold this map for a more clear display.

iv. Grid Station Service Areas stores the small area loads served by specified Grid Stations. A maximum of 5 Grid Stations can be stored in a map but multiple maps can be used so all Grid Stations can be stored.

v. Voltage Drops stores, in each small area, the voltage drop to that small area from the Grid Station serving it.

vi. Loads Served at Low Voltage stores a value for each cell served at a voltage below the user-specified low voltage criteria, from all Grid Stations or from a list of up to 5 Grid Stations, as the user chooses. For display purposes the user may wish to threshold the map so all non-zero cells have the same value.

vii. Unserved Loads stores the unserved load in each unserved cell. The user may wish to threshold this map for display purposes.

viii. Assigned Grid Station Loading stores a map of per unit Grid Station utilizations. In other words, if a Grid Station has a utilization of 70 percent of its capacity, every cell served by that Grid Station will contain a value of 0.7. This can be used in calibrating base year load maps when the Grid Station loading and service areas are known.

d. Comparison Reports

i. Difference Summary lists the results for each case for Grid Stations whose loadings differ by more than a user specified percentage in the two cases.

ii. A complete comparison can be displayed by using the Difference Summary, listing all Grid Station results in both cases. This is obtained by specifying that the program list results for all Grid Stations whose loading differs by more than 0% in the two cases.

5. Typical Application

A typical SUBSITE application might proceed with the following steps:

a. Run a load forecast to produce load maps for the years to be studied.

b. Create a SUBSITE database and prepare the Grid Station and Setup data in a SUBSITE study case.

c. Prepare a Feeder Effort map and Site Cost maps. If possible, include sub-transmission factors in the site cost map.

d. Run a reference case for the base year, using unconstrained mode. Compare the results with actual metered loads.

e. Make adjustments to the data and Feeder Effort map to bring the solution in line with known values.

f. Check and adjust the economics data.

g. Run in unconstrained mode and compare with the constrained solution. Analyze what changes could be made to the system or to the constraints if the two are different.

h. Run the horizon year in both the constrained and unconstrained modes using existing plus committed stations. Analyze the results and decide where to add more capacity and how much. Make more runs to fine tune the horizon year system.

i. Study the intermediate years to determine capacity and locations needed for those years. Use subsets of the horizon year system in the intermediate years system. This is the recommended approach because the user is always adding to the system where he knows it will be needed in the future. Use the present and intermediate year studies to determine the order and timing of adding the components of the horizon year system.

6. Summary:

SUBSITE is a 'big picture' tool.

The user creates, moves, adds or deletes capacity; changes voltages; or alters other factors at the Grid Station level.

Each time the user changes the Grid Station system, SUBSITE recalculates 'optimal' loadings and service areas, Grid Station and feeder costs, probable low voltage problems, and unable-to-serve problem areas.

SUBSITE estimates the capital costs and costs of losses of the system.

SUBSITE functions without detailed feeder system data. To perform its analysis, it generates a 'synthetic feeder system' as needed.

- This is an 'approximate' feeder system, used only to estimate feeder system costs and problems to the extent needed to study Grid Station-level decisions.

- As a user changes the Grid Station data, the corresponding synthetic feeder system is also changed.

- Add a new Grid Station and the program automatically creates a synthetic feeder network emanating from it.

- Add capacity to an existing Grid Station and the program automatically reinforces the Grid Station's feeder system so it can deliver the added power.

- Change a Grid Station's voltage and its synthetic feeder system is redesigned at the new voltage level.

- Move a Grid Station and its feeders move too.

- Detail beyond that used in SUBSITE is normally not needed in Grid Station level planning.

- The 'synthetic feeder system' is modeled in response to user controllable cost, constraint and priority rules.

C. SUMMARY OF SUBSITE DATA REQUIREMENTS

Because of the long-range nature of the SUBSITE program, a low level of detail is justified and the data requirements are minimal.

1. Minimum Data Required

The minimum data required is:

a. Small-area load maps, for the study years, from the LOADSITE program.

b. Grid Station data defining existing and future locations, timings, capacities, voltages, and feeder length limits.

c. Setup data defining voltages used, typical feeder impedance, voltage drop limit, cost of losses, and power factor. Also, for each voltage, "cost curves" containing values defining Grid Station and feeder costs for different capacity steps.

2. Optional Data

Optional data that can be supplied and used, if wanted, is:

a. A Feeder Effort map, which is a small area map of the costs for building a feeder through each small area.

   Off-limits areas are given high values so the program will go around them. Other areas may have a higher cost because of having to go underground or use some higher priced construction. This map is usually created using the land-use or customer maps and Map Mathematics.

b. A Site Cost map to represent different costs of purchasing and developing future Grid Station sites.

Normally, some areas will have higher costs than others. Negative costs can be entered to nullify the cost of existing Grid Stations as computed by the program.

c. A Feeder Capacity map where information about the existing feeder system capacities can be loaded. Data for this would be brought in from the FEEDERSITE program.

d. Grid Station and System Historical Loads data.

VIII. SUBSITE DATA COLLECTION AND ENTRY

VIII. SUBSITE DATA COLLECTION AND ENTRY

A. DATA IDENTIFICATION

1. Load Map

There are seven load maps required whenever Deterministic Load forecast algorithm is run.

2. Feeder Effort Map (Optional)

Geographic restrictions, a data map of "scores" for each cell based on how difficult it is to build a feeder across it.

3. Substation Site Cost Map (Optional)

Substation site data, information on the costs of substation sites in a small-area.

4. Capacity Cost Curves

Capacity Cost Curve, represented as twenty values, the cost of each level of capacity. For substations the cost of capacity is from 10 MVA to 200 MVA, in steps of 10 MVA. For feeders the cost of capacity is from 2 MVA to 40 MVA, in steps of 2 MVA. All costs are levelized annual costs, entered in thousands of rupees.

5. Feeder Capacity Map (Optional)

Existing feeder information, including route locations and existing feeder capacities.

6. Substation Data

The information about the substations, i.e. location, name, voltage level, load history summer and winter peak.

7. Cost of Losses

This represents the composite cost of the demand and energy cost of losses.

8. Line Impedance

Resistance and admittance in per unit per width of small-area of the typical feeder.

9. **Voltage Drop Limit**

Maximum percentage voltage drop limit.

10. **Study Voltages**

SUBSITE can handle up to 4 different substation voltages in a study. These are used in the computations and to pick different substation or feeder cost curves.

11. **Power Factor**

In the SUBSITE algorithm, the input data is assumed in kVA, this power factor is used to convert it to real and reactive loads for voltage drop calculations.

12. **WIDGIT/FEEDERSITE Coordinates**

These are needed for any data interface between the programs. Lower left and upper right coordinates of the LOADSITE maps are required.

B. DATA SOURCES

As an example, the following data sources were used for the Sheikhupura Division data:

1. Small-area customer distribution maps for 1-9 classes from already existing spatial model for 1990. [A-1]

2. Tariff-wise customer counts for June 1992 obtained from Division Manager Sheikhupura. [A-1]

3. Load maps for base and horizon years and five forecast years from LOADSITE spatial model after having run DLF algorithm. [A-1]

4. Costs of 132 KV and 66 KV Grid Stations were taken from letter No. CED/T&G/D(PROJ)/F-14/G-61/27905 dated 10.12.1990 addressed to Mr. L.A. Rodriguez issued from Office of Chief Engineer Design (T&G) WAPDA, WAPDA House, Lahore. Costs were escalated @ 8% annually to get costs for 1992 and 20% carrying charge rate was applied to levelize these costs. [A-3 and A-4]

5. For feeder cost curve, costs of different conductor types, 1 KM lines for rural area were obtained from "Computerized Work Order System", Volume II of II. [A-4].

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6. Geographical maps were used to get LOADSITE coordinates. [A-6 and A-7]

7. Peak loads for Grid Stations from "Quarterly Load Data Report" issued from the office of Chief Engineer (Distribution Planning). [A-6]

8. Feeder effort map was prepared giving weightage to customer classes. [A-2]

9. Cost of losses (from Mr. Zahid Siddiqi). [A-7]

10. Values of R and X were obtained from Feeder types table already prepared in feeder design for commonly used conductor "DOG" in rural areas. [A-8]

11. Percentage of load share of Sheikhupura Division from spreadsheet output for 1990, prepared by Mr. Zahid Siddiqi. [A-6]

C. DATA ENTRY

The user logs in to the VAX system by entering his user name and password. The next step is to enter the DLF-2 program by entering:

DLF92

The user then responds to the prompts made by the program. For example the user selects "60" for choosing the correct terminal which in this case is Tektronix 4205. The program then prompts for an output file name to which the response may be:

LDSOUT

Data Set Up Menu appears and the user is prompted to make a valid choice. The Spatial Database must be opened before SUBSITE can be invoked.

Data Set-Up Menu

10 - Global/Load Model Database (GM)
20 - Spatial Model Database (SM)
30 - Open Both Databases (OB)
40 - Change Output File (CO)

Select Database:

Select "20" or "SM" for opening Spatial Database. The program prompts and user responses are given below:

```
Please Enter Name of Spatial Database
SKP-S

Maximum Number of Small Areas EAST-WEST:
120

Maximum Number of Small Areas NORTH-SOUTH:
120

SPATIAL Database Header
SHEIKHUPURA MODEL DIVISION
SMALL AREA LOAD DISTRIBUTION

Database ID
10    Year: 1992      Iteration: 0

Wish to Change Header and ID
(Y or N)?  N
```

The user response is "N" if no change in header or ID is required. If the user enters "Y", the user is allowed to change the header and the ID.

Data file is opened, the user now enters "/" to return to the Primary Menu:

```
Primary Menu

10 - Data Set-Up (SU)
20 - Global Model (GM)
30 - Spatial Model (SM)
40 - Load Model (LM)
50 - Substation Siting (SS)
90 - Exit LOADSITE (EX)

Select Primary Operation
```

Select "50" or "SS" to invoke SUBSITE database.

```
PLEASE ENTER NAME OF SUBSITE DATABASE: SUBSIT
```

SUBSIT is the name of the SUBSITE database file. User can create a new SUBSIT database file by just entering a file name not already existing. When SUBSITE database is opened (new or existing) the user will have the SUBSITE Menu.

SUBSITE Menu

10 - File Manipulation (FM)
15 - Data Auxiliaries (DA)
20 - Edit Substation Data (ES)
25 - Edit Load Histories (EL)
30 - Edit Other Setup Data (EO)
40 - Solve Subsite (SS)
45 - Calibrate Subsite (CS)
50 - Display Results (DR)
53 - Economics (EC)
55 - Store Results in Maps (SR)
60 - Spatial Data Display Menu (SD)
65 - Map Name List (MN)
70 - Map Edit Menu (ME)
80 - Contingency Analysis (CA)
90 - Exit SUBSITE (EX)

Select SUBSITE Function:

First of all substation data will be entered by using Choice "20" or "ES".

Substation Data Edit Menu

10 - Add (AD)
20 - Delete (DE)
30 - Modify (MO)
40 - Review (RE)

Select Substation Edit Function:

Since there is no substation data in the database, Choice "10" or "AD" will be entered in Substation Data Edit Menu to add new substation to the study case data. The program will ask for substation ID number, its location coordinates, name, voltage, distance limit, and the capacity limit for up to five capacity steps, respectively. The program then prompts the user for load history data for summer peaks and winter peaks. A "/" is entered to retain the default values of zero, since we are not relying on this data to project loads.

```
SUBSTATION ID: 1
(IX,IY) COORDINATES:   80,65
NAME (10 CHARACTERS MAX):  SKP
NOMINAL VOLTAGE:  11.0
DISTANCE LIMIT - SMALL AREAS:  75
YEAR BUILT AND CAPACITY (MVA):  1991,42
YEAR BUILT AND CAPACITY (MVA):  1992,45
YEAR BUILT AND CAPACITY (MVA): /
```

```
SUBSTATION: 1 -- SKP
SUMMER PEAK LOAD (MVA):
1987   1988   1989   1990   1991   1992 (BASE YEAR)
---    ---    ---    ---    ---    ---
0.0    0.0    0.0    0.0    0.0    0.0

ENTER NEW SUMMER PEAK VALUES: /
SUMMER PEAK LOAD (MVA):
1987   1988   1989   1990   1991   1992 (BASE YEAR)
---    ---    ---    ---    ---    ---
0.0    0.0    0.0    0.0    0.0    0.0

ARE THESE PEAK VALUES OK (Y OR N)?  Y

WINTER PEAK LOAD (MVA):
1987   1988   1989   1990   1991   1992 (BASE YEAR)
---    ---    ---    ---    ---    ---
0.0    0.0    0.0    0.0    0.0    0.0

ENTER NEW WINTER PEAK VALUES: /
WINTER PEAK LOAD (MVA):
1987   1988   1989   1990   1991   1992 (BASE YEAR)
---    ---    ---    ---    ---    ---
0.0    0.0    0.0    0.0    0.0    0.0

ARE THESE PEAK VALUES OK (Y OR N)?  Y

SUBSTATION ID: 1039
(IX,IY) COORDINATES:   99,66
NAME (10 CHARACTERS MAX):  ATTABAD
NOMINAL VOLTAGE:  11.0
DISTANCE LIMIT - SMALL AREAS:  75
YEAR BUILT AND CAPACITY (MVA):  1991,39
YEAR BUILT AND CAPACITY (MVA):  1992,40
YEAR BUILT AND CAPACITY (MVA):  /

SUBSTATION: 1039 -- ATTABAD
SUMMER PEAK LOAD (MVA):
1987   1988   1989   1990   1991   1992 (BASE YEAR)
---    ---    ---    ---    ---    ---
0.0    0.0    0.0    0.0    0.0    0.0

ENTER NEW SUMMER PEAK VALUES: /
SUMMER PEAK LOAD (MVA):
1987   1988   1989   1990   1991   1992 (BASE YEAR)
---    ---    ---    ---    ---    ---
0.0    0.0    0.0    0.0    0.0    0.0

ARE THESE PEAK VALUES OK (Y OR N)?  Y
```

```
WINTER PEAK LOAD (MVA):
1987  1988  1989  1990  1991  1992 (BASE YEAR)
---   ---   ---   ---   ---   ---
0.0   0.0   0.0   0.0   0.0   0.0

ENTER NEW WINTER PEAK VALUES: /
WINTER PEAK LOAD (MVA):
1987  1988  1989  1990  1991  1992 (BASE YEAR)
---   ---   ---   ---   ---   ---
0.0   0.0   0.0   0.0   0.0   0.0

ARE THESE PEAK VALUES OK (Y OR N)?  Y

SUBSTATION ID: 1439
(IX,IY) COORDINATES:   58,53
NAME (10 CHARACTERS MAX):  F-ABAD
NOMINAL VOLTAGE:  11.0
DISTANCE LIMIT - SMALL AREAS:  75
YEAR BUILT AND CAPACITY (MVA):  1991,27
YEAR BUILT AND CAPACITY (MVA):  1992,52
YEAR BUILT AND CAPACITY (MVA):  /

SUBSTATION: 1439 -- F-ABAD
SUMMER PEAK LOAD (MVA):
1987  1988  1989  1990  1991  1992 (BASE YEAR)
---   ---   ---   ---   ---   ---
0.0   0.0   0.0   0.0   0.0   0.0

ENTER NEW SUMMER PEAK VALUES: /
SUMMER PEAK LOAD (MVA):
1987  1988  1989  1990  1991  1992 (BASE YEAR)
---   ---   ---   ---   ---   ---
0.0   0.0   0.0   0.0   0.0   0.0

ARE THESE PEAK VALUES OK (Y OR N)?  Y

WINTER PEAK LOAD (MVA):
1987  1988  1989  1990  1991  1992 (BASE YEAR)
---   ---   ---   ---   ---   ---
0.0   0.0   0.0   0.0   0.0   0.0


ENTER NEW WINTER PEAK VALUES: /
WINTER PEAK LOAD (MVA):
1987  1988  1989  1990  1991  1992 (BASE YEAR)
---   ---   ---   ---   ---   ---
0.0   0.0   0.0   0.0   0.0   0.0

ARE THESE PEAK VALUES OK (Y OR N)?  Y
```

```
SUBSTATION ID: 2631
(IX,IY) COORDINATES:     8,31
NAME (10 CHARACTERS MAX):  SUKHEKI
NOMINAL VOLTAGE:  11.1
DISTANCE LIMIT - SMALL AREAS:  75
YEAR BUILT AND CAPACITY (MVA):  1991, 9
YEAR BUILT AND CAPACITY (MVA):  1992,10
YEAR BUILT AND CAPACITY (MVA):  /

SUBSTATION: 2631 -- SUKHEKI
SUMMER PEAK LOAD (MVA):
1987  1988  1989  1990  1991  1992 (BASE YEAR)
---   ---   ---   ---   ---   ---
0.0   0.0   0.0   0.0   0.0   0.0

ENTER NEW SUMMER PEAK VALUES: /
SUMMER PEAK LOAD (MVA):
1987  1988  1989  1990  1991  1992 (BASE YEAR)
---   ---   ---   ---   ---   ---
0.0   0.0   0.0   0.0   0.0   0.0

ARE THESE PEAK VALUES OK (Y OR N)?  Y

WINTER PEAK LOAD (MVA):
1987  1988  1989  1990  1991  1992 (BASE YEAR)
---   ---   ---   ---   ---   ---
0.0   0.0   0.0   0.0   0.0   0.0

ENTER NEW WINTER PEAK VALUES: /
WINTER PEAK LOAD (MVA):
1987  1988  1989  1990  1991  1992 (BASE YEAR)
---   ---   ---   ---   ---   ---
0.0   0.0   0.0   0.0   0.0   0.0

ARE THESE PEAK VALUES OK (Y OR N)?  Y

SUBSTATION ID: 3020
(IX,IY) COORDINATES:  104,44
NAME (10 CHARACTERS MAX):  J.WALA
NOMINAL VOLTAGE:  11.1
DISTANCE LIMIT - SMALL AREAS:  60
YEAR BUILT AND CAPACITY (MVA):  1991,4
YEAR BUILT AND CAPACITY (MVA):  1992,5
YEAR BUILT AND CAPACITY (MVA):  /

SUBSTATION: 3020 -- J.WALA
SUMMER PEAK LOAD (MVA):
1987  1988  1989  1990  1991  1992 (BASE YEAR)
---   ---   ---   ---   ---   ---
0.0   0.0   0.0   0.0   0.0   0.0
```

```
ENTER NEW SUMMER PEAK VALUES: /
SUMMER PEAK LOAD (MVA):
1987  1988  1989  1990  1991  1992 (BASE YEAR)
---   ---   ---   ---   ---   ---
0.0   0.0   0.0   0.0   0.0   0.0

ARE THESE PEAK VALUES OK (Y OR N)?  Y

WINTER PEAK LOAD (MVA):
1987  1988  1989  1990  1991  1992 (BASE YEAR)
---   ---   ---   ---   ---   ---
0.0   0.0   0.0   0.0   0.0   0.0

ENTER NEW WINTER PEAK VALUES: /
WINTER PEAK LOAD (MVA):
1987  1988  1989  1990  1991  1992 (BASE YEAR)
---   ---   ---   ---   ---   ---
0.0   0.0   0.0   0.0   0.0   0.0

ARE THESE PEAK VALUES OK (Y OR N)?  Y

SUBSTATION ID: 3375
(IX,IY) COORDINATES:   91,62
NAME (10 CHARACTERS MAX):  A.T.M.
NOMINAL VOLTAGE:  11.1
DISTANCE LIMIT - SMALL AREAS:  75
YEAR BUILT AND CAPACITY (MVA):  1991,22
YEAR BUILT AND CAPACITY (MVA):  1992,26
YEAR BUILT AND CAPACITY (MVA):  /

SUBSTATION: 3375 -- A.T.M.
SUMMER PEAK LOAD (MVA):
1987  1988  1989  1990  1991  1992 (BASE YEAR)
---   ---   ---   ---   ---   ---
0.0   0.0   0.0   0.0   0.0   0.0

ENTER NEW SUMMER PEAK VALUES: /
SUMMER PEAK LOAD (MVA):
1987  1988  1989  1990  1991  1992 (BASE YEAR)
---   ---   ---   ---   ---   ---
0.0   0.0   0.0   0.0   0.0   0.0

ARE THESE PEAK VALUES OK (Y OR N)?  Y

WINTER PEAK LOAD (MVA):
1987  1988  1989  1990  1991  1992 (BASE YEAR)
---   ---   ---   ---   ---   ---
0.0   0.0   0.0   0.0   0.0   0.0
```

```
ENTER NEW WINTER PEAK VALUES: /
WINTER PEAK LOAD (MVA):
1987   1988   1989   1990   1991   1992 (BASE YEAR)
---    ---    ---    ---    ---    ---
0.0    0.0    0.0    0.0    0.0    0.0

ARE THESE PEAK VALUES OK (Y OR N)?  Y

SUBSTATION ID: 3000
(IX,IY) COORDINATES:   60,52
NAME (10 CHARACTERS MAX):  TEMP
NOMINAL VOLTAGE:  11.1
DISTANCE LIMIT - SMALL AREAS:  75
YEAR BUILT AND CAPACITY (MVA):  1992,52
YEAR BUILT AND CAPACITY (MVA):  /

SUBSTATION: 3000 -- TEMP
SUMMER PEAK LOAD (MVA):
1987   1988   1989   1990   1991   1992 (BASE YEAR)
---    ---    ---    ---    ---    ---
0.0    0.0    0.0    0.0    0.0    0.0


ENTER NEW SUMMER PEAK VALUES: /
SUMMER PEAK LOAD (MVA):
1987   1988   1989   1990   1991   1992 (BASE YEAR)
---    ---    ---    ---    ---    ---
0.0    0.0    0.0    0.0    0.0    0.0

ARE THESE PEAK VALUES OK (Y OR N)?  Y

WINTER PEAK LOAD (MVA):
1987   1988   1989   1990   1991   1992 (BASE YEAR)
---    ---    ---    ---    ---    ---
0.0    0.0    0.0    0.0    0.0    0.0


ENTER NEW WINTER PEAK VALUES: /
WINTER PEAK LOAD (MVA):
1987   1988   1989   1990   1991   1992 (BASE YEAR)
---    ---    ---    ---    ---    ---
0.0    0.0    0.0    0.0    0.0    0.0

ARE THESE PEAK VALUES OK (Y OR N)?  Y


SUBSTATION ID :/
```

"/" will take the user back to Substation Data Edit Menu.

Substation Data Edit Menu

10 - Add (AD)
20 - Delete (DE)
30 - Modify (MO)
40 - Review (RE)

Select Substation Edit Function:

Now the user wants to delete TEMP Grid Station which is erroneously added. To do so, enter "10" or "DE", and the program will ask for the ID number.

SUBSTATION ID : 3000

The program will display the information on the specified substation and then asks the user to confirm its deletion as follows:

ID	NAME	IX	IY	KV	DIST	YEAR	MVA
3000	TEMP	60	52	11.1	75	1992	52

OK TO DELETE (Y OR N): Y

SUBSTATION ID: /

The user enters "/" to return to the Substation Data Edit Menu.

Substation Data Edit Menu

10 - Add (AD)
20 - Delete (DE)
30 - Modify (MO)
40 - Review (RE)

Select Substation Edit Function:

In order to modify the distance limit, in small-areas, of the Joyanwala Grid Station, the user enters the Command "30" or "MO", and responds to the prompts as follows:

SUBSTATION ID: 3020
OLD COORDINATES: (104,44)
ENTER NEW VALUES: /
OLD SUBSTATION NAME IS: J.WALA
ENTER NEW NAME (10 CHARACTERS MAX): J.WALA
OLD VOLTAGE: 11.1
ENTER NEW KV: /
OLD DISTANCE LIMIT: 60 SMALL AREAS
ENTER NEW LIMIT: 75

CURRENT CAPACITY STEPS ARE:

YEAR	MVA
1992	5

ENTER YEAR TO MODIFY: /

DO YOU WISH TO MODIFY SUBSTATION HISTORY (Y or N)? N
which will omit history modification.

SUBSTATION ID: /

The program will then return to the Substation Data Edit Menu.

Substation Data Edit Menu

10 - Add (AD)
20 - Delete (DE)
30 - Modify (MO)
40 - Review (RE)

Select Substation Edit Function:

Entries made till this time could be reviewed by entering "40" or "RE". This command displays the data of all or selected substations in the database.

BASE CASE OR STUDY CASE? S

The substation data selection menu will be displayed, giving the user different ways of selecting the substations for review.

Substation Data Selection Menu

10 - ID Number (ID)
20 - Name (NA)
30 - Coordinate Window (CW)
40 - Substation Voltage (SV)
50 - Capacity Range (CR)
60 - Study Year (SY)
70 - All (AL)

Select Substation Data for Review:

Entering choice "70" or "AL", the program will display the following:

SUBSTATION INPUT DATA - STUDY CASE

ID	NAME	IX	IY	KV	DIST	YEAR	MVA
1	SKP	80	65	11.0	75	1991	42
						1992	45
1039	ATTABAD	99	66	11.0	75	1991	39
						1992	40
1439	F.ABAD	58	53	11.0	75	1991	27
						1992	52
2631	SUKHEKI	8	31	11.1	75	1991	9
						1992	10
3020	J.WALA	104	44	11.1	75	1991	4
						1992	5
3375	A.T.M.	91	62	11.1	75	1991	22
						1992	26

Hit <RETURN> to continue, or "Q" to QUIT.
Enter "/" to go back to Substation Data Edit Menu.

Substation Data Edit Menu

10 - Add (AD)
20 - Delete (DE)
30 - Modify (MO)
40 - Review (RE)

Select Substation Edit Function:

and an other "/" to return to the SUBSITE Menu.

SUBSITE Menu

10 - File Manipulation (FM)
15 - Data Auxiliaries (DA)
20 - Edit Substation Data (ES)
25 - Edit Load Histories (EL)
30 - Edit Other Setup Data (EO)
40 - Solve Subsite (SS)
45 - Calibrate Subsite (CS)
50 - Display Results (DR)
53 - Economics (EC)
55 - Store Results in Maps (SR)
60 - Spatial Data Display Menu (SD)
65 - Map Name List (MN)
70 - Map Edit Menu (ME)
80 - Contingency Analysis (CA)
90 - Exit SUBSITE (EX)

Select SUBSITE Function:

Now Enter choice "30" or "EO" to go to the Edit Other Setup Data Menu.

SUBSITE Setup Data Edit Menu

10 - Substation Cost Curve (SC)
15 - Feeder Cost Curve (FC)
20 - Cost of Losses (CL)
30 - Line Impedance (LI)
40 - Voltage Drop Limit (VD)
50 - Study Voltages (SV)
60 - Power Factor (PF)
70 - WIDGIT/FEEDERSITE Coordinates (WF)
80 - Display Setup Data (DS)

Select Setup Data Edit Function:

Besides the substation data described above, SUBSITE also requires data which includes costs and line characteristics, etc. Now the user is in the SUBSITE Setup Data Edit Menu, Enter "10" or "SC" to enter a Substation Cost Curve.

FOR WHAT VOLTAGE LEVEL? 11.0

As shown below the program will display the values of the curve currently stored in the database (they will be zero if the user has not entered any), and then ask the user to enter any new values:

SUBSTATION CAPACITY COSTS (KRs)

FOR 10 TO 200 MVA's, IN 10 MVA INCREMENTS

CURRENT VALUES ARE:

0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00

ENTER NEW VALUES:

3050.37, 4160.47, 4937.59, 4937.59, 4937.59, 10445.87, 10445.87, 12807.52,12807.52,12807.52,12807.52,12807.52, 12807.52, 12807.52, 12807.52,12807.52,12807.52,12807.52,12807.52, 12807.52

FOR WHAT VOLTAGE LEVEL? 11.1

SUBSTATION CAPACITY COSTS (KRs)

FOR 10 TO 200 MVA's, IN 10 MVA INCREMENTS

CURRENT VALUES ARE:

0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00

ENTER NEW VALUES:

3050.37, 4160.47, 8084.21, 8084.21, 8084.21, 10445.87, 10445.87, 12807.52,12807.52,12807.52,12807.52,12807.52, 12807.52, 12807.52, 12807.52,12807.52,12807.52,12807.52,12807.52, 12807.52

FOR WHAT VOLTAGE LEVEL? /

"/" will take the user back to the SUBSITE Setup Data Edit Menu.

SUBSITE Setup Data Edit Menu

10 - Substation Cost Curve (SC)
15 - Feeder Cost Curve (FC)
20 - Cost of Losses (CL)
30 - Line Impedance (LI)
40 - Voltage Drop Limit (VD)
50 - Study Voltages (SV)
60 - Power Factor (PF)
70 - WIDGIT/FEEDERSITE Coordinates (WF)
80 - Display Setup Data (DS)

Select Setup Data Edit Function:

Now the user will enter "15" or "FC".

FOR WHAT VOLTAGE LEVEL? 11.0

FEEDER COSTS (KRS/WIDTH OF S.A.)
FOR 2 TO 40 MVA'S, IN 2 MVA INCREMENTS

CURRENT VALUES ARE:

0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00

ENTER NEW VALUES:

5.61, 12.45, 15.51, 19.81, 24.41, 35.24, 46.07, 56.89, 67.72, 78.55, 89.37, 100.20, 111.03, 121.85, 132.68, 143.51, 154.34, 165.16, 175.99, 186.82

FOR WHAT VOLTAGE LEVEL? 11.1

FEEDER COSTS (KRS/WIDTH OF S.A.)
FOR 2 TO 40 MVA'S, IN 2 MVA INCREMENTS

CURRENT VALUES ARE:

0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00

ENTER NEW VALUES:

5.61, 12.45, 15.51, 19.81, 24.41, 35.24, 46.07, 56.89, 67.72, 78.55, 89.37, 100.20, 111.03, 121.85, 132.68, 143.51, 154.34, 165.16, 175.99, 186.82

FOR WHAT VOLTAGE LEVEL?

"/" will take the user back to the SUBSITE Setup Data Edit Menu.

SUBSITE Setup Data Edit Menu

10 - Substation Cost Curve (SC)
15 - Feeder Cost Curve (FC)
20 - Cost of Losses (CL)
30 - Line Impedance (LI)
40 - Voltage Drop Limit (VD)
50 - Study Voltages (SV)
60 - Power Factor (PF)
70 - WIDGIT/FEEDERSITE Coordinates (WF)
80 - Display Setup Data (DS)

Select Setup Data Edit Function:

The user may enter Choice "20" or "CL".

LEVELIZED ANNUAL COST OF LOSSES (RS/kW): 0.00
ENTER NEW VALUES: 8000.0

The program will return to the SUBSITE Setup Data Edit Menu.

SUBSITE Setup Data Edit Menu

10 - Substation Cost Curve (SC)
15 - Feeder Cost Curve (FC)
20 - Cost of Losses (CL)
30 - Line Impedance (LI)
40 - Voltage Drop Limit (VD)
50 - Study Voltages (SV)
60 - Power Factor (PF)
70 - WIDGIT/FEEDERSITE Coordinates (WF)
80 - Display Setup Data (DS)

Select Setup Data Edit Function:

The user then enters command "30" or "LI".

R AND X (P.U./WIDTH OF S.A.): 0, 0

ENTER NEW VALUES: 0.166, 0.187

The program will then return to the SUBSITE Setup Data Edit Menu.

SUBSITE Setup Data Edit Menu

10 - Substation Cost Curve (SC)
15 - Feeder Cost Curve (FC)
20 - Cost of Losses (CL)
30 - Line Impedance (LI)
40 - Voltage Drop Limit (VD)
50 - Study Voltages (SV)
60 - Power Factor (PF)
70 - WIDGIT/FEEDERSITE Coordinates (WF)
80 - Display Setup Data (DS)

Select Setup Data Edit Function:

The user enters command "40" or "VD" and the program allows the user to change the voltage drop limit.

V.D. LIMIT (%): 0.000

ENTER NEW VALUES: 12.00

The program will return to the SUBSITE Setup Data Edit Menu.

SUBSITE Setup Data Edit Menu

10 - Substation Cost Curve (SC)
15 - Feeder Cost Curve (FC)
20 - Cost of Losses (CL)
30 - Line Impedance (LI)
40 - Voltage Drop Limit (VD)
50 - Study Voltages (SV)
60 - Power Factor (PF)
70 - WIDGIT/FEEDERSITE Coordinates (WF)
80 - Display Setup Data (DS)

Select Setup Data Edit Function:

The user enters command "50" or "SV".

STUDY VOLTAGES (KV): 0.00, 0.00, 0.00, 0.00

ENTER NEW VALUES: 11.0, 11.1/

The program will return to the SUBSITE Setup Data Edit Menu.

SUBSITE Setup Data Edit Menu

10 - Substation Cost Curve (SC)
15 - Feeder Cost Curve (FC)
20 - Cost of Losses (CL)
30 - Line Impedance (LI)
40 - Voltage Drop Limit (VD)
50 - Study Voltages (SV)
60 - Power Factor (PF)
70 - WIDGIT/FEEDERSITE Coordinates (WF)
80 - Display Setup Data (DS)

Select Setup Data Edit Function:

The user enters command "60" or "PF".

POWER FACTOR (%): 0.000

ENTER NEW VALUES: 80.0

In the SUBSITE algorithm, the input load data is assumed in units of kVA, and this power factor is used to convert it to real and reactive loads for voltage drop calculations.

The program will return to the SUBSITE Setup Data Edit Menu.

SUBSITE Setup Data Edit Menu

10 - Substation Cost Curve (SC)
15 - Feeder Cost Curve (FC)
20 - Cost of Losses (CL)
30 - Line Impedance (LI)
40 - Voltage Drop Limit (VD)
50 - Study Voltages (SV)
60 - Power Factor (PF)
70 - WIDGIT/FEEDERSITE Coordinates (WF)
80 - Display Setup Data (DS)

Select Setup Data Edit Function:

The database used for load forecasting and Grid Station planning (LOADSITE and SUBSITE) and those databases used for feeder analysis and planning (WIDGIT, FEEDERSITE) follow two different coordinates systems. For this reason, the user needs to provide the information relating the two different systems to facilitate any data interface between the programs. This information is provided through four numbers, representing the WIDGIT/FEEDERSITE coordinates at two diagonal corners of the LOADSITE study area maps. The user enters Choice "70" or "WF".

PLEASE DEFINE THE LOADSITE STUDY AREA IN
WIDGIT/FEEDERSITE COORDINATES, DEFAULTS ARE

LOWER LEFT		UPPER RIGHT	
X	Y	X	Y
0.00	0.00	120.00	120.00

ENTER NEW VALUES: 354600, 3472200, 426600, 3544200

The program will return to the SUBSITE Setup Data Edit Menu.

SUBSITE Setup Data Edit Menu

10 - Substation Cost Curve (SC)
15 - Feeder Cost Curve (FC)
20 - Cost of Losses (CL)
30 - Line Impedance (LI)
40 - Voltage Drop Limit (VD)
50 - Study Voltages (SV)
60 - Power Factor (PF)
70 - WIDGIT/FEEDERSITE Coordinates (WF)
80 - Display Setup Data (DS)

Select Setup Data Edit Function:

The user enters Choice "80" or "DS".

CRT OR PRINTER?

The user enters "CRT" (or just a carriage return) for the CRT option, or "PR" for the printer option, the program will display:

(a) All setup data except cost curves: coordinate conversion values, study voltages typical line impedances, voltage drop limit, costs of losses, and power factor.

(b) All substation cost curves, one voltage level at a time.

(c) All feeder cost curves, one voltage level at a time.

SUBSITE INPUT DATA -- BASE CASE - EXISTING GRID STATION
STUDY CASE - ADDITIONAL 3 GRID STATIONS

LOADSITE STUDY AREA IN WIDGIT COORDINATES:

LOWER-LEFT: (354600.000, 3472200.000)
UPPER-RIGHT: (426600.000, 3544200.000)

STUDY VOLTAGES : 11.00-KV 11.10-KV 0.00-KV 0.00-KV

	BASE CASE	STUDY CASE
LINE IMPEDANCE (P.U./WIDTH OF S.A.)		
RESISTANCE	0.166	0.166
REACTANCE	0.187	0.187
VOLTAGE DROP LIMIT (%)	12.000	12.000
COST OF LOSSES (LEVELIZED ANNUAL RS/kW)	8000.000	8000.000
POWER FACTOR (%)	80.000	80.000

"/" will take the user back to SUBSITE Menu.

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SUBSITE Menu

10 - File Manipulation (FM)
15 - Data Auxiliaries (DA)
20 - Edit Substation Data (ES)
25 - Edit Load Histories (EL)
30 - Edit Other Setup Data (EO)
40 - Solve Subsite (SS)
45 - Calibrate Subsite (CS)
50 - Display Results (DR)
53 - Economics (EC)
55 - Store Results in Maps (SR)
60 - Spatial Data Display Menu (SD)
65 - Map Name List (MN)
70 - Map Edit Menu (ME)
80 - Contingency Analysis (CA)
90 - Exit SUBSITE (EX)

Select SUBSITE Function:

Data entries required to solve SUBSITE for SUBSITE database are complete. If the user has already run the Load Forecast and has Load Maps in the Spatial database, and has prepared a Site Cost map, Feeder Effort map etc. then he is ready to solve SUBSITE. If the Site Cost and Feeder Effort maps need to be set up, Card Image files can be prepared for loading the data into these maps. The user can select option "70" or "ME" which will take the user to Map Edit Menu of Spatial Model.

Map Edit Menu

10 - Card Image Data (CI)
15 - COOKBOOK Format Input (CF)
20 - Change Name of a Map (CN)
30 - Initialize a Map (IM)
40 - Set point to a Value (SP)
41 - Set Line to a Value (SL)
42 - Set Block to a Value (SB)
50 - Edit Row of 10 Small Areas (ER)
51 - Edit Column of 10 Small Areas (EC)
88 - Map Mathematic (MM)
89 - Spatial Data Display (SD)

Select Map Edit Operation

The user selects Map Edit operation "30" or "IM"

```
MAP NUMBER: 30
ENTER INITIAL VALUE: 0
SET ALL VALUES OF MAP 30 TO 0.000E+00
(Y OR N)?  Y
```

```
MAP NUMBER: 60
ENTER INITIAL VALUE: 0
SET ALL VALUES OF MAP 60 TO 0.000E+00
(Y OR N)?  Y

MAP NUMBER : /
```

"/" will take the user back to Map Edit Menu.

Map Edit Menu

10 - Card Image Data (CI)
15 - COOKBOOK Format Input (CF)
20 - Change Name of a Map (CN)
30 - Initialize a Map (IM)
40 - Set point to a Value (SP)
41 - Set Line to a Value (SL)
42 - Set Block to a Value (SB)
50 - Edit Row of 10 Small Areas (ER)
51 - Edit Column of 10 Small Areas (EC)
88 - Map Mathematic (MM)
89 - Spatial Data Display (SD)

Select Map Edit Operation

The next step is to read data files for the Feeder Effort map and the Substation Site Cost map.

The user selects "10" or "CI" Card Image Data to read files for maps. The program prompts:

```
PLEASE ENTER INPUT FILE NAME: EFFORT
```

The program will read the file and returns the user to the Map Edit Menu.

The user selects "10" or "CI".

```
PLEASE ENTER INPUT FILE NAME: SITECS
```

The program will return to the Map Edit Menu.

"/" will take the user back to the SUBSITE Menu.

SUBSITE Menu

10 - File Manipulation (FM)
15 - Data Auxiliaries (DA)
20 - Edit Substation Data (ES)
25 - Edit Load Histories (EL)
30 - Edit Other Setup Data (EO)
40 - Solve Subsite (SS)
45 - Calibrate Subsite (CS)
50 - Display Results (DR)
53 - Economics (EC)
55 - Store Results in Maps (SR)
60 - Spatial Data Display Menu (SD)
65 - Map Name List (MN)
70 - Map Edit Menu (ME)
80 - Contingency Analysis (CA)
90 - Exit SUBSITE (EX)

Select SUBSITE Function:

Now the user can solve SUBSITE. Before doing that the user should copy the Study Case to the Base Case, enter both case titles, and write the data from the SUBSITE database to a Card Image file.

The user types "10" or "FM" for the SUBSITE File Manipulation Menu.

SUBSITE File Manipulation Menu

10 - Read Data From File (RD)
20 - Write Data to File (WD)
30 - Base --> Study Case (BS)
40 - Study --> Base Case (SB)
50 - Clear Substation Data (CS)
60 - Change Case Title (CC)
70 - Send Data To FEEDERSITE (SD)

Select SUBSITE File Manipulation

Whatever has been entered so far is in the Study Case. The user enters Choice "40" or "SB".

THE CURRENT BASE CASE DATA WILL BE GONE, OK? (Y OR N): Y

If the user responds with "N" the command will not be executed. The program will return to SUBSITE File Manipulation Menu. If "Y" was given then the Base Case and Study Case have become identical. To put titles for base and study cases the user may enter "60" or "CC". A title can be up to 40 characters.

BASE CASE OR STUDY CASE? S

ENTER TITLE (40 CHARACTERS MAX): SKP STUDY 1992

The program will return to the SUBSITE File Manipulation Menu. The user enters Choice "60" or "CC" to enter a title for Study Case.

BASE CASE OR STUDY CASE? B

ENTER TITLE (40 CHARACTERS MAX): SKP COPIED FROM STUDY CASE

The program will return to the SUBSITE File Manipulation Menu.

It is worth mentioning that there is no need to create several SUBSITE databases, as Card Image Files can be written and read into the program as needed. The user may enter Choice "20" or "WD".

BASE CASE OR STUDY CASE? B

PLEASE ENTER PUNCH FILE NAME: BASE

At the end, the program will summarize what has been written to the data file as follows, and then return to the SUBSITE File Manipulation Menu:

```
*  2 SUBS CAPACITY COST CURVES WRITTEN TO FILE.
*  2 LINE CAPACITY COST CURVES WRITTEN TO FILE.
*  6 SUBSTATIONS WRITTEN TO FILE.
*  0 SUBSTATION HISTORIES WRITTEN TO FILE.
```

SUBSITE File Manipulation Menu

10 - Read Data From File (RD)
20 - Write Data to File (WD)
30 - Base --> Study Case (BS)
40 - Study --> Base Case (SB)
50 - Clear Substation Data (CS)
60 - Change Case Title (CC)
70 - Send Data To FEEDERSITE (SD)

Select SUBSITE File Manipulation

The same file can be read into the Base Case or the Study Case. The user enters Choice "10" or "RD" to read data from Card Image file "BASE" into Study case.

BASE CASE OR STUDY CASE? S

THE CURRENT STUDY CASE DATA WILL BE GONE, OK? (Y OR N): Y

PLEASE ENTER INPUT FILE NAME: BASE

After the program has read the data file, it will display a message telling the user how many substations have been read into the database:

```
* 6 SUBSTATIONS READ FROM FILE.
* 0 SUBSTATIONS HISTORIES READ FROM FILE.
```

The program will return to the SUBSITE File Manipulation Menu. The user enters "/" to go back to the SUBSITE Menu.

```
SUBSITE Menu

10 - File Manipulation (FM)
15 - Data Auxiliaries (DA)
20 - Edit Substation Data (ES)
25 - Edit Load Histories (EL)
30 - Edit Other Setup Data (EO)
40 - Solve Subsite (SS)
45 - Calibrate Subsite (CS)
50 - Display Results (DR)
53 - Economics (EC)
55 - Store Results in Maps (SR)
60 - Spatial Data Display Menu (SD)
65 - Map Name List (MN)
70 - Map Edit Menu (ME)
80 - Contingency Analysis (CA)
90 - Exit SUBSITE (EX)

Select SUBSITE Function:
```

IX. SUBSITE PROCEDURE EXAMPLE

IX. SUBSITE PROCEDURE EXAMPLE

This section consists of a copy of the screen displays during a sample SUBSITE planning session. Prior to this session, the forecast had been completed and the SUBSITE data had been entered.

The approach taken in this session was to run the base year first to check the existing Grid Stations ability to serve the base year load, and then to determine the horizon year Grid Station requirements. The intermediate years were then studied, starting with the first forecast iteration year.

For the sake of saving space, program menus are shown in their complete form the first time they are used, but thereafter only the chosen option is shown. When no option was chosen, all options are removed.

Explanatory comments are added, inside of brackets, [ ], and in boldface type.

User entries are underlined.

The "- - - - - - - - - - - - - -" lines indicate where the program refreshes the screen.

For this session all output was sent to the screen. For study work the user will want to send results to the printer after reviewing them on the screen.

When running SUBSITE, the user should use graphical displays to review the results and figure out solutions to problem areas. That is not shown in this session.

A. SUMMARY OF THE SUBSITE SESSION

Check the substation data
Enter the Base case title
Copy the Base case to the Study case
Solve the Base year 1992; display and review the results
Save the 1992 Base case
Change the Study case title for the Horizon year
Solve the Horizon year 2012, Unconstrained, with existing and planned substations; display and review the results
Add 52 MVA substation called NORTH, at 67,17
" " " " WEST, at 60,17
" " " " EAST, at 67,28
Solve the Horizon year, Unconstrained, with all substations; display and review
Modify substations: Move K.R.Kishan to 24,88 and KHANA to 67,37
Change capacity of RAIWIND and KHANA to 52 MVA and West to 26 MVA
Display the substation data
Solve the Horizon Year, Unconstrained, with changes; display and review
Modify substations: Move NORTH to 62,16; WEST to 52,33; and EAST to 68,25
Display the substation data
Solve the Horizon year, Unconstrained, with changes; display and review
Solve the Horizon year, Constrained, with changes; display and review (Unserved load)
Modify substation: Change NORTH capacity to 26 MVA
Add barriers to the Feeder Cost map to help SUBSITE pick up unserved load
Solve the Horizon year, Constrained, with changes; display and review
Display the final horizon year substations
Save the Horizon year Study case
Change the Study case title for 1994
Solve for 1994, Unconstrained, with 1992 substations; display and review
Modify: Add EAST at 26 MVA
Solve 1994, Unconstrained, with East added; display and review
Modify: Remove EAST and add WEST at 26 MVA
Solve 1994, Unconstrained, with WEST added; display and review
Modify: Remove WEST and add KHANA at 26 MVA
Solve 1994, Unconstrained, with KHANA added; display and review (this is best)
Save 1994 Study case and change the Study case title for 1997
Solve for 1997, Unconstrained, with 1994 substations; display and review
Modify: Change KHANA to 52 MVA for 1997
Solve 1997, Constrained, with the change; display and review -(unserved load)

Add barriers to the Feeder Cost map to help SUBSITE pick up unserved load
Solve for 1997, Constrained, with changes; display and review
Modify: Add K.R.Kishan at 13 MVA
Solve for 1997, Constrained, with changes; display and review
Save 1997 Study case and change the Study case title for 2002
Modify: Add NORTH at 26 MVA
Solve for 2002, Unconstrained, with 1997 substations plus NORTH; display and review
Solve for 2002, Constrained, with 1997 substations plus NORTH; display and review
Save 2002 Study Case and change the Study case title for 2007
Modify: Change RAIWIND to 26 MVA and add EAST at 26 MVA
Solve for 2007, Unconstrained, with changes; display and review
Modify: Add WEST at 26 MVA
Solve for 2007, Constrained, with changes; display and review -(unserved load)
Add barriers to the Feeder Cost map to help SUBSITE pick up unserved load
Solve for 2007, Constrained, with changes; display and review
Save 2007 Study case
Display the final substation data. This is the final substation plan for the period 1992 to 2012.

B. SAMPLE SUBSITE SESSION

```
SUBSITE Menu
10 - File Manipulation (FM)
15 - Data Auxiliaries (DA)
20 - Edit Substation Data (ES)
25 - Edit Load Histories (EL)
30 - Edit Other Setup Data (EO)
40 - Solve Subsite (SS)
45 - Calibrate Subsite (CS)
50 - Display Results (DR)
53 - Economics (EC)
55 - Store Results In Maps (SR)
60 - Spatial Data Display (SD)
65 - Map Name List (MN)
70 - Map Edit (ME)
80 - Contingency Analysis (CA)
90 - Exit SUBSITE (EX)
```

[GO AND CHECK THE SUBSTATION DATA.]

```
Select SUBSITE Function: ES
- - - - - - - - - - - - - - - - - - - - -

Substation Data Edit Menu
10 - Add (AD)
20 - Delete (DE)
30 - Modify (MO)
40 - Review (RE)

Select Substation Edit Function: RE
- - - - - - - - - - - - - - - - - - - - -

Base case or Study case? (Enter B or S): B
- - - - - - - - - - - - - - - - - - - - -

Substation Data Selection Menu
10 - ID Number (ID)
20 - Name (NA)
30 - Coordinate Window (CW)
40 - Substation Voltage (SV)
50 - Capacity Range (CR)
60 - Study Year (SY)
70 - All (AL)

Select Substation Data For Review: AL
- - - - - - - - - - - - - - - - - - - - -

CRT or PRINTER?  <RETURN>
- - - - - - - - - - - - - - - - - - - - -
```

```
[ THE DISPLAY BELOW INCLUDES THE FOLLOWING FIELDS:                                  ]
[    IX & IY = GRID STATION COORDINATES.                                            ]
[    DIST = MAXIMUM FEEDER LENGTH ALLOWED, IN NUMBER OF SMALL AREAS.                ]
[    YEAR & MVA = GRID STATION CAPACITY STEPS. YEAR IS THE YEAR THE CAPACITY        ]
[      BECOMES AVAILABLE. 1992 IS THE BASE YEAR OF THE STUDY. 1990 CAPACITY         ]
[      IS USED TO ENTER THE BASE YEAR METERED LOADINGS WHICH WERE USED IN           ]
[      THE CALIBRATION OF THE LOAD FORECAST DURING THE FORECAST PROCEDURE.          ]

 Page:  1     LOADSITE --  Release 8.92      -- OCT. 11, 1993 --  14:01:39
 ****** WAPDA CADPAD OUTPUT ***********************************************

  SUBSITE Input Data ...  Base Case-
  ----------------------------------------------------------------------------
        ID       Name        IX     IY      KV   Dist   Year    MVA
        82     OLD K.L.P     61     14    11.00   100   1990     13
                                                        1992     16
       113     NEW K.L.P     63     20    11.00   100   1990     26
                                                        1992     30
       353     RAIWIND       42     64    11.00   100   1990     20
                                                        1992     26
       800     K.R.KISHAN    23     84    11.00   100   1998     13
       900     KHANA         64     36    11.00   100   1998     26

    Hit <RETURN> to CONTINUE, or "Q" to QUIT: <RETURN>
- - - - - - - - - - - - - - - - - - - - - -

    Substation Data Selection Menu

    Select Substation Data For Review: <RETURN>
- - - - - - - - - - - - - - - - - - - - - -

    Substation Data Edit Menu

    Select Substation Edit Function: <RETURN>
- - - - - - - - - - - - - - - - - - - - - -

    SUBSITE Menu
    10 - File Manipulation (FM)

[ GO AND ENTER THE BASE CASE TITLE. ]

    Select SUBSITE Function: FM
- - - - - - - - - - - - - - - - - - - - - -

    SUBSITE File Manipulation Menu
    10 - Read Data From File (RD)
    20 - Write Data To File (WD)
    30 - Base --> Study Case (BS)
    40 - Study --> Base Case (SB)
    50 - Clear Substation Data (CS)
    60 - Change Case Title (CC)
    70 - Send Data to FEEDERSITE (SD)
```


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Select SUBSITE File Manipulation: CC
- -

Base case or Study case? (Enter B or S): B

Enter title (40 characters max.): BASE CASE - KOT LAKHPAT - 1992
- -

SUBSITE File Manipulation Menu
30 Base --> Study case (BS)

[COPY THE BASE CASE TO THE STUDY CASE.]

Select SUBSITE File Manipulation: BS

The Current Study case will be gone, OK? (Y or N): Y
- -

SUBSITE File Manipulation Menu

Select SUBSITE File Manipulation: <RETURN>
- -

SUBSITE Menu
40 - Solve Subsite (SS)

[SOLVE SUBSITE FOR THE BASE YEAR,1992 - UNCONSTRAINED.]

Select SUBSITE Function: SS
- -

Base case or Study case? (Enter B or S): B

Enter study year: 1992
- -

Feeder effort map, "/" if none: 53

Substation site cost map, "/" if none: /

Load map ("/" to return to SUBSITE menu): 1

Feeder capacity map, "/" if none: /
- -

Solve with constraints or not? (Y or N): N

[IT IS USUALLY GOOD TO RUN SUBSITE FIRST IN THE UNCONSTRAINED MODE TO SEE]
[WHAT THE PROGRAM WOULD LIKE TO DO WITHOUT CONSTRAINTS. THIS WILL SHOW]
[WHICH GRID STATIONS, IF ANY, NEED MORE CAPACITY, AND HOW MUCH MORE. IF]
[THERE ARE NO PROBLEMS WITH THE UNCONSTRAINED SOLUTION, THERE IS NO NEED]
[TO RUN A CONSTRAINED SOLUTION BECAUSE THE RESULTS WOULD BE THE SAME.]

... SUBSITE in progress ...
... SUBSITE in progress ...

* SUBSITE completed.

- - - - - - - - - - - - - - - - - - - -

[RUN TRSR TO STORE RESULTS IN MAPS. DISPLAY AND REVIEW MAPS GRAPHICS.]

[THE TRANSFER FILE TRSR STORES THE SUBSITE RESULTS IN MAPS]
[41 THROUGH 48, AND MODIFIES SOME OF THEM FOR CLEAR DISPLAY.]
[IT RETURNS THE USER TO THE SUBSITE MENU. FROM THERE HE CAN]
[USE SPATIAL GRAPHICAL MAP DISPLAYS TO REVIEW THE RESULTS.]
[HERE THE USER SEES THE SERVICE AREAS, SUBSTATION AND LOAD]
[CENTER LOCATIONS, AREAS OF LOW VOLTAGE, ETC., THAT HELP HIM]
[UNDERSTAND QUANTATATIVELY WHAT IS NEEDED. THE TABULAR]
[DISPLAYED ON THE SCREEN OR PRINTED OUT GIVE THE QUANTITIES.]
[THE STEPS OF THE TRANSFER FILE AND DISPLAYS ARE NOT SHOWN,]
[BUT THIS IS IMPORTANT TO DO AFTER EACH SUBSITE RUN. BY]
[REVIEWING THE RESULTS GRAPHICALLY, THE USER CAN TELL IF THE]
[RESULTS ARE REASONABLE AND MAKE SENSE, AND CAN SEE VISUALLY]
[IF THERE ARE ANY PROBLEMS IN A GEOGRAPHICAL SENSE. HE CAN]
[ALSO GET A SENSE OF THE CHANGES THAT NEED TO BE MADE IN THE]
[GRID STATION LOCATIONS AND CAPACITIES.]

SUBSITE Menu

Select SUBSITE Function: TR

Please enter command filename:TRSR

- - - - - - - - - - - - - - - - - - - -

SUBSITE Menu
50 - Display Results (DR)

[DISPLAY AND REVIEW THE TABULAR RESULTS.]

Select SUBSITE Function: DR

- - - - - - - - - - - - - - - - - - - -

SUBSITE Result Display Menu
10 - Base Case Substation Loading (BC)
20 - Study Case Substation Loading (SC)
30 - Base and Study Case Comparison (BS)
40 - Case Summary (CS)
80 - Set-Up Data (SU)

Select SUBSITE Result Display: BC

- - - - - - - - - - - - - - - - - - - -

Substation Data Selection Menu
10 - ID Number (ID)

```
    20 - Name (NA)
    30 - Coordinate Window (CW)
    40 - Substation Voltage (SV)
    50 - Capacity Range (CR)
    60 - Unserved Loads (UL)
    70 - All (AL)

    Select Substation Data For Review: AL
- - - - - - - - - - - - - - - - - - - - -

    CRT or PRINTER? <RETURN>
- - - - - - - - - - - - - - - - - - - - -

[ IN THE BASE CASE RESULTS DISPLAY BELOW:          ]
[    X AND Y = GRID STATION COORDINATES.           ]
[    KV = GRID STATION LOW-SIDE VOLTAGE.           ]
[    MVA = GRID STATION OPERATING CAPACITY.        ]
[    D = MAXIMUM FEEDER LENGTH IN SMALL AREAS.     ]
[    LD-KVA = GRID STATION ASSIGNED LOAD.          ]
[    LCX & LCY = LOAD CENTER COORDINATES.          ]
[    %VD = MAXIMUM ESTIMATED VOLTAGE DROP.         ]
[    KVA@LV = KVA SERVED AT LOW VOLTAGE.           ]
[    LOSS = ESTIMATED FEEDER LOSSES.               ]
[    CAPITAL 1000RS = SUM OF ALL CAPITAL COSTS.    ]

 Page:  1     LOADSITE --  Release 8.92      -- OCT. 11, 1993 --  14:03:57
 ****** WAPDA CADPAD OUTPUT ***********************************************

                 SUBSTATION LOADING -- UNCONSTRAINED SOLUTION
   Base Case : BASE CASE - KOT LAKHPAT - 1992            Study Year : 1992

<--------------- INPUT --------------->  <-------- PERFORMANCE --------> CAPITAL
   ID    NAME       X    Y    KV MVA  D  LD-KVA LCX LCY  %VD KVA@LV LOSS  1000RS
   82 OLD K.L.P    61   14 11.00  16100   13138  62  14  5.0       0  323   5203
  113 NEW K.L.P    63   20 11.00  30100   26648  65  26 25.0    9789 1893  34046
  353 RAIWIND      42   64 11.00  26100   19152  36  71 44.9   10755 2174  54174

[ ALL LOADINGS ARE BELOW OPERATING CAPACITY SO NO CONSTRAINED SOLUTION IS ]
[ NEEDED.  IT WOULD GIVE THE SAME RESULTS.  VOLTAGE DROPS ARE TOO HIGH SO ]
[ SOME LOADS ARE SERVED AT LOW VOLTAGE.  THIS SHOULD BE INVESTIGATED IN   ]
[ MORE DETAIL WITH THE FEEDERSITE PROGRAM.                                ]

    Hit <RETURN> to CONTINUE, or "Q" to QUIT: <RETURN>
- - - - - - - - - - - - - - - - - - - - -

 Page:  2     LOADSITE --  Release 8.92      -- OCT. 11, 1993 --  14:03:59
 ****** WAPDA CADPAD OUTPUT ***********************************************

                 SUBSTATION LOADING -- UNCONSTRAINED SOLUTION
   Base Case : BASE CASE - KOT LAKHPAT - 1992            Study Year : 1992
```


224

```
    Total Unserved Loads        :      0 KVA
    Center of Unserved Loads    : (  0,   0)

[ THERE IS NO UNSERVED LOAD BECAUSE THIS IS AN UNCONSTRAINED SOLUTION. ]

    Hit <RETURN> to CONTINUE, or "Q" to QUIT: <RETURN>
- - - - - - - - - - - - - - - - - - - - - -

    Substation Data Selection Menu

    Select Substation Data For Review: <RETURN>
- - - - - - - - - - - - - - - - - - - - - -

    SUBSITE Result Display Menu
    40 - Case Summary (CS)

    Select SUBSITE Result Display: CS

    CRT or PRINTER? <RETURN>
- - - - - - - - - - - - - - - - - - - - - -

 Page:  1     LOADSITE --  Release 8.92      -- OCT. 11, 1993 --   14:04:14
 ****** WAPDA CADPAD OUTPUT ***********************************************

                                SUBSITE Summary
 Base: BASE CASE - KOT LAKHPAT - 1992            - UNConstrained  Year: 1992
Study:                                           - UNConstrained  Year: 1992
                                            Base        Study
   INPUT...        Number of subs              3            0
                   KVA Capacity- 11.00KV   72000            0

   PERFORMANCE...  Load Served-KVA         58938            0
                   Load Unserved-KVA           0            0
                   % Utilized- Min         73.66         0.00
                               Avg         81.53         0.00
                               Max         88.83         0.00
                   MAX. % V.D.              44.9          0.0
                   Load at Low V.-KVA      20544            0

   COSTS-1000Rs..  Substation             14036.           0.
                   Feeder                 79389.           0.
                   Losses                 35120.           0.
                   Total Costs           128545.           0.

[ THIS SUMMARIZES BOTH CASES, GIVING COST TOTALS WHICH ARE USEFUL FOR ]
[ COMPARING ALTERNATIVES, TOTALS OF CAPACITY AND LOAD, GRID STATION   ]
[ UTILIZATION, MAXIMUM VOLTAGE DROP, AND LOAD SERVED AT LOW VOLTAGE.  ]

    Hit <RETURN> to CONTINUE, or "Q" to QUIT: <RETURN>
- - - - - - - - - - - - - - - - - - - - - -
```

```
SUBSITE Result Display Menu

Select SUBSITE Result Display: <RETURN>
- - - - - - - - - - - - - - - - - - - - -


SUBSITE Menu
10 - File Manipulation (FM)

[ THE REVIEW OF THE BASE YEAR SYSTEM IS COMPLETED.  GO AND SAVE THE ]
[ BASE YEAR CASE TO A CARD IMAGE FILE, AND CHANGE THE STUDY CASE    ]
[ TITLE IN PREPARATION FOR THE HORIZON YEAR CASE.                   ]

Select SUBSITE Function: FM
- - - - - - - - - - - - - - - - - - - - -

SUBSITE File Manipulation Menu
20 - Write Data To File (WD)

Select SUBSITE File Manipulation: WD
- - - - - - - - - - - - - - - - - - - - -

Base case or Study case? (Enter B or S): B
- - - - - - - - - - - - - - - - - - - - -

Please enter  punch filename: BC92

*    1 SUBS CAPACITY COST CURVES WRITTEN TO FILE.
*    1 LINE CAPACITY COST CURVES WRITTEN TO FILE.
*    5 SUBSTATIONS WRITTEN TO FILE.
*    5 SUBSTATION HISTORIES WRITTEN TO FILE.
- - - - - - - - - - - - - - - - - - - - -

SUBSITE File Manipulation Menu
60 - Change Case Title (CC)

Select SUBSITE File Manipulation: CC
- - - - - - - - - - - - - - - - - - - - -

Base case or Study case? (Enter B or S): S

Enter title (40 characters max.): STUDY CASE - KOT LAKHPAT - 2012
- - - - - - - - - - - - - - - - - - - - -
SUBSITE File Manipulation Menu

Select SUBSITE File Manipulation: <RETURN>
- - - - - - - - - - - - - - - - - - - - -

SUBSITE Menu
40 - Solve Subsite (SS)
```


226

[SOLVE SUBSITE FOR THE HORIZON YEAR, 2012, WITH ONLY EXISTING AND PLANNED]
[SUBSTATIONS. THIS WILL SHOW HOW THOSE SUBSTATIONS WOULD BE UTILIZED IF]
[THERE WERE NO OTHERS. THAT WILL BE USED AS A STARTING POINT FOR DECIDING]
[HOW MANY NEW SUBSTATIONS AND SUBSTATION EXPANSIONS ARE NEEDED, AND WHERE.]

Select SUBSITE Function: SS

- -

Base case or Study case? (Enter B or S): S

Enter study year: 2012

- -

Feeder effort map, "/" if none: 53

Substation site cost map, "/" if none: /

Load map ("/" to return to SUBSITE menu): 6

Feeder capacity map, "/" if none: /

- -

Solve with constraints or not? (Y or N): N

[RUN AN UNCONSTRAINED CASE TO SEE HOW THE LOADS WOULD]
[BE SERVED IF EACH SUBSTATION HAD UNLIMITED CAPACITY.]

... SUBSITE in progress ...
... SUBSITE in progress ...

* SUBSITE completed.

[RUN TRSR TO STORE RESULTS IN MAPS. DISPLAY AND REVIEW MAPS GRAPHICS.]
[REFER TO THE COMMENTS ON PAGE IX - 7 REGARDING USE OF THIS INFORMATION.]

- -

SUBSITE Menu
50 - Display Results (DR)

Select SUBSITE Function: DR

- -

SUBSITE Result Display Menu
20 - Study Case Substation Loading (SC)

Select SUBSITE Result Display: SC

- -

Substation Data Selection Menu
70 - All (AL)

Select Substation Data For Review: AL

221

- -

CRT or PRINTER? <RETURN>

- -

Page: 1 LOADSITE -- Release 8.92 -- OCT. 11, 1993 -- 14:07:00
****** WAPDA CADPAD OUTPUT **********

SUBSTATION LOADING -- UNCONSTRAINED SOLUTION
Study Case : STUDY CASE - KOT LAKHPAT - 2012 Study Year : 2012

<---------- INPUT ---------->						<-------- PERFORMANCE -------->						CAPITAL
ID	NAME	X	Y	KV	MVA	D	LD-KVA	LCX	LCY	%VD	KVA@LV	LOSS	1000Rs
82	OLD K.L.P	61	14	11.00	16100		26631	62	14	10.7	0	1194	6280
113	NEW K.L.P	63	20	11.00	30100		80879	66	21	49.6	38320	7826	27972
353	RAIWIND	42	64	11.00	26100		33405	42	63	27.9	17257	3010	34218
800	K.R.KISHAN	23	84	11.00	13100		17749	24	87	16.3	4067	1047	25830
900	KHANA	64	36	11.00	26100		76243	65	39	37.1	50903	8714	42610

[HERE WE SEE THAT ALL THE SUESTATIONS ARE OVERLOADED, BUT MOST SERIOUSLY]
[AT NEW K.L.P. AND KHANA. MORE CAPACITY IS NEEDED, AND THIS TELLS WHERE.]

Hit <RETURN> to CONTINUE, or "Q" to QUIT: <RETURN>

- -

Page: 2 LOADSITE -- Release 8.92 -- OCT. 11, 1993 -- 14:07:21
****** WAPDA CADPAD OUTPUT **********

SUBSTATION LOADING -- UNCONSTRAINED SOLUTION
Study Case : STUDY CASE - KOT LAKHPAT - 2012 Study Year : 2012

Total Unserved Loads : 0 KVA
Center of Unserved Loads : (0, 0)

[THERE IS NO UNSERVED LOAD BECAUSE THIS IS AN UNCONSTRAINED SOLUTION.]

Hit <RETURN> to CONTINUE, or "Q" to QUIT: <RETURN>

- -

Substation Data Selection Menu

Select Substation Data For Review: <RETURN>

- -

SUBSITE Result Display Menu

40 - Case Summary (CS)

Select SUBSITE Result Display: CS

CRT or PRINTER? <RETURN>

- -

228

[IN THE SUMMARY BELOW, THE BASE CASE CONTAINS THE BASE YEAR RESULTS AND]
[THE STUDY CASE CONTAINS THE HORIZON YEAR STUDY RESULTS FROM THE LAST RUN.]

Page: 1 LOADSITE -- Release 8.92 -- OCT. 11, 1993 -- 14:07:32
****** WAPDA CADPAD OUTPUT **********

SUBSITE Summary

Base: BASE CASE - KOT LAKHPAT - 1992 - UNConstrained Year: 1992
Study: STUDY CASE - KOT LAKHPAT - 2012 - UNConstrained Year: 2012

		Base	Study
INPUT...	Number of subs	3	5
	KVA Capacity- 11.00KV	72000	111000
PERFORMANCE...	Load Served-KVA	58938	234907
	Load Unserved-KVA	0	0
	% Utilized- Min	73.66	128.48
	Avg	81.53	198.86
	Max	88.83	293.24
	MAX. % V.D.	44.9	49.6
	Load at Low V.-KVA	20544	110547
COSTS-1000Rs..	Substation	14036.	39651.
	Feeder	79389.	97271.
	Losses	35120.	174328.
	Total Costs	128545.	311250.

Hit <RETURN> to CONTINUE, or "Q" to QUIT: <RETURN>
- -

SUBSITE Result Display Menu

Select SUBSITE Result Display: <RETURN>
- -

SUBSITE Menu
20 - Edit Substation Data (ES)

[FROM THE REVIEW OF THE GRAPHICAL AND TABULAR DISPLAYS, THE USER DECIDES]
[WHAT NEW CAPACITIES TO ADD AND WHERE TO ADD THEM. THESE DECISIONS MAY]
[BE JUST EDUCATED GUESSES BUT THAT IS FINE BECAUSE THEY CAN BE MODIFIED]
[AFTER SEEING THE RESULTS OF THE CHANGES WHEN SUBSITE IS RUN AGAIN.]

[ADD THREE NEW SUBSTATIONS CALLED NORTH, WEST AND EAST. ADD THEM TO BE]
[BUILT IN THE HORIZON YEAR, 2012, AND MAKE THEM 52 MVA. COORDINATES ARE]
[A FIRST GUESS AT LOCATIONS. ALL THESE DATA CAN BE CHANGED LATER.]

Select SUBSITE Function: ES
- -

Substation Data Edit Menu
10 - Add (AD)

229

Select Substation Edit Function: AD

- - - - - - - - - - - - - - - - - - - -

Substation ID: 1000

(IX,IY) coordinates: 67,17

Name (10 characters max): NORTH

Nominal voltage - KV: 11

Distance limit - small areas: 99

Year built and capacity (MVA): 2012,52

Year built and capacity (MVA): /

- - - - - - - - - - - - - - - - - - - -

Substation: 1000 -- NORTH

Summer Peak Loads (MVA):

-5	-4	-3	-2	-1	0(BASE YEAR)
0.0	0.0	0.0	0.0	0.0	0.0

Enter new SUMMER peak values: /

[WE ARE NOT USING HISTORICAL DATA SO THERE IS NO NEED TO ENTER VALUES.]

Summer Peak Loads (MVA):

-5	-4	-3	-2	-1	0(BASE YEAR)
0.0	0.0	0.0	0.0	0.0	0.0

Are these peak values ok (Y or N)? Y

- - - - - - - - - - - - - - - - - - - -

Substation: 1000 -- NORTH

Winter Peak Loads (MVA):

-5	-4	-3	-2	-1	0(BASE YEAR)
0.0	0.0	0.0	0.0	0.0	0.0

Enter new WINTER peak values: /

Winter Peak Loads (MVA):

-5	-4	-3	-2	-1	0(BASE YEAR)
0.0	0.0	0.0	0.0	0.0	0.0

Are these peak values ok (Y or N)? Y

- - - - - - - - - - - - - - - - - - - -

Substation ID: 1100

(IX,IY) coordinates: 60,17

Name (10 characters max): WEST

Nominal voltage - KV: 11

Distance limit - small areas: 99

Year built and capacity (MVA): 2012,52

Year built and capacity (MVA): /

- -

Substation: 1100 -- WEST

Summer Peak Loads (MVA):

-5	-4	-3	-2	-1	0(BASE YEAR)
0.0	0.0	0.0	0.0	0.0	0.0

Enter new SUMMER peak values: /

Summer Peak Loads (MVA):

-5	-4	-3	-2	-1	0(BASE YEAR)
0.0	0.0	0.0	0.0	0.0	0.0

Are these peak values ok (Y or N)? Y

- -

Substation: 1100 -- WEST

Winter Peak Loads (MVA):

-5	-4	-3	-2	-1	0(BASE YEAR)
0.0	0.0	0.0	0.0	0.0	0.0

Enter new WINTER peak values: /

Winter Peak Loads (MVA):

-5	-4	-3	-2	-1	0(BASE YEAR)
0.0	0.0	0.0	0.0	0.0	0.0

Are these peak values ok (Y or N)? Y

- -

Substation ID: 1200

(IX,IY) coordinates: 67,28

031

Name (10 characters max): EAST

Nominal voltage - KV: 11

Distance limit - small areas: 99

Year built and capacity (MVA): 2012,52

Year built and capacity (MVA): /

- -

Substation: 1200 -- EAST

Summer Peak Loads (MVA):

-5	-4	-3	-2	-1	0(BASE YEAR)
0.0	0.0	0.0	0.0	0.0	0.0

Enter new SUMMER peak values: /

Summer Peak Loads (MVA):

-5	-4	-3	-2	-1	0(BASE YEAR)
0.0	0.0	0.0	0.0	0.0	0.0

Are these peak values ok (Y or N)? Y

- -

Substation: 1200 -- EAST

Winter Peak Loads (MVA):

-5	-4	-3	-2	-1	0(BASE YEAR)
0.0	0.0	0.0	0.0	0.0	0.0

Enter new WINTER peak values: /

Winter Peak Loads (MVA):

-5	-4	-3	-2	-1	0(BASE YEAR)
0.0	0.0	0.0	0.0	0.0	0.0

Are these peak values ok (Y or N)? Y

- -

Substation ID: /

- -

Substation Data Edit Menu

Select Substation Edit Function: <RETURN>
- -

SUBSITE Menu
40 - Solve Subsite (SS)

[SOLVE SUBSITE FOR THE HORIZON YEAR, 2012, WITH ALL SUBSTATIONS.]

Select SUBSITE Function: SS
- -

Base case or Study case? (Enter B or S): S

Enter study year: 2012
- -

Feeder effort map, "/" if none: 53

Substation site cost map, "/" if none: /

Load map ("/" to return to SUBSITE menu): 6

Feeder capacity map, "/" if none: /
- -

Solve with constraints or not? (Y or N): N

[WE STILL WANT TO RUN UNCONSTRAINED TO SEE IF ANY SUBSTATIONS OVERLOAD.]
[IF THEY DO, WE CAN CHANGE LOCATIONS AND CAPACITIES FOR THE NEXT RUN.]

... SUBSITE in progress ...
... SUBSITE in progress ...

* SUBSITE completed.

[RUN TRSR TO STORE RESULTS IN MAPS. DISPLAY AND REVIEW MAPS GRAPHICS.]
[REFER TO THE COMMENTS ON PAGE IX - 7 REGARDING USE OF THIS INFORMATION.]
- -

SUBSITE Menu
50 - Display Results (DR)

[DISPLAY THE TABULAR RESULTS AND REVIEW THEM.]

Select SUBSITE Function: DR
- -

SUBSITE Result Display Menu
20 - Study Case Substation Loading (SC)

Select SUBSITE Result Display: SC

- -

Substation Data Selection Menu
70 - All (AL)

Select Substation Data For Review: AL
- -

CRT or PRINTER? <RETURN>
- -

Page: 1 LOADSITE -- Release 8.92 -- OCT. 11, 1993 -- 14:12:32
****** WAPDA CADPAD OUTPUT **********

SUBSTATION LOADING -- UNCONSTRAINED SOLUTION
Study Case : STUDY CASE - KOT LAKHPAT - 2012 Study Year : 2012

<---------- INPUT ---------->							<-------- PERFORMANCE -------->					CAPITAL
ID	NAME	X	Y	KV	MVA	D	LD-KVA	LCX	LCY	%VD	KVA@LV	LOSS	1000Rs
82	OLD K.L.P	61	14	11.00	16100		17589	62	13	7.4	0	658	4826
113	NEW K.L.P	63	20	11.00	30100		23134	62	22	17.1	5299	1132	7467
353	RATWIND	42	64	11.00	26100		33405	42	63	27.9	17257	3010	34218
800	K.R.KISHAN	23	84	11.00	13100		17749	24	87	16.3	4067	1047	25830
900	KHANA	64	36	11.00	26100		60817	64	41	37.2	40240	7021	31108
1000	NORTH	67	17	11.00	52	99	31273	70	18	25.2	5745	1758	17356
1100	WEST	60	17	11.00	52	99	17203	60	18	7.4	0	590	12515
1200	EAST	67	28	11.00	52	99	33737	69	29	24.9	5087	2067	25085

[SUBSTATION LOADS AND CAPACITIES ARE MISMATCHED SO CAPACITIES NEED TO BE]
[CHANGED. BASED ON THIS LOADING INFORMATION AND THE GRAPHICAL DISPLAYS]
[REVIEW, SOME LOCATION CHANGES ARE ALSO NEEDED.]

Hit <RETURN> to CONTINUE, or "Q" to QUIT: <RETURN>
- -

Page: 2 LOADSITE -- Release 8.92 -- OCT. 11, 1993 -- 14:14:41
****** WAPDA CADPAD OUTPUT **********

SUBSTATION LOADING -- UNCONSTRAINED SOLUTION
Study Case : STUDY CASE - KOT LAKHPAT - 2012 Study Year : 2012

Total Unserved Loads : 0 KVA
Center of Unserved Loads : (0, 0)

[THERE IS NO UNSERVED LOAD BECAUSE THIS IS AN UNCONSTRAINED SOLUTION.]

Hit <RETURN> to CONTINUE, or "Q" to QUIT: <RETURN>
- -

Substation Data Selection Menu

Select Substation Data For Review: <RETURN>

- -

SUBSITE Result Display Menu
40 - Case Summary (CS)

Select SUBSITE Result Display: CS

CRT or PRINTER? <RETURN>

- -

Page: 1 LOADSITE -- Release 8.92 -- OCT. 11, 1993 -- 14:14:50
****** WAPDA CADPAD OUTPUT **********

SUBSITE Summary

Base: BASE CASE - KOT LAKHPAT - 1992 - UNConstrained Year: 1992
Study: STUDY CASE - KOT LAKHPAT - 2012 - UNConstrained Year: 2012

		Base	Study
INPUT...	Number of subs	3	8
	KVA Capacity- 11.00KV	72000	267000
PERFORMANCE...	Load Served-KVA	58938	234907
	Load Unserved-KVA	0	0
	% Utilized- Min	73.66	33.08
	Avg	81.53	105.51
	Max	88.83	233.91
	MAX. % V.D.	44.9	37.2
	Load at Low V.-KVA	20544	77695
COSTS-1000Rs..	Substation	14036.	59980.
	Feeder	79389.	98729.
	Losses	35120.	138264.
	Total Costs	128545.	296973.

[COMPARING THIS SUMMARY WITH THE SUMMARY OF THE PREVIOUS RUN, WE SEE]
[THAT THIS ONE IS CHEAPER. THE COST OF ADDING SUBSTATION CAPACITY]
[WAS MORE THAN OFFSET BY THE DECREASE IN THE COST OF LOSSES.]

Hit <RETURN> to CONTINUE, or "Q" to QUIT: <RETURN>

- -

SUBSITE Result Display Menu

Select SUBSITE Result Display: <RETURN>

- -

SUBSITE Menu
20 - Edit Substation Data (ES)

[MODIFY SUBSTATION LOCATIONS AND CAPACITIES BASED ON THE ABOVE RESULTS.]

Select SUBSITE Function: ES

- -

```
Substation Data Edit Menu
30 - Modify (MO)

Select Substation Edit Function: MO
- - - - - - - - - - - - - - - - - - - -
Substation ID: 800
- - - - - - - - - - - - - - - - - - - -
Old coordinates:  ( 23, 84)
Enter new values: 24,88
```

[THIS MOVES K. R. KISHAN CLOSER TO ITS LOAD CENTER.]

```
Old substation name is:                K.R.KISHAN
Enter new name (10 characters max): K.R.KISHAN

Old voltage:  11.00-KV
Enter new KV: /

Old distance limit: 100 small areas
Enter new limit: /
- - - - - - - - - - - - - - - - - - - -
Current capacity steps are:

        Year      MVA
        ----      ---
        1998       13

Enter year to modify: /

Do you wish to modify Substation History (Y or N)?  N
- - - - - - - - - - - - - - - - - - - -
Substation ID: 353
- - - - - - - - - - - - - - - - - - - -
Old coordinates:  ( 42, 64)
Enter new values: /

Old substation name is:                RAIWIND
Enter new name (10 characters max): RAIWIND

Old voltage:  11.00-KV
Enter new KV: /

Old distance limit: 100 small areas
Enter new limit:  /
- - - - - - - - - - - - - - - - - - - -
Current capacity steps are:

        Year      MVA
        ----      ---
        1990       20
        1992       26
```

```
    Enter year to modify: 1992
    Enter year, Capacity (0,0 to delete): 1992,52

[ THIS INCREASES RAIWIND CAPACITY TO 52 MVA STARTING IN 1992.  A BETTER WAY ]
[ WOULD BE TO ADD A CAPACITY STEP FOR 2012 AS IS DONE FOR KHANA BELOW.      ]
- - - - - - - - - - - - - - - - - - - - - -
    Current capacity steps are:

            Year      MVA
            ----      ---
            1990       20
            1992       52

    Enter year to modify: /

    Do you wish to modify Substation History (Y or N)?  N
- - - - - - - - - - - - - - - - - - - - - -
    Substation ID: 900
- - - - - - - - - - - - - - - - - - - - - -
    Old coordinates:  ( 64, 36)
    Enter new values: 67,37

[ KHANA LOCATION WAS WRONG.  NOW IT IS WHERE THE DIVISION WANTS IT. ]

    Old substation name is:              KHANA
    Enter new name (10 characters max): KHANA

    Old voltage:  11.00-KV
    Enter new KV: /

    Old distance limit: 100 small areas
    Enter new limit:  /
- - - - - - - - - - - - - - - - - - - - - -
    Current capacity steps are:

            Year      MVA
            ----      ---
            1998       26

    Enter year to modify: 2012
    Enter capacity: 52

[ THIS ADDS A CAPACITY STE OF 52 MVA FOR KHANA IN 2012. ]
- - - - - - - - - - - - - - - - - - - - - -
    Current capacity steps are:

            Year      MVA
            ----      ---
            1998       26
            2012       52

    Enter year to modify: /
```

Do you wish to modify Substation History (Y or N)? N

- -

Substation ID: 1100

- -

Old coordinates: (60, 17)
Enter new values: /

Old substation name is: WEST
Enter new name (10 characters max): WEST

Old voltage: 11.00-KV
Enter new KV: /

Old distance limit: 99 small areas
Enter new limit: /

- -

Current capacity steps are:

Year	MVA
2012	52

Enter year to modify: 2012
Enter year, Capacity: 2012,26

[THIS REDUCES THE CAPACITY OF WEST TO 26 MVA IN 2012]
[BECAUSE THE HIGHER CAPACITY WAS NOT UTILIZED.]

- -

Current capacity steps are:

Year	MVA
2012	26

Enter year to modify: /

Do you wish to modify Substation History (Y or N)? N

- -

Substation ID: 353

- -

Old coordinates: (42, 64)
Enter new values: /

Old substation name is: RAIWIND
Enter new name (10 characters max): RAIWIND

Old voltage: 11.00-KV
Enter new KV: /

Old distance limit: 100 small areas
Enter new limit: /

- -

238

Current capacity steps are:

Year	MVA
1990	20
1992	52

Enter year to modify: 1992
Enter year, Capacity (0,0 to delete): 1992,26

[THIS RESTORES RAIWIND 1992 CAPACITY TO ITS ORIGINAL VALUE.]
[A NEW CAPACITY STEP IS ADDED BELOW FOR THE YEAR 2012 CAPACITY.]

- -

Current capacity steps are:

Year	MVA
1990	20
1992	26

Enter year to modify: 2012
Enter capacity: 52

[THIS ADDS A 52 MVA CAPACITY STEP TO RAIWIND FOR THE YEAR 2012.]

- -

Current capacity steps are:

Year	MVA
1990	20
1992	26
2012	52

Enter year to modify: /

Do you wish to modify Substation History (Y or N)? N

- -

Substation ID: /

- -

Substation Data Edit Menu
40 - Review (RE)

[REVIEW THE SUBSTATION DATA TO MAKE SURE THE CHANGES WERE MADE AS INTENDED.]

Select Substation Edit Function: RE

- -

Base case or Study case? (Enter B or S): S

- -

Substation Data Selection Menu
70 - All (AL)

Select Substation Data For Review: AL
- -

CRT or PRINTER? <RETURN>
- -

Page: 1 LOADSITE -- Release 8.92 -- OCT. 11, 1993 -- 14:22:07
****** WAPDA CADPAD OUTPUT ******

SUBSITE Input Data ... Study Case-

ID	Name	IX	IY	KV	Dist	Year	MVA
82	OLD K.L.P	61	14	11.00	100	1990	13
						1992	16
113	NEW K.L.P	63	20	11.00	100	1990	26
						1992	30
353	RAIWIND	42	64	11.00	100	1990	20
						1992	26
						2012	52
800	K.R.KISHAN	24	88	11.00	100	1998	13
900	KHANA	67	37	11.00	100	1998	26
						2012	52
1000	NORTH	67	17	11.00	99	2012	52
1100	WEST	60	17	11.00	99	2012	26
1200	EAST	67	28	11.00	99	2012	52

Hit <RETURN> to CONTINUE, or "Q" to QUIT: <RETURN>
- -

Hit <RETURN> to CONTINUE, or "Q" to QUIT: <RETURN>
- -

Substation Data Selection Menu

Select Substation Data For Review: <RETURN>
- -

Substation Data Edit Menu

Select Substation Edit Function: <RETURN>
- -

SUBSITE Menu
40 - Solve Subsite (SS)

[SOLVE SUBSITE WITH MODIFIED SUBSTATIONS.]

Select SUBSITE Function: SS
- -

Base case or Study case? (Enter B or S): S

Enter study year: 2012

- -

Feeder effort map, "/" if none: 53

Substation site cost map, "/" if none: /

Load map ("/" to return to SUBSITE menu): 6

Feeder capacity map, "/" if none: /

- -

Solve with constraints or not? (Y or N): N

[RUN UNCONSTRAINED TO ALLOW SUBSTATIONS TO OVERLOAD IF THEY WANT TO.]

... SUBSITE in progress ...
... SUBSITE in progress ...

* SUBSITE completed.

[RUN TRSR TO STORE RESULTS IN MAPS. DISPLAY AND REVIEW MAPS GRAPHICS.]
[REFER TO THE COMMENTS ON PAGE IX - 7 REGARDING USE OF THIS INFORMATION.]

- -

SUBSITE Menu
50 - Display Results (DR)

[DISPLAY THE TABULAR RESULTS AND REVIEW THEM.]

Select SUBSITE Function: DR

- -

SUBSITE Result Display Menu
20 - Study Case Substation Loading (SC)

Select SUBSITE Result Display: SC

- -

Substation Data Selection Menu
70 - All (AL)

Select Substation Data For Review: AL

- -

CRT or PRINTER? <RETURN>

- -

Page: 1 LOADSITE -- Release 8.92 -- OCT. 11, 1993 -- 14:26:22
****** WAPDA CADPAD OUTPUT **********

SUBSTATION LOADING -- UNCONSTRAINED SOLUTION

Study Case : STUDY CASE - KOT LAKHPAT - 2012 Study Year : 2012

<---------- INPUT ---------->						<-------- PERFORMANCE -------->						CAPITAL
ID	NAME	X	Y	KV	MVA D	LD-KVA	LCX	LCY	%VD	KVA@LV	LOSS	1000Rs
82	OLD K.L.P	61	14	11.00	16100	17589	62	13	7.4	0	658	4826
113	NEW K.L.P	63	20	11.00	30100	23561	62	23	19.1	6129	1236	7692
353	RAIWIND	42	64	11.00	52100	34773	43	63	28.1	18751	3300	40127
800	K.R.KISHAN	24	88	11.00	13100	17262	24	88	16.8	6128	1176	22672
900	KHANA	67	37	11.00	52100	55827	66	42	33.6	36384	6001	33570
1000	NORTH	67	17	11.00	52 99	31273	70	18	25.2	5745	1758	17356
1100	WEST	60	17	11.00	26 99	17222	60	18	7.5	0	591	7148
1200	EAST	67	28	11.00	52 99	37399	65	28	22.8	13032	2765	21228

[THREE SUBSTATIONS ARE OVERLOADED, SO MORE CHANGES ARE IN ORDER.]

Hit <RETURN> to CONTINUE, or "Q" to QUIT: <RETURN>

- -

Page: 2 LOADSITE -- Release 8.92 -- OCT. 11, 1993 -- 14:28:04

****** WAPDA CADPAD OUTPUT **********

SUBSTATION LOADING -- UNCONSTRAINED SOLUTION

Study Case : STUDY CASE - KOT LAKHPAT - 2012 Study Year : 2012

Total Unserved Loads : 0 KVA

Center of Unserved Loads : (0, 0)

[THERE IS NO UNSERVED LOAD BECAUSE THIS IS AN UNCONSTRAINED SOLUTION.]

Hit <RETURN> to CONTINUE, or "Q" to QUIT: <RETURN>

- -

Substation Data Selection Menu

Select Substation Data For Review: <RETURN>

- -

SUBSITE Result Display Menu

Select SUBSITE Result Display: <RETURN>

- -

SUBSITE Menu

20 - Edit Substation Data (ES)

Select SUBSITE Function: ES **[Modify substation locations]**

- -

Substation Data Edit Menu

30 - Modify (MO)

```
    Select Substation Edit Function: MO
- - - - - - - - - - - - - - - - - - - - -
    Substation ID: 1000
- - - - - - - - - - - - - - - - - - - - -
    Old coordinates:  ( 67, 17)
    Enter new values: 62,16

[ THIS MOVES NORTH TO WHERE IT WILL PICK UP EXCESS LOAD          ]
[ FROM OLD K.L.P WHICH IS OVERLOADED AND CAN NOT BE EXPANDED.    ]

    Old substation name is:                NORTH
    Enter new name (10 characters max): NORTH

    Old voltage:  11.00-KV
    Enter new KV: /

    Old distance limit:  99 small areas
    Enter new limit: /
- - - - - - - - - - - - - - - - - - - - -
    Current capacity steps are:

          Year      MVA
          ----      ---
          2012       52

    Enter year to modify: /

    Do you wish to modify Substation History (Y or N)? N
- - - - - - - - - - - - - - - - - - - - -
    Substation ID: 1100
- - - - - - - - - - - - - - - - - - - - -

    Old coordinates:  ( 60, 17)
    Enter new values: 52,33

[ THIS MOVES WEST TO THE SOUTHWEST, AWAY FROM NEW K.L.P, TO ALLOW ]
[ THAT SUBSTATION TO PICK UP MORE LOAD, AND TOWARD RAIWIND.       ]

    Old substation name is:                WEST
    Enter new name (10 characters max): WEST

    Old voltage:  11.00-KV
    Enter new KV: /

    Old distance limit:  99 small areas
    Enter new limit: /
- - - - - - - - - - - - - - - - - - - - -
    Current capacity steps are:

          Year      MVA
          ----      ---
          2012       26
```

```
    Enter year to modify: /

    Do you wish to modify Substation History (Y or N)? N
- - - - - - - - - - - - - - - - - - - - - -
    Substation ID: 1200
- - - - - - - - - - - - - - - - - - - - - -
    Old coordinates:  ( 67, 28)
    Enter new values: 68,25
```

[THIS MOVES EAST TOWARD THE NORTH TO ASSIST WITH THE NEW K.L.P. LOADS.]

```
    Old substation name is:                EAST
    Enter new name (10 characters max): EAST

    Old voltage:  11.00-KV
    Enter new KV: /

    Old distance limit:  99 small areas
    Enter new limit: /
- - - - - - - - - - - - - - - - - - - - - -
    Current capacity steps are:

          Year      MVA
          ----      ---
          2012       52

    Enter year to modify: /

    Do you wish to modify Substation History (Y or N)? N
- - - - - - - - - - - - - - - - - - - - - -
    Substation ID: /
- - - - - - - - - - - - - - - - - - - - - -

    Substation Data Edit Menu
    40 - Review (RE)
```

[REVIEW THE SUBSTATION DATA TO MAKE SURE THE CHANGES ARE CORRECT.]

```
    Select Substation Edit Function: RE
- - - - - - - - - - - - - - - - - - - - - -

    Base case or Study case? (Enter B or S):  S
- - - - - - - - - - - - - - - - - - - - - -
    Substation Data Selection Menu
    70 - All (AL)

    Select Substation Data For Review: AL
- - - - - - - - - - - - - - - - - - - - - -

    CRT or PRINTER? <RETURN>
- - - - - - - - - - - - - - - - - - - - - -
```

****** WAPDA CADPAD OUTPUT **********

SUBSITE Input Data ... Study Case-

ID	Name	IX	IY	KV	Dist	Year	MVA
82	OLD K.L.P	61	14	11.00	100	1990	13
						1992	16
113	NEW K.L.P	63	20	11.00	100	1990	26
						1992	30
353	RAIWIND	42	64	11.00	100	1990	20
						1992	26
						2012	52
800	K.R.KISHAN	24	88	11.00	100	1998	13
900	KHANA	67	37	11.00	100	1998	26
						2012	52
1000	NORTH	62	16	11.00	99	2012	52
1100	WEST	52	33	11.00	99	2012	26
1200	EAST	68	25	11.00	99	2012	52

Hit <RETURN> to CONTINUE, or "Q" to QUIT: <RETURN>

Hit <RETURN> to CONTINUE, or "Q" to QUIT: <RETURN>

Substation Data Selection Menu

Select Substation Data For Review: <RETURN>

Substation Data Edit Menu

Select Substation Edit Function: <RETURN>

SUBSITE Menu
40 - Solve Subsite (SS)

[SOLVE SUBSITE WITH THE MODIFIED SUBSTATIONS.]

Select SUBSITE Function: SS

Base case or Study case? (Enter B or S): S

Enter study year: 2012

Feeder effort map, "/" if none: 53

Substation site cost map, "/" if none: /

Load map ("/" to return to SUBSITE menu): 6

Feeder capacity map, "/" if none: /

- -

Solve with constraints or not? (Y or N): N

[RUN UNCONSTRAINED TO ALLOW SUBSTATIONS TO OVERLOAD IF THEY WANT TO.]

... SUBSITE in progress ...
... SUBSITE in progress ...

* SUBSITE completed.

[RUN TRSR TO STORE RESULTS IN MAPS. DISPLAY AND REVIEW MAPS GRAPHICS.]
[REFER TO THE COMMENTS ON PAGE IX - 7 REGARDING USE OF THIS INFORMATION.]

- -

SUBSITE Menu
50 - Display Results (DR)

[DISPLAY THE TABULAR RESULTS AND REVIEW THEM.]

Select SUBSITE Function: DR

- -

SUBSITE Result Display Menu
20 - Study Case Substation Loading (SC)

Select SUBSITE Result Display: SC

- -

Substation Data Selection Menu
70 - All (AL)

Select Substation Data For Review: AL

- -

CRT or PRINTER? <RETURN>

- -

Page: 1 LOADSITE -- Release 8.92 -- OCT. 11, 1993 -- 14:32:05
****** WAPDA CADPAD OUTPUT **********

SUBSTATION LOADING -- UNCONSTRAINED SOLUTION
Study Case : STUDY CASE - KOT LAKHPAT - 2012 Study Year : 2012

<---------- INPUT ---------->						<-------- PERFORMANCE -------->						CAPITAL
ID	NAME	X	Y	KV	MVA	D	LD-KVA	LCX	LCY	%VD	KVA@LV	LOSS	1000Rs
82	OLD K.L.P	61	14	11.00	16100		15482	62	13	7.5	0	597	4773
113	NEW K.L.P	63	20	11.00	30100		29644	63	21	11.2	0	1288	8004
353	RAIWIND	42	64	11.00	52100		33815	42	63	28.0	17419	3102	39789

800	K.R.KISHAN	24	88	11.00	13100	17262	24	88	16.8	6128	1176	22672
900	KHANA	67	37	11.00	52100	49517	68	42	32.1	23807	4659	30474
1000	NORTH	62	16	11.00	52 99	27051	63	16	15.3	3825	1348	11974
1100	WEST	52	33	11.00	26 99	20384	55	34	12.5	1305	1032	11927
1200	EAST	68	25	11.00	52 99	41751	70	25	40.0	13020	3765	23240

```
[ K. R. KISHAN IS STILL OVERLOADED.  THIS CAN BE HANDLED BY ADDING  ]
[ CAPACITY TO THE SUBSTATION OR BY FORCING A TRANSFER OF THE EXCESS ]
[ LOAD BY RUNNING A CONSTRAINED SOLUTION.                           ]

    Hit <RETURN> to CONTINUE, or "Q" to QUIT: <RETURN>
- - - - - - - - - - - - - - - - - - - - - -

 Page:  2    LOADSITE --  Release 8.92     -- OCT. 11, 1993 --  14:32:22
 ****** WAPDA CADPAD OUTPUT ***************************************************

                  SUBSTATION LOADING -- UNCONSTRAINED SOLUTION
  Study Case : STUDY CASE - KOT LAKHPAT - 2012            Study Year : 2012

    Total Unserved Loads       :      0 KVA
    Center of Unserved Loads   : (   0,   0)

[ THERE IS NO UNSERVED LOAD BECAUSE THIS IS AN UNCONSTRAINED SOLUTION. ]

    Hit <RETURN> to CONTINUE, or "Q" to QUIT: <RETURN>
- - - - - - - - - - - - - - - - - - - - - -

    Substation Data Selection Menu

    Select Substation Data For Review: <RETURN>
- - - - - - - - - - - - - - - - - - - - - -

    SUBSITE Result Display Menu
    20 - Study Case Substation Loading (SC)

    Select SUBSITE Result Display: CS

    CRT or PRINTER? <RETURN>
- - - - - - - - - - - - - - - - - - - - - -

 Page:  1    LOADSITE --  Release 8.92     -- OCT. 11, 1993 --  14:32:31
 ****** WAPDA CADPAD OUTPUT ***************************************************

                              SUBSITE Summary
 Base: BASE CASE - KOT LAKHPAT - 1992          - UNConstrained  Year: 1992
Study: STUDY CASE - KOT LAKHPAT - 2012         - UNConstrained  Year: 2012
                                          Base        Study
   INPUT...          Number of subs          3            8
                     KVA Capacity- 11.00KV   72000        293000

   PERFORMANCE...    Load Served-KVA         58938        234906
                     Load Unserved-KVA       0            0
```

	% Utilized- Min	73.66	52.02
	Avg	81.53	87.42
	Max	88.83	132.78
	MAX. % V.D.	44.9	40.0
	Load at Low V.-KVA	20544	65504
COSTS-1000Rs..	Substation	14036.	59980.
	Feeder	79389.	92877.
	Losses	35120.	135736.
	Total Costs	128545.	288592.

[TOTAL COST IS AGAIN IMPROVED OVER THE PREVIOUS RUN.]

Hit <RETURN> to CONTINUE, or "Q" to QUIT: <RETURN>

- -

SUBSITE Result Display Menu

Select SUBSITE Result Display: <RETURN>

- -

SUBSITE Menu
40 - Solve Subsite (SS)

[SOLVE SUBSITE AGAIN, BUT THIS TIME CONSTRAINED]

Select SUBSITE Function: SS

- -

Base case or Study case? (Enter B or S): S

Enter study year: 2012

- -

Feeder effort map, "/" if none: 53

Substation site cost map, "/" if none: /

Load map ("/" to return to SUBSITE menu): 6

Feeder capacity map, "/" if none: /

- -

Solve with constraints or not? (Y or N): Y

[THIS TIME RUN CONSTRAINED TO FORCE TRANSFER]
[OF EXCESS LOAD FROM K. R. KISHAN.]

... SUBSITE in progress ...
... SUBSITE in progress ...

* SUBSITE completed.

[RUN TRSR TO STORE RESULTS IN MAPS. DISPLAY AND REVIEW MAPS GRAPHICS.]
[REFER TO THE COMMENTS ON PAGE IX - 7 REGARDING USE OF THIS INFORMATION.]
- -

SUBSITE Menu
50 - Display Results (DR)

[DISPLAY THE TABULAR RESULTS AND REVIEW THEM.]

Select SUBSITE Function: DR
- -

SUBSITE Result Display Menu
20 - Study Case Substation Loading (SC)

Select SUBSITE Result Display: SC
- -

Substation Data Selection Menu
70 - All (AL)

Select Substation Data For Review: AL
- -

CRT or PRINTER? <RETURN>
- -

Page: 1 LOADSITE -- Release 8.92 -- OCT. 11, 1993 -- 14:34:00
****** WAPDA CADPAD OUTPUT **********

SUBSTATION LOADING -- CONSTRAINED SOLUTION
Study Case : STUDY CASE - KOT LAKHPAT - 2012 Study Year : 2012

<---------- INPUT ---------->						<-------- PERFORMANCE -------->						CAPITAL
ID	NAME	X	Y	KV	MVA	D	LD-KVA	LCX	LCY	%VD	KVA@LV	LOSS	1000Rs
82	OLD K.L.P	61	14	11.00	16100		15482	62	13	7.5	0	597	4773
113	NEW K.L.P	63	20	11.00	30100		28091	63	21	12.7	2233	1405	7716
353	RAIWIND	42	64	11.00	52100		34648	42	64	28.2	19506	3244	40633
800	K.R.KISHAN	24	88	11.00	13100		12998	24	91	14.7	1209	636	20588
900	KHANA	67	37	11.00	52100		49517	68	42	32.1	23807	4659	30474
1000	NORTH	62	16	11.00	52	99	26341	63	16	15.2	3825	1284	11859
1100	WEST	52	33	11.00	26	99	21817	54	35	12.7	3918	1125	14296
1200	EAST	68	25	11.00	52	99	43038	70	25	40.1	13040	3829	23524

[ALL SUBSTATIONS ARE NOW AT OR BELOW THEIR CAPACITY LIMITS. NORTH]
[CAN BE REDUCED TO A 26 MVA CAPACITY WITH A SMALL AMOUNT OF LOAD TRANSFER.]

Hit <RETURN> to CONTINUE, or "Q" to QUIT: <RETURN>
- -

Page: 2 LOADSITE -- Release 8.92 -- OCT. 11, 1993 -- 14:35:12
****** WAPDA CADPAD OUTPUT **********

247

SUBSTATION LOADING -- CONSTRAINED SOLUTION

Study Case : STUDY CASE - KOT LAKHPAT - 2012 Study Year : 2012

Total Unserved Loads : 2974 KVA

Center of Unserved Loads : (21, 79)

[NOW WE HAVE UNSERVED LOAD WHICH WILL HAVE TO BE TAKEN CARE OF.]

Hit <RETURN> to CONTINUE, or "Q" to QUIT: <RETURN>

- -

Substation Data Selection Menu

Select Substation Data For Review: <RETURN>

- -

SUBSITE Result Display Menu
40 - Case Summary (CS)

Select SUBSITE Result Display: CS

CRT or PRINTER? <RETURN>

- -

Page: 1 LOADSITE -- Release 8.92 -- OCT. 11, 1993 -- 14:35:22
****** WAPDA CADPAD OUTPUT **********

SUBSITE Summary

Base: BASE CASE - KOT LAKHPAT - 1992 - UNConstrained Year: 1992
Study: STUDY CASE - KOT LAKHPAT - 2012 - Constrained Year: 2012

		Base	Study
INPUT...	Number of subs	3	8
	KVA Capacity- 11.00KV	72000	293000
PERFORMANCE...	Load Served-KVA	58938	231932
	Load Unserved-KVA	0	2974
	% Utilized- Min	73.66	50.66
	Avg	81.53	83.70
	Max	88.83	99.98
	MAX. % V.D.	44.9	40.1
	Load at Low V.-KVA	20544	67538
COSTS-1000Rs..	Substation	14036.	59980.
	Feeder	79389.	93888.
	Losses	35120.	134232.
	Total Costs	128545.	288099.

[THE TOTAL COST IS ABOUT THE SAME AS IN THE PREVIOUS RUN,]
[BUT THIS TIME WE HAVE UNSERVED LOAD TO TAKE CARE OF.]

Hit <RETURN> to CONTINUE, or "Q" to QUIT: <RETURN>

```
- - - - - - - - - - - - - - - - - - - - -

    SUBSITE Result Display Menu

    Select SUBSITE Result Display: <RETURN>
- - - - - - - - - - - - - - - - - - - - -

    SUBSITE Menu
    20 - Edit Substation Data (ES)

    Select SUBSITE Function: ES          [Modify substation capacity]
- - - - - - - - - - - - - - - - - - - - -

    Substation Data Edit Menu
    30 - Modify (MO)

    Select Substation Edit Function: MO
- - - - - - - - - - - - - - - - - - - - -
    Substation ID: 1000
- - - - - - - - - - - - - - - - - - - - -
    Old coordinates:  ( 62, 16)
    Enter new values: /

    Old substation name is:                NORTH
    Enter new name (10 characters max): NORTH

    Old voltage:  11.00-KV
    Enter new KV: /

    Old distance limit:  99 small areas
    Enter new limit: /
- - - - - - - - - - - - - - - - - - - - -
    Current capacity steps are:

          Year      MVA
          ----      ---
          2012       52

    Enter year to modify: 2012
    Enter year, Capacity: 2012,26

[ THIS DECREASES THE HORIZON YEAR CAPACITY OF NORTH TO 26 MVA. ]
- - - - - - - - - - - - - - - - - - - - -
    Current capacity steps are:

          Year      MVA
          ----      ---
          2012       26

    Enter year to modify: /

    Do you wish to modify Substation History (Y or N)? N
```

- -

Substation ID: /

- -

Substation Data Edit Menu

Select Substation Edit Function: <RETURN>

- -

[FROM THE GRAPHICAL DISPLAYS WE SEE THAT THE UNSERVED LOAD IS BETWEEN]
[K. R. KISHAN AND RAIWIND. SOMETIMES THE SUBSITE ALGORITHM HAS TROUBLE]
[IN THE CONSTRAINED MODE, EVEN THOUGH THE SUBSTATIONS HAVE ENOUGH]
[CAPACITY. IN THESE CASES THE USER MUST INSERT BARRIERS IN THE FEEDER]
[COST MAP TO FORCE THE PROGRAM TO SERVE THE LOADS IN THE PROBLEM AREA]
[FROM ONE SUBSTATION OR ANOTHER. THE USER DECIDES, BASED ON THE]
[GRAPHICAL DISPLAYS AND THE LOADINGS FROM THE TABULAR DISPLAYS, WHICH]
[SUBSTATIONS SHOULD SERVE WHAT PARTS OF THE AREA AND BUILD BARRIERS TO]
[FORCE THE SOLUTION TO THAT DECISION. GO TO MAP MATHEMATICS AND MAP]
[EDIT TO PUT THE BARRIERS IN THE FEEDER COST MAP. SEVERAL TRIES MAY BE]
[NEEDED TO GET THE BARRIERS RIGHT. ENTER THE BARRIERS, RUN SUBSITE,]
[REVIEW THE RESULTS, MODIFY THE BARRIERS, RUN SUBSITE, ETC.]

SUBSITE Menu
70 - Map Edit (ME)

Select SUBSITE Function: ME

- -

Map Edit Menu
10 - Card-Image Data (CI)
15 - COOKBOOK Format Input (CF)
20 - Change Name of a Map (CN)
30 - Initialize a Map (IM)
31 - Increase Number Of Maps (IN)
40 - Set Point To a Value (SP)
41 - Set Line To a Value (SL)
42 - Set Block To a Value (SB)
50 - Edit Row of 10 Small Areas (ER)
51 - Edit Column of 10 Small Areas (EC)
88 - Map Mathematics (MM)
89 - Spatial Data Display (SD)

Select Map Edit Operation: MM

- -

Map Mathematics Menu
10 - Copy a Map (CM)
11 - Move Window (MW)
20 - Add/Subtract (AS)
21 - Multiply (MU)
22 - Divide (DI)
30 - Exponential (EP)
43 - MAX (,) (MX)
44 - IF (<) (LT)
45 - IF (=) (EQ)
46 - Map Statistics (MS)
50 - "Bus" Assignment (BA)
60 - Convolution (CV)

31 - Natural LOG (NL)
32 - Power (PO)
40 - Scale (SC)
41 - Threshold (TH)
42 - MIN (,) (MN)
80 - Spatial Data Display (SD)
61 - Proximity (PR)
62 - Urban Poles (UR)
63 - FFT (FF)
64 - Inverse FFT (IF)
70 - Spatial Allocation (SA)

Select Map Mathematics Function: CM

To Map(I), From Map(J)

Enter I, J: 65,53

Enter I, J: /

- -

Map Mathematics Menu

Select Map Mathematics Function: <RETURN>

- -

Map Edit Menu
41 - Set Line To a Value (SL)

Select Map Edit Operation: SL

[THIS SETS A LINE OF SMALL AREAS TO A VALUE.]

Map Number: 65

Map number: 65 Name- BARRIER MAP
Set line from (X1,Y1) to (X2,Y2) to value A

Enter X1,Y1, X2,Y2, AND A: 1,82,14,82,999
Enter X1,Y1, X2,Y2, AND A: 17,82,40,82,999
Enter X1,Y1, X2,Y2, AND A: 14,83,17,83,999
Enter X1,Y1, X2,Y2, AND A: /

[THE VALUE 999 IS A LARGE ENOUGH COST TO KEEP THE]
[PROGRAM FROM BUILDING FEEDERS ACROSS THOSE SMALL AREAS.]

- -

Map Edit Menu
Select Map Edit Operation: <RETURN>

- -

SUBSITE Menu
40 - Solve Subsite (SS)

[SOLVE SUBSITE USING MAP 65 WITH BARRIERS ADDED.]

```
    Select SUBSITE Function: SS
- - - - - - - - - - - - - - - - - - - - -

    Base case or Study case? (Enter B or S): S

    Enter study year: 2012
- - - - - - - - - - - - - - - - - - - - -

    Feeder effort map, "/" if none: 65

    Substation site cost map, "/" if none: /

    Load map ("/" to return to SUBSITE menu): 6

    Feeder capacity map, "/" if none: /
- - - - - - - - - - - - - - - - - - - - -

    Solve with constraints or not? (Y or N): Y

[ RUN CONSTRAINED TO FORCE LOAD TRANSFERS FROM THE                    ]
[ SLIGHTLY OVERLOADED SUBSTATIONS OF K. R. KISHAN AND NORTH.          ]

    ... SUBSITE in progress ...
    ... SUBSITE in progress ...

    * SUBSITE completed.
[ RUN TRSR TO STORE RESULTS IN MAPS.  DISPLAY AND REVIEW MAPS GRAPHICS.   ]
[ REFER TO THE COMMENTS ON PAGE IX - 7 REGARDING USE OF THIS INFORMATION. ]
- - - - - - - - - - - - - - - - - - - - -

    SUBSITE Menu
    50 - Display Results (DR)

[ DISPLAY THE TABULAR RESULTS AND REVIEW THEM. ]

    Select SUBSITE Function: DR
- - - - - - - - - - - - - - - - - - - - -

    SUBSITE Result Display Menu
    20 - Study Case Substation Loading (SC)

    Select SUBSITE Result Display: SC
- - - - - - - - - - - - - - - - - - - - -

    Substation Data Selection Menu
    70 - All (AL)

    Select Substation Data For Review: AL
- - - - - - - - - - - - - - - - - - - - -

    CRT or PRINTER? <RETURN>
- - - - - - - - - - - - - - - - - - - - -
```

Page: 1 LOADSITE -- Release 8.92 -- OCT. 11, 1993 -- 14:40:58
****** WAPDA CADPAD OUTPUT **********

SUBSTATION LOADING -- CONSTRAINED SOLUTION
Study Case : STUDY CASE - KOT LAKHPAT - 2012 Study Year : 2012

<---------- INPUT ---------->						<-------- PERFORMANCE -------->						CAPITAL
ID	NAME	X	Y	KV	MVA D	LD-KVA	LCX	LCY	%VD	KVA@LV	LOSS	1000Rs
82	OLD K.L.P	61	14	11.00	16100	15482	62	13	7.5	0	597	4773
113	NEW K.L.P	63	20	11.00	30100	29238	63	21	12.1	579	1291	7706
353	RAIWIND	42	64	11.00	52100	38227	40	65	38.8	23319	4263	43169
800	K.R.KISHAN	24	88	11.00	13100	12850	24	91	14.6	1209	627	24838
900	KHANA	67	37	11.00	52100	49517	68	42	32.1	23807	4659	30474
1000	NORTH	62	16	11.00	26 99	25194	63	16	15.0	3825	1190	6271
1100	WEST	52	33	11.00	26 99	21360	55	34	12.6	3918	1104	12062
1200	EAST	68	25	11.00	52 99	43038	70	25	40.1	13040	3829	23524

[ALL LOADINGS ARE NOW BELOW THE CAPACITY LIMITS.]

Hit <RETURN> to CONTINUE, or "Q" to QUIT: <RETURN>
- -

Page: 2 LOADSITE -- Release 8.92 -- OCT. 11, 1993 -- 14:41:19
****** WAPDA CADPAD OUTPUT **********

SUBSTATION LOADING -- CONSTRAINED SOLUTION
Study Case : STUDY CASE - KOT LAKHPAT - 2012 Study Year : 2012

Total Unserved Loads : 0 KVA
Center of Unserved Loads : (0, 0)

[THERE IS NOW NO UNSERVED LOAD. THE BARRIERS HAVE TAKEN CARE OF THEM.]

Hit <RETURN> to CONTINUE, or "Q" to QUIT: <RETURN>
- -

Substation Data Selection Menu

Select Substation Data For Review: <RETURN>
- -

SUBSITE Result Display Menu
20 - Study Case Substation Loading (SC)

Select SUBSITE Result Display: CS

CRT or PRINTER? <RETURN>
- -

Page: 1 LOADSITE -- Release 8.92 -- OCT. 11, 1993 -- 14:41:25
****** WAPDA CADPAD OUTPUT **********

SUBSITE Summary

Base: BASE CASE - KOT LAKHPAT - 1992 - UNConstrained Year: 1992
Study: STUDY CASE - KOT LAKHPAT - 2012 - Constrained Year: 2012

		Base	Study
INPUT...	Number of subs	3	8
	KVA Capacity- 11.00KV	72000	267000
PERFORMANCE...	Load Served-KVA	58938	234906
	Load Unserved-KVA	0	0
	% Utilized- Min	73.66	73.51
	Avg	81.53	90.45
	Max	88.83	98.85
	MAX. % V.D.	44.9	40.1
	Load at Low V.-KVA	20544	69697
COSTS-1000Rs..	Substation	14036.	54471.
	Feeder	79389.	98349.
	Losses	35120.	140480.
	Total Costs	128545.	293301.

[THE TOTAL COST HAS INCREASED SOME FROM THE]
[PREVIOUS RUN, BUT NOW WE ARE SERVING ALL OF THE LOAD.]

Hit <RETURN> to CONTINUE, or "Q" to QUIT: <RETURN>

- -

SUBSITE Result Display Menu

Select SUBSITE Result Display: <RETURN>

- -

SUBSITE Menu
20 - Edit Substation Data (ES)

[REVIEW THE FINAL HORIZON YEAR SUBSTATION]
[DATA ONCE MORE TO MAKE SURE IT IS CORREC'.]

Select SUBSITE Function: ES

- -

Substation Data Edit Menu
40 - Review (RE)

Select Substation Edit Function: RE

- -

Base case or Study case? (Enter B or S): S

- -

Substation Data Selection Menu
70 - All (AL)

256

Select Substation Data For Review: AL

CRT or PRINTER? <RETURN>

Page: 1 LOADSITE -- Release 8.92 -- OCT. 11, 1993 -- 14:41:55
****** WAPDA CADPAD OUTPUT **********

SUBSITE Input Data ... Study Case-

ID	Name	IX	IY	KV	Dist	Year	MVA
82	OLD K.L.P	61	14	11.00	100	1990	13
						1992	16
113	NEW K.L.P	63	20	11.00	100	1990	26
						1992	30
353	RAIWIND	42	64	11.00	100	1990	20
						1992	26
						2012	52
800	K.R.KISHAN	24	88	11.00	100	1998	13
900	KHANA	67	37	11.00	100	1998	26
						2012	52
1000	NORTH	62	16	11.00	99	2012	26
1100	WEST	52	33	11.00	99	2012	26
1200	EAST	68	25	11.00	99	2012	52

Hit <RETURN> to CONTINUE, or "Q" to QUIT: <RETURN>

Substation Data Selection Menu

Select Substation Data For Review: <RETURN>

Substation Data Edit Menu

Select Substation Edit Function: <RETURN>

SUBSITE Menu
10 - File Manipulation (FM)

[THIS CONCLUDES THE HORIZON YEAR SUBSTATION PLAN. SAVE THE]
[HORIZON YEAR CASE TO A CARD IMAGE FILE FOR POSSIBLE FUTURE USE,]
[AND CHANGE THE CASE STUDY TITLE IN PREPARATION FOR THE 1994 CASE.]

Select SUBSITE Function: FM

SUBSITE File Manipulation Menu
20 - Write Data To File (WD)

```
    Select SUBSITE File Manipulation: WD
- - - - - - - - - - - - - - - - - - - - -

    Base case or Study case? (Enter B or S): S
- - - - - - - - - - - - - - - - - - - - -

    Please enter  punch filename: SC12

    *    1 SUBS CAPACITY COST CURVES WRITTEN TO FILE.
    *    1 LINE CAPACITY COST CURVES WRITTEN TO FILE.
    *    8 SUBSTATIONS WRITTEN TO FILE.
    *    8 SUBSTATION HISTORIES WRITTEN TO FILE.
- - - - - - - - - - - - - - - - - - - - -

    SUBSITE File Manipulation Menu
    60 - Change Case Title (CC)

    Select SUBSITE File Manipulation: CC
- - - - - - - - - - - - - - - - - - - - -

    Base case or Study case? (Enter B or S): S

    Enter title (40 characters max.): STUDY CASE - KOT LAKHPAT - 1994
- - - - - - - - - - - - - - - - - - - - -

    SUBSITE File Manipulation Menu

    Select SUBSITE File Manipulation: <RETURN>
- - - - - - - - - - - - - - - - - - - - -

    SUBSITE Menu
    40 - Solve Subsite (SS)

[ SOLVE SUBSITE FOR 1994, UNCONSTRAINED, USING THE BASE YEAR   ]
[ SUBSTATIONS, TO SEE WHERE MORE CAPACITY IS NEEDED FOR 1994.  ]

    Select SUBSITE Function: SS
- - - - - - - - - - - - - - - - - - - - -

    Base case or Study case? (Enter B or S): S

    Enter study year: 1994
- - - - - - - - - - - - - - - - - - - - -

    Feeder effort map, "/" if none: 53

    Substation site cost map, "/" if none: /

    Load map ("/" to return to SUBSITE menu): 2

    Feeder capacity map, "/" if none: /
- - - - - - - - - - - - - - - - - - - - -
```

Solve with constraints or not? (Y or N): N

[RUN UNCONSTRAINED TO ALLOW SUBSTATIONS TO OVERLOAD IF THEY WANT TO.]

... SUBSITE in progress ...
... SUBSITE in progress ...

* SUBSITE completed.

[RUN TRSR TO STORE RESULTS IN MAPS. DISPLAY AND REVIEW MAPS GRAPHICS.]
[REFER TO THE COMMENTS ON PAGE IX - 7 REGARDING USE OF THIS INFORMATION.]

- -

SUBSITE Menu
50 - Display Results (DR)

[DISPLAY THE TABULAR RESULTS AND REVIEW THEM.]

Select SUBSITE Function: DR

- -

SUBSITE Result Display Menu
20 - Study Case Substation Loading (SC)

Select SUBSITE Result Display: SC

- -

Substation Data Selection Menu
70 - All (AL)

Select Substation Data For Review: AL

- -

CRT or PRINTER? <RETURN>

- -

Page: 1 LOADSITE -- Release 8.92 -- OCT. 11, 1993 -- 14:56:25
****** WAPDA CADPAD OUTPUT **********

SUBSTATION LOADING -- UNCONSTRAINED SOLUTION
Study Case : STUDY CASE - KOT LAKHPAT - 1994 Study Year : 1994

<---------- INPUT ---------->						<-------- PERFORMANCE -------->						CAPITAL
ID	NAME	X	Y	KV	MVA	D	LD-KVA	LCX	LCY	%VD	KVA@LV	LOSS	1000Rs
82	OLD K.L.P	61	14	11.00	16100		14381	62	14	5.5	0	393	5337
113	NEW K.L.P	63	20	11.00	30100		36830	65	27	48.6	16827	4292	37477
353	PAIWIND	42	64	11.00	26100		22145	36	71	52.3	13215	2874	57386

[NOW NEW K.L.P. IS SIGNIFICANTLY OVERLOADED SO SOME NEW CAPACITY IS]
[NEEDED. NEW CAPACITIES SHOULD BE SELECTED FROM THE CAPACITIES ADDED]
[ABOVE FOR THE HORIZON YEAR. VOLTAGE DROPS AGAIN ARE EXCESSIVE.]

Hit <RETURN> to CONTINUE, or "Q" to QUIT: <RETURN>
- -

Page: 2 LOADSITE -- Release 8.92 -- OCT. 11, 1993 -- 14:56:36
****** WAPDA CADPAD OUTPUT **********

SUBSTATION LOADING -- UNCONSTRAINED SOLUTION
Study Case : STUDY CASE - KOT LAKHPAT - 1994 Study Year : 1994

Total Unserved Loads : 0 KVA
Center of Unserved Loads : (0, 0)

[THERE IS NO UNSERVED LOAD BECAUSE THIS IS AN UNCONSTRAINED SOLUTION.]

Hit <RETURN> to CONTINUE, or "Q" to QUIT: <RETURN>
- -

Substation Data Selection Menu

Select Substation Data For Review: <RETURN>
- -

SUBSITE Result Display Menu
20 - Study Case Substation Loading (SC)

Select SUBSITE Result Display: CS

CRT or PRINTER? <RETURN>
- -

Page: 1 LOADSITE -- Release 8.92 -- OCT. 11, 1993 -- 14:56:42
****** WAPDA CADPAD OUTPUT **********

SUBSITE Summary
Base: BASE CASE - KOT LAKHPAT - 1992 - UNConstrained Year: 1992
Study: STUDY CASE - KOT LAKHPAT - 1994 - UNConstrained Year: 1994

		Base	Study
INPUT...	Number of subs	3	3
	KVA Capacity- 11.00KV	72000	72000
PERFORMANCE...	Load Served-KVA	58938	73356
	Load Unserved-KVA	0	0
	% Utilized- Min	73.66	85.17
	Avg	81.53	99.27
	Max	88.83	122.77
	MAX. % V.D.	44.9	52.3
	Load at Low V.-KVA	20544	30042
COSTS-1000Rs..	Substation	14036.	14036.
	Feeder	79389.	86166.
	Losses	35120.	60472.
	Total Costs	128545.	160674.

Hit <RETURN> to CONTINUE, or "Q" to QUIT: <RETURN>
- -

SUBSITE Result Display Menu

Select SUBSITE Result Display: <RETURN>
- -

[FROM THE REVIEW OF THE GRAPHICAL AND TABULAR DISPLAYS, IT IS SEEN THAT]
[ADDING CAPACITY AT EITHER EAST OR WEST OR KHANA WOULD RELIEVE THE NEW]
[K.L.P. OVERLOAD. TRY ALL THREE, ONE AT A TIME, TO DECIDE WHICH IS BEST.]

SUBSITE Menu
20 - Edit Substation Data (ES)

[ADD THE FUTURE EAST SUBSTATION.]

Select SUBSITE Function: ES
- -

Substation Data Edit Menu
30 - Modify (MO)

Select Substation Edit Function: MO
- -

Substation ID: 1200
- -

Old coordinates: (68, 25)
Enter new values: /

Old substation name is: EAST
Enter new name (10 characters max): EAST

Old voltage: 11.00-KV
Enter new KV: /

Old distance limit: 99 small areas
Enter new limit: /
- -

Current capacity steps are:

Year	MVA
2012	52

Enter year to modify: 1994
Enter capacity: 26

[THIS ADDS A 26 MVA CAPACITY STEP TO EAST SUBSTATION IN 1994.]
- -

Current capacity steps are:

```
          Year      MVA
          ----      ---
          1994       26
          2012       52

    Enter year to modify: /

    Do you wish to modify Substation History (Y or N)? N
- - - - - - - - - - - - - - - - - - - - -
    Substation ID: /
- - - - - - - - - - - - - - - - - - - - -

    Substation Data Edit Menu

    Select Substation Edit Function: <RETURN>
- - - - - - - - - - - - - - - - - - - - -

    SUBSITE Menu
    40 - Solve Subsite (SS)

[ SOLVE SUBSITE WITH EAST SUBSTATION. ]

    Select SUBSITE Function: SS
- - - - - - - - - - - - - - - - - - - - -

    Base case or Study case? (Enter B or S): S

    Enter study year: 1994
- - - - - - - - - - - - - - - - - - - - -

    Feeder effort map, "/" if none: 53

    Substation site cost map, "/" if none: /

    Load map ("/" to return to SUBSITE menu): 2

    Feeder capacity map, "/" if none: /
- - - - - - - - - - - - - - - - - - - - -

    Solve with constraints or not? (Y or N): N

[ RUN UNCONSTRAINED TO ALLOW SUBSTATIONS TO OVERLOAD IF THEY WANT TO. ]

    ... SUBSITE in progress ...
    ... SUBSITE in progress ...

    * SUBSITE completed.

[ RUN TRSR TO STORE RESULTS IN MAPS.  DISPLAY AND REVIEW MAPS GRAPHICS.   ]
[ REFER TO THE COMMENTS ON PAGE IX - 7 REGARDING USE OF THIS INFORMATION. ]
- - - - - - - - - - - - - - - - - - - - -
```

SUBSITE Menu
50 - Display Results (DR)

[DISPLAY THE TABULAR RESULTS AND REVIEW THEM.]

Select SUBSITE Function: DR
- -

SUBSITE Result Display Menu
20 - Study Case Substation Loading (SC)

Select SUBSITE Result Display: SC
- -

Substation Data Selection Menu
70 - All (AL)

Select Substation Data For Review: AL
- -

CRT or PRINTER? <RETURN>
- -

Page: 1 LOADSITE -- Release 8.92 -- OCT. 11, 1993 -- 14:59:58
****** WAPDA CADPAD OUTPUT **********

SUBSTATION LOADING -- UNCONSTRAINED SOLUTION
Study Case : STUDY CASE - KOT LAKHPAT - 1994 Study Year : 1994

<---------- INPUT ---------->						<-------- PERFORMANCE -------->						CAPITAL
ID	NAME	X	Y	KV	MVA D	LD-KVA	LCX	LCY	%VD	KVA@LV	LOSS	1000Rs
82	OLD K.L.P	61	14	11.00	16100	14381	62	14	5.5	0	393	5337
113	NEW K.L.P	63	20	11.00	30100	15442	62	20	10.0	0	570	10592
353	RAIWIND	42	64	11.00	26100	21850	36	71	52.3	12718	2844	55332
1200	EAST	68	25	11.00	26 99	21683	68	33	39.0	7387	2364	29995

[THIS HANDLES THE LOADS NICELY AND LEAVES NEW K.L.P. WITH EXTRA CAPACITY.]

Hit <RETURN> to CONTINUE, or "Q" to QUIT: <RETURN>
- -

Page: 2 LOADSITE -- Release 8.92 -- OCT. 11, 1993 -- 15:00:08
****** WAPDA CADPAD OUTPUT **********

SUBSTATION LOADING -- UNCONSTRAINED SOLUTION
Study Case : STUDY CASE - KOT LAKHPAT - 1994 Study Year : 1994

Total Unserved Loads : 0 KVA
Center of Unserved Loads : (0, 0)

[THERE IS NO UNSERVED LOAD BECAUSE THIS IS AN UNCONSTRAINED SOLUTION.]

Hit <RETURN> to CONTINUE, or "Q" to QUIT: <RETURN>
- -

Substation Data Selection Menu

Select Substation Data For Review: <RETURN>
- -

SUBSITE Result Display Menu
40 - Case Summary (CS)

Select SUBSITE Result Display: CS

CRT or PRINTER? <RETURN>
- -

Page: 1 LOADSITE -- Release 8.92 -- OCT. 11, 1993 -- 15:00:16
****** WAPDA CADPAD OUTPUT **********

SUBSITE Summary

Base: BASE CASE - KOT LAKHPAT - 1992 - UNConstrained Year: 1992
Study: STUDY CASE - KOT LAKHPAT - 1994 - UNConstrained Year: 1994

		Base	Study
INPUT...	Number of subs	3	4
	KVA Capacity- 11.00KV	72000	98000
PERFORMANCE...	Load Served-KVA	58938	73356
	Load Unserved-KVA	0	0
	% Utilized- Min	73.66	51.47
	Avg	81.53	77.20
	Max	88.83	89.88
	MAX. % V.D.	44.9	52.3
	Load at Low V.-KVA	20544	20105
COSTS-1000Rs..	Substation	14036.	18973.
	Feeder	79389.	82284.
	Losses	35120.	49368.
	Total Costs	128545.	150625.

[COMPARE THIS TOTAL COST WITH THE NEXT TWO CASES.]

Hit <RETURN> to CONTINUE, or "Q" to QUIT: <RETURN>
- -

SUBSITE Result Display Menu
Select SUBSITE Result Display: <RETURN>
- -

SUBSITE Menu
20 - Edit Substation Data (ES)

[REMOVE EAST AND ADD WEST SUBSTATION.]

Select SUBSITE Function: ES- -

Substation Data Edit Menu
30 - Modify (MO)

Select Substation Edit Function: MO
- -

Substation ID: 1200
- -

Old coordinates: (68, 25)
Enter new values: /

Old substation name is: EAST
Enter new name (10 characters max): EAST

Old voltage: 11.00-KV
Enter new KV: /

Old distance limit: 99 small areas
Enter new limit: /
- -

Current capacity steps are:

Year	MVA
1994	26
2012	52

Enter year to modify: 1994
Enter year, Capacity (0,0 to delete): 0,0

[THIS REMOVES THE 1994 CAPACITY STEP FROM EAST.]
- -

Current capacity steps are:

Year	MVA
2012	52

Enter year to modify: /

Do you wish to modify Substation History (Y or N)? N
- -

Substation ID: 1100
- -

Old coordinates: (52, 33)
Enter new values: /

Old substation name is: WEST
Enter new name (10 characters max): WEST

Old voltage: 11.00-KV
Enter new KV: /

Old distance limit: 99 small areas
Enter new limit: /

- -

Current capacity steps are:

Year	MVA
2012	26

Enter year to modify: 1994
Enter capacity: 26

[THIS ADDS A 26 MVA CAPACITY STEP TO WEST IN 1994.]

- -

Current capacity steps are:

Year	MVA
1994	26
2012	26

Enter year to modify: /

Do you wish to modify Substation History (Y or N)? N

- -

Substation ID: /

- -

Substation Data Edit Menu

Select Substation Edit Function: <RETURN>

- -

SUBSITE Menu
40 - Solve Subsite (SS)

[SOLVE SUBSITE WITH WEST SUBSTATION.]

Select SUBSITE Function: SS

- -

Base case or Study case? (Enter B or S): S

Enter study year: 1994

- -

Feeder effort map, "/" if none: 53

Substation site cost map, "/" if none: /

Load map ("/" to return to SUBSITE menu): 2

Feeder capacity map, "/" if none: /

- -

Solve with constraints or not? (Y or N): N

[RUN UNCONSTRAINED TO ALLOW SUBSTATIONS TO OVERLOAD IF THEY WANT TO.]

... SUBSITE in progress ...
... SUBSITE in progress ...

* SUBSITE completed.

[RUN TRSR TO STORE RESULTS IN MAPS. DISPLAY AND REVIEW MAPS GRAPHICS.]
[REFER TO THE COMMENTS ON PAGE IX - 7 REGARDING USE OF THIS INFORMATION.]

- -

SUBSITE Menu
50 - Display Results (DR)

[DISPLAY THE TABULAR RESULTS AND REVIEW THEM.]

Select SUBSITE Function: DR

- -

SUBSITE Result Display Menu
20 - Study Case Substation Loading (SC)

Select SUBSITE Result Display: SC

- -

Substation Data Selection Menu
70 - All (AL)

Select Substation Data For Review: AL

- -

CRT or PRINTER? <RETURN>

- -

Page: 1 LOADSITE -- Release 8.92 -- OCT. 11, 1993 -- 15:03:20
****** WAPDA CADPAD OUTPUT **********

SUBSTATION LOADING -- UNCONSTRAINED SOLUTION
Study Case : STUDY CASE - KOT LAKHPAT - 1994 Study Year : 1994

<---------- INPUT ---------->						<-------- PERFORMANCE -------->						CAPITAL
ID	NAME	X	Y	KV	MVA	D	LD-KVA	LCX	LCY	%VD	KVA@LV	LOSS	1000Rs
82	OLD K.L.P	61	14	11.00	16100		14381	62	14	5.5	0	393	5337
113	NEW K.L.P	63	20	11.00	30100		25972	66	23	21.0	7338	1543	25816
353	RAIWIND	42	64	11.00	26100		21141	35	72	52.2	12697	2787	53224

```
1100 WEST        52  33 11.00  26 99   11862  64  39 24.6   8010 1191  23052
```

[THIS ALSO HANDLES THE LOADS NICELY, WITH EXTRA CAPACITY AT WEST.]

```
    Hit <RETURN> to CONTINUE, or "Q" to QUIT: <RETURN>
- - - - - - - - - - - - - - - - - - - - -

 Page:  2    LOADSITE --  Release 8.92      -- OCT. 11, 1993 --  15:03:32
****** WAPDA CADPAD OUTPUT ************************************************

                 SUBSTATION LOADING -- UNCONSTRAINED SOLUTION
  Study Case : STUDY CASE - KOT LAKHPAT - 1994            Study Year : 1994

    Total Unserved Loads       :      0 KVA
    Center of Unserved Loads   : (   0,   0)
```

[THERE IS NO UNSERVED LOAD BECAUSE THIS IS AN UNCONSTRAINED SOLUTION.]

```
    Hit <RETURN> to CONTINUE, or "Q" to QUIT: <RETURN>
- - - - - - - - - - - - - - - - - - - - -

    Substation Data Selection Menu

    Select Substation Data For Review: <RETURN>
- - - - - - - - - - - - - - - - - - - - -

    SUBSITE Result Display Menu
    40 - Case Summary (CS)

    Select SUBSITE Result Display: CS

    CRT or PRINTER? <RETURN>
- - - - - - - - - - - - - - - - - - - - -

 Page:  1    LOADSITE --  Release 8.92      -- OCT. 11, 1993 --  15:03:38
****** WAPDA CADPAD OUTPUT ************************************************

                              SUBSITE Summary
 Base: BASE CASE - KOT LAKHPAT - 1992            - UNConstrained  Year: 1992
Study: STUDY CASE - KOT LAKHPAT - 1994           - UNConstrained  Year: 1994
                                          Base        Study
  INPUT...        Number of subs             3            4
                  KVA Capacity- 11.00KV  72000        98000

  PERFORMANCE...  Load Served-KVA        58938        73356
                  Load Unserved-KVA          0            0
                  % Utilized- Min        73.66        45.62
                              Avg        81.53        75.85
                              Max        88.83        89.88
                  MAX. % V.D.             44.9         52.2
                  Load at Low V.-KVA     20544        28045
```

```
COSTS-1000Rs.. Substation          14036.      18973.
               Feeder              79389.      88458.
               Losses              35120.      47312.
               Total Costs        128545.     154743.

[ THE TOTAL COST OF THIS CASE IS HIGHER THAN THE PREVIOUS CASE     ]
[ SO, COST-WISE, EAST IS A BETTER CHOICE THAN WEST FOR THIS YEAR.  ]

    Hit <RETURN> to CONTINUE, or "Q" to QUIT: <RETURN>
- - - - - - - - - - - - - - - - - - - - -


    SUBSITE Result Display Menu

    Select SUBSITE Result Display: <RETURN>
- - - - - - - - - - - - - - - - - - - - -

    SUBSITE Menu
    20 - Edit Substation Data (ES)

[ REMOVE WEST AND ADD KHANA SUBSTATION. ]

    Select SUBSITE Function: ES
- - - - - - - - - - - - - - - - - - - - -

    Substation Data Edit Menu
    30 - Modify (MO)

    Select Substation Edit Function: MO
- - - - - - - - - - - - - - - - - - - - -
    Substation ID: 1100
- - - - - - - - - - - - - - - - - - - - -
    Old coordinates:  ( 52, 33)
    Enter new values: /

    Old substation name is:                WEST
    Enter new name (10 characters max): WEST

    Old voltage:  11.00-kV
    Enter new KV: /

    Old distance limit:  99 small areas
    Enter new limit: /
- - - - - - - - - - - - - - - - - - - - -
    Current capacity steps are:

          Year      MVA
          ----      ---
          1994       26
          2012       26
```

```
Enter year to modify: 1994
Enter year, Capacity (0,0 to delete): 0,0
- - - - - - - - - - - - - - - - - - - - -
Current capacity steps are:

        Year      MVA
        ----      ---
        2012       26

Enter year to modify: /

Do you wish to modify Substation History (Y or N)? N
- - - - - - - - - - - - - - - - - - - - -
Substation ID: 900
- - - - - - - - - - - - - - - - - - - - -
Old coordinates:  ( 67, 37)
Enter new values: /

Old substation name is:                KHANA
Enter new name (10 characters max): KHANA

Old voltage:  11.00-KV
Enter new KV: /

Old distance limit: 100 small areas
Enter new limit: /
- - - - - - - - - - - - - - - - - - - - -
Current capacity steps are:

        Year      MVA
        ----      ---
        1998       26
        2012       52

Enter year to modify: 1994
Enter capacity: 26
- - - - - - - - - - - - - - - - - - - - -
Current capacity steps are:

        Year      MVA
        ----      ---
        1994       26
        1998       26
        2012       52

Enter year to modify: /

Do you wish to modify Substation History (Y or N)? N
- - - - - - - - - - - - - - - - - - - - -
Substation ID: /
- - - - - - - - - - - - - - - - - - - - -
```

Substation Data Edit Menu

Select Substation Edit Function: <RETURN>

- -

SUBSITE Menu
40 - Solve Subsite (SS)

[SOLVE SUBSITE WITH KHANA SUBSTATION.]

Select SUBSITE Function: SS

- -

Base case or Study case? (Enter B or S): S

Enter study year: 1994

- -

Feeder effort map, "/" if none: 53

Substation site cost map, "/" if none: /

Load map ("/" to return to SUBSITE menu): 2

Feeder capacity map, "/" if none: /

- -

Solve with constraints or not? (Y or N): N

[RUN UNCONSTRAINED TO ALLOW SUBSTATIONS TO OVERLOAD IF THEY WANT TO.]

... SUBSITE in progress ...
... SUBSITE in progress ...

* SUBSITE completed.

[RUN TRSR TO STORE RESULTS IN MAPS. DISPLAY AND REVIEW MAPS GRAPHICS.]
[REFER TO THE COMMENTS ON PAGE IX - 7 REGARDING USE OF THIS INFORMATION.]

- -

SUBSITE Menu
50 - Display Results (DR)

[DISPLAY THE TABULAR RESULTS AND REVIEW THEM.]

Select SUBSITE Function: DR

- -

SUBSITE Result Display Menu

20 - Study Case Substation Loading (SC)
Select SUBSITE Result Display: SC

- -

Substation Data Selection Menu
70 - All (AL)

Select Substation Data For Review: AL
- -

CRT or PRINTER? <RETURN>
- -

Page: 1 LOADSITE -- Release 8.92 -- OCT. 11, 1993 -- 15:06:12
****** WAPDA CADPAD OUTPUT **********

SUBSTATION LOADING -- UNCONSTRAINED SOLUTION
Study Case : STUDY CASE - KOT LAKHPAT - 1994 Study Year : 1994

<---------- INPUT ---------->						<-------- PERFORMANCE -------->						CAPITAL
ID	NAME	X	Y	KV	MVA	D	LD-KVA	LCX	LCY	%VD	KVA@LV	LOSS	1000Rs
82	OLD K.L.P	61	14	11.00	16100		14381	62	14	5.5	0	393	5337
113	NEW K.L.P	63	20	11.00	30100		21938	64	21	10.6	0	886	16117
353	RAIWIND	42	64	11.00	26100		20988	35	72	52.1	12697	2764	52467
900	KHANA	67	37	11.00	26100		16049	67	37	11.3	0	696	26866

[THIS SERVES THE LOADS NICELY AND IN A BALANCED LOADING PATTERN. THIS]
[ALSO GIVES THE BEST VOLTAGES, EXCEPT FOR RAIWIND WHICH IS THE SAME.]

Hit <RETURN> to CONTINUE, or "Q" to QUIT: <RETURN>
- -

Page: 2 LOADSITE -- Release 8.92 -- OCT. 11, 1993 -- 15:06:53
****** WAPDA CADPAD OUTPUT **********

SUBSTATION LOADING -- UNCONSTRAINED SOLUTION
Study Case : STUDY CASE - KOT LAKHPAT - 1994 Study Year : 1994

Total Unserved Loads : 0 KVA
Center of Unserved Loads : (0, 0)

[THERE IS NO UNSERVED LOAD BECAUSE THIS IS AN UNCONSTRAINED SOLUTION.]

Hit <RETURN> to CONTINUE, or "Q" to QUIT: <RETURN>
- -

Substation Data Selection Menu

Select Substation Data For Review: <RETURN>
- -

SUBSITE Result Display Menu
40 - Case Summary (CS)

Select SUBSITE Result Display: CS

CRT or PRINTER? <RETURN>

- - - - - - - - - - - - - - - - - - - -

Page: 1 LOADSITE -- Release 8.92 -- OCT. 11, 1993 -- 15:06:58
****** WAPDA CADPAD OUTPUT **********

SUBSITE Summary

Base: BASE CASE - KOT LAKHPAT - 1992 - UNConstrained Year: 1992
Study: STUDY CASE - KOT LAKHPAT - 1994 - UNConstrained Year: 1994

		Base	Study
INPUT...	Number of subs	3	4
	KVA Capacity- 11.00KV	72000	98000
PERFORMANCE...	Load Served-KVA	58938	73356
	Load Unserved-KVA	0	0
	% Utilized- Min	73.66	61.73
	Avg	81.53	76.36
	Max	88.83	89.88
	MAX. % V.D.	44.9	52.1
	Load at Low V.-KVA	20544	12697
COSTS-1000Rs..	Substation	14036.	18973.
	Feeder	79389.	81815.
	Losses	35120.	37912.
	Total Costs	128545.	138700.

[THIS TOTAL COST IS MUCH LESS THAN FOR THE OTHER TWO CASES, SO KHANA IS]
[THE ECONOMIC CHOICE TO BUILD FOR 1994. NONE OF THE SOLUTIONS HELPED THE]
[VOLTAGE AT RAIWIND. THAT SHOULD IMPROVE WHEN K. R. KISHAN IS BUILT.]

Hit <RETURN> to CONTINUE, or "Q" to QUIT: <RETURN>

- - - - - - - - - - - - - - - - - - - -

SUBSITE Result Display Menu

Select SUBSITE Result Display: <RETURN>

- - - - - - - - - - - - - - - - - - - -

SUBSITE Menu
10 - File Manipulation (FM)

[SAVE THE 1994 STUDY CASE TO A CARD IMAGE FILE FOR POSSIBLE FUTURE USE,]
[AND CHANGE THE CASE STUDY TITLE IN PREPARATION FOR THE 1997 CASE.]

Select SUBSITE Function: FM

- - - - - - - - - - - - - - - - - - - -

SUBSITE File Manipulation Menu
20 - Write Data To File (WD)

```
    Select SUBSITE File Manipulation: WD
- - - - - - - - - - - - - - - - - - - - -

    Base case or Study case? (Enter B or S): S
- - - - - - - - - - - - - - - - - - - - -

    Please enter  punch filename: CS94

    *   1 SUBS CAPACITY COST CURVES WRITTEN TO FILE.
    *   1 LINE CAPACITY COST CURVES WRITTEN TO FILE.
    *   8 SUBSTATIONS WRITTEN TO FILE.
    *   8 SUBSTATION HISTORIES WRITTEN TO FILE.
- - - - - - - - - - - - - - - - - - - - -

    SUBSITE File Manipulation Menu
    60 - Change Case Title (CC)

    Select SUBSITE File Manipulation: CC
- - - - - - - - - - - - - - - - - - - - -

    Base case or Study case? (Enter B or S): S

    Enter title (40 characters max.): CASE STUDY - KOT LAKHPAT - 1997
- - - - - - - - - - - - - - - - - - - - -

    SUBSITE File Manipulation Menu

    Select SUBSITE File Manipulation: <RETURN>
- - - - - - - - - - - - - - - - - - - - -

    SUBSITE Menu
    40 - Solve Subsite (SS)

[ SOLVE 1997 SUBSITE, UNCONSTRAINED, USING THE 1994                 ]
[ SUBSTATIONS TO SEE WHERE MORE CAPACITY IS NEEDED FOR 1997.        ]

    Select SUBSITE Function: SS
- - - - - - - - - - - - - - - - - - - - -

    Base case or Study case? (Enter B or S): S

    Enter study year: 1997
- - - - - - - - - - - - - - - - - - - - -

    Feeder effort map, "/" if none: 53

    Substation site cost map, "/" if none: /

    Load map ("/" to return to SUBSITE menu): 3

    Feeder capacity map, "/" if none: /
- - - - - - - - - - - - - - - - - - - - -
```

Solve with constraints or not? (Y or N): N

[RUN UNCONSTRAINED TO ALLOW SUBSTATIONS TO OVERLOAD IF THEY WANT TO.]

... SUBSITE in progress ...
... SUBSITE in progress ...

* SUBSITE completed.

[RUN TRSR TO STORE RESULTS IN MAPS. DISPLAY AND REVIEW MAPS GRAPHICS.]
[REFER TO THE COMMENTS ON PAGE IX - 7 REGARDING USE OF THIS INFORMATION.]

- -

SUBSITE Menu
50 - Display Results (DR)

[DISPLAY THE TABULAR RESULTS AND REVIEW THEM.]

Select SUBSITE Function: DR

- -

SUBSITE Result Display Menu
20 - Study Case Substation Loading (SC)

Select SUBSITE Result Display: SC

- -

Substation Data Selection Menu
70 - All (AL)

Select Substation Data For Review: AL

- -

CRT or PRINTER? <RETURN>

- -

Page: 1 LOADSITE -- Release 8.92 -- OCT. 11, 1993 -- 15:09:57
****** WAPDA CADPAD OUTPUT **********

SUBSTATION LOADING -- UNCONSTRAINED SOLUTION
Study Case : CASE STUDY - KOT LAKHPAT - 1997 Study Year : 1997

<---------- INPUT ---------->						<-------- PERFORMANCE -------->						CAPITAL
ID	NAME	X	Y	KV	MVA D	LD-KVA	LCX	LCY	%VD	KVA@LV	LOSS	1000Rs
82	OLD K.L.P	61	14	11.00	16100	16422	62	14	6.5	0	527	5386
113	NEW K.L.P	63	20	11.00	30100	30841	64	22	13.3	1985	1544	17019
353	RAIWIND	42	64	11.00	26100	27845	36	70	66.6	19034	4585	56047
900	KHANA	67	37	11.00	26100	26642	68	39	15.3	7255	1653	29540

[ALL SUBSTATIONS ARE SLIGHTLY OVERLOADED SO MORE CAPACITY IS NEEDED.]

Hit <RETURN> to CONTINUE, or "Q" to QUIT: <RETURN>
- - - - - - - - - - - - - - - - - - - -

Page: 2 LOADSITE -- Release 8.92 -- OCT. 11, 1993 -- 15:10:05
****** WAPDA CADPAD OUTPUT **********

SUBSTATION LOADING -- UNCONSTRAINED SOLUTION
Study Case : CASE STUDY - KOT LAKHPAT - 1997 Study Year : 1997

Total Unserved Loads : 0 KVA
Center of Unserved Loads : (0, 0)

[THERE IS NO UNSERVED LOAD BECAUSE THIS IS AN UNCONSTRAINED SOLUTION.]

Hit <RETURN> to CONTINUE, or "Q" to QUIT: <RETURN>
- - - - - - - - - - - - - - - - - - - -

Substation Data Selection Menu

Select Substation Data For Review: <RETURN>
- - - - - - - - - - - - - - - - - - - -

SUBSITE Result Display Menu
40 - Case Summary (CS)

Select SUBSITE Result Display: CS

CRT or PRINTER? <RETURN>
- - - - - - - - - - - - - - - - - - - -

Page: 1 LOADSITE -- Release 8.92 -- OCT. 11, 1993 -- 15:12:32
****** WAPDA CADPAD OUTPUT **********

SUBSITE Summary
Base: BASE CASE - KOT LAKHPAT - 1992 - UNConstrained Year: 1992
Study: CASE STUDY - KOT LAKHPAT - 1997 - UNConstrained Year: 1997

		Base	Study
INPUT...	Number of subs	3	4
	KVA Capacity- 11.00KV	72000	98000
PERFORMANCE...	Load Served-KVA	58938	101750
	Load Unserved-KVA	0	0
	% Utilized- Min	73.66	102.47
	Avg	81.53	103.75
	Max	88.83	107.10
	MAX. % V.D.	44.9	66.6
	Load at Low V.-KVA	20544	28274
COSTS-1000Rs..	Substation	14036.	18973.
	Feeder	79389.	89021.
	Losses	35120.	66472.
	Total Costs	128545.	174467.

```
    Hit <RETURN> to CONTINUE, or "Q" to QUIT: <RETURN>
- - - - - - - - - - - - - - - - - - - - -

    SUBSITE Result Display Menu

    Select SUBSITE Result Display: <RETURN>
- - - - - - - - - - - - - - - - - - - - -
```

[FROM A REVIEW OF THE GRAPHICAL AND TABULAR RESULTS,]
[IT WAS DECIDED TO INCREASE THE CAPACITY AT KHANA.]

```
    SUBSITE Menu
    20 - Edit Substation Data (ES)

    Select SUBSITE Function: ES
- - - - - - - - - - - - - - - - - - - - -

    Substation Data Edit Menu
    30 - Modify (MO)

    Select Substation Edit Function: MO
- - - - - - - - - - - - - - - - - - - - -
    Substation ID: 900
- - - - - - - - - - - - - - - - - - - - -
    Old coordinates:  ( 67, 37)
    Enter new values: /

    Old substation name is:                KHANA
    Enter new name (10 characters max): KHANA

    Old voltage:  11.00-KV
    Enter new KV: /

    Old distance limit: 100 small areas
    Enter new limit: /
- - - - - - - - - - - - - - - - - - - - -
    Current capacity steps are:

            Year      MVA
            ----      ---
            1994       26
            1998       26
            2012       52

    Enter year to modify: 1998
    Enter year, Capacity (0,0 to delete): 1997,52
```

[THIS CHANGES THE THE 1998 CAPACITY STEP TO 1997 AND INCREASES THE CAPACITY]
[TO 52 MVA FOR 1997. THIS STILL LEAVES TWO STEPS WITH THE SAME CAPACITY,]
[WHICH DOES NOT MATTER TO THE PROGRAM BUT WHICH WILL BE CLEANED UP LATER.]

```
- - - - - - - - - - - - - - - - - - - - -
    Current capacity steps are:
```

```
          Year      MVA
          ----      ---
          1994       26
          1997       52
          2012       52

    Enter year to modify: /

    Do you wish to modify Substation History (Y or N)?  N
- - - - - - - - - - - - - - - - - - - - -
    Substation ID: /
- - - - - - - - - - - - - - - - - - - - -

    Substation Data Edit Menu

    Select Substation Edit Function: <RETURN>
- - - - - - - - - - - - - - - - - - - - -

    SUBSITE Menu
    40 - Solve Subsite (SS)

[ SOLVE SUBSITE WITH KHANA EXPANDED. ]

    Select SUBSITE Function: SS
- - - - - - - - - - - - - - - - - - - - -

    Base case or Study case? (Enter B or S): S

    Enter study year: 1997
- - - - - - - - - - - - - - - - - - - - -

    Feeder effort map, "/" if none: 53

    Substation site cost map, "/" if none: /

    Load map ("/" to return to SUBSITE menu): 3

    Feeder capacity map, "/" if none: /
- - - - - - - - - - - - - - - - - - - - -

    Solve with constraints or not? (Y or N): Y

[ WE WILL RUN A CONSTRAINED SOLUTION, KNOWING FROM THE PREVIOUS RUN ]
[ THAT NO SUBSTATION WILL BE OVERLOADED BY VERY MUCH AND THAT SOME  ]
[ LOAD NEEDS TO BE FORCED TO TRANSFER TO ADJACENT SUBSTATIONS.      ]

    ... SUBSITE in progress ...
    ... SUBSITE in progress ...

    * SUBSITE completed.
```

[RUN TRSR TO STORE RESULTS IN MAPS. DISPLAY AND REVIEW MAPS GRAPHICS.]
[REFER TO THE COMMENTS ON PAGE IX - 7 REGARDING USE OF THIS INFORMATION.]
- -

SUBSITE Menu
50 - Display Results (DR)

[DISPLAY THE TABULAR RESULTS AND REVIEW THEM.]

Select SUBSITE Function: DR
- -

SUBSITE Result Display Menu
20 - Study Case Substation Loading (SC)

Select SUBSITE Result Display: SC
- -

Substation Data Selection Menu
70 - All (AL)

Select Substation Data For Review: AL
- -

CRT or PRINTER? <RETURN>
- -

Page: 1 LOADSITE -- Release 8.92 -- OCT. 11, 1993 -- 15:15:22
****** WAPDA CADPAD OUTPUT **********

SUBSTATION LOADING -- CONSTRAINED SOLUTION
Study Case : CASE STUDY - KOT LAKHPAT - 1997 Study Year : 1997

<---------- INPUT ---------->						<-------- PERFORMANCE -------->						CAPITAL
ID	NAME	X	Y	KV	MVA	D	LD-KVA	LCX	LCY	%VD	KVA@LV	LOSS	1000Rs
82	OLD K.L.P	61	14	11.00	16100		15524	62	15	7.1	0	490	5406
113	NEW K.L.P	63	20	11.00	30100		29993	64	22	13.2	1782	1482	16941
353	RAIWIND	42	64	11.00	26100		25744	35	72	66.3	16231	4239	55561
900	KHANA	67	37	11.00	52100		26642	68	39	15.3	7255	1653	35048

[NO SUBSTATIONS ARE OVERLOADED BUT THREE ARE NEAR THEIR LIMIT.]

Hit <RETURN> to CONTINUE, or "Q" to QUIT: <RETURN>
- -

Page: 2 LOADSITE -- Release 8.92 -- OCT. 11, 1993 -- 15:17:43
****** WAPDA CADPAD OUTPUT **********

SUBSTATION LOADING -- CONSTRAINED SOLUTION
Study Case : CASE STUDY - KOT LAKHPAT - 1997 Study Year : 1997

279

```
    Total Unserved Loads        :  3847 KVA
    Center of Unserved Loads    : ( 54, 32)

[ THERE IS UNSERVED LOAD WHICH WILL HAVE TO BE TAKEN CARE OF BY     ]
[ ADDING BARRIERS TO THE FEEDER COST MAP FOR THIS YEAR, IN MAP 65.  ]

    Hit <RETURN> to CONTINUE, or "Q" to QUIT: <RETURN>
- - - - - - - - - - - - - - - - - - - - -

    Substation Data Selection Menu

    Select Substation Data For Review: <RETURN>
- - - - - - - - - - - - - - - - - - - - -

    SUBSITE Result Display Menu
    40 - Case Summary (CS)

    Select SUBSITE Result Display: CS

    CRT or PRINTER? <RETURN>
- - - - - - - - - - - - - - - - - - - - -

 Page:  1    LOADSITE --  Release 8.92      -- OCT. 11, 1993 --  15:18:18
 ****** WAPDA CADPAD OUTPUT ***********************************************

                                SUBSITE Summary
 Base: BASE CASE - KOT LAKHPAT - 1992            - UNConstrained  Year: 1992
Study: CASE STUDY - KOT LAKHPAT - 1997           -  Constrained   Year: 1997
                                              Base        Study
   INPUT...        Number of subs               3            4
                   KVA Capacity- 11.00KV    72000       124000

   PERFORMANCE...  Load Served-KVA          58938        97903
                   Load Unserved-KVA            0         3847
                   % Utilized- Min          73.66        51.23
                               Avg          81.53        86.81
                               Max          88.83        99.98
                   MAX. % V.D.               44.9         66.3
                   Load at Low V.-KVA       20544        25268

   COSTS-1000Rs..  Substation               14036.       24482.
                   Feeder                   79389.       88476.
                   Losses                   35120.       62912.
                   Total Costs             128545.      175870.

    Hit <RETURN> to CONTINUE, or "Q" to QUIT: <RETURN>
- - - - - - - - - - - - - - - - - - - - -

    SUBSITE Result Display Menu

    Select SUBSITE Result Display: <RETURN>
- - - - - - - - - - - - - - - - - - - - -
```

[GO TO MAP MATHEMATICS AND MAP EDIT TO ADD BARRIERS TO THE FEEDER COST MAP]
[TO HELP SUBSITE WITH UNSERVED LOAD. SEE PAGE IX - 36 FOR MORE EXPLANATION.]

SUBSITE Menu
70 - Map Edit (ME)

Select SUBSITE Function: ME -

Map Edit Menu

88 - Map Mathematics (MM)

Select Map Edit Operation: MM
- -

Map Mathematics Menu
10 - Copy a Map (CM)

Select Map Mathematics Function: CM

To Map(I), From Map(J)

Enter I, J: 65,53

Enter I, J: /
- - - - - - - - - - - - - - - - - - - -

Map Mathematics Menu

Select Map Mathematics Function: <RETURN>
- - - - - - - - - - - - - - - - - - - -

Map Edit Menu
41 - Set Line To a Value (SL)

Select Map Edit Operation: SL

Map Number: 65

Map number: 65 Name- BARRIER MAP
Set line from (X1,Y1) to (X2,Y2) to value A

Enter X1,Y1, X2,Y2, AND A: 1,80,42,80,999
Enter X1,Y1, X2,Y2, AND A: 1,50,53,50,999
Enter X1,Y1, X2,Y2, AND A: 52,27,74,27,999
Enter X1,Y1, X2,Y2, AND A: 62,16,62,1,999
Enter X1,Y1, X2,Y2, AND A: /
- - - - - - - - - - - - - - - - - - - -

Map Edit Menu

Select Map Edit Operation: <RETURN>

- -

SUBSITE Menu
40 - Solve Subsite (SS)

[SOLVE SUBSITE WITH BARRIERS ADDED TO THE FEEDER COST MAP.]

Select SUBSITE Function: SS

- -

Base case or Study case? (Enter B or S): S

Enter study year: 1997

- -

Feeder effort map, "/" if none: 65

Substation site cost map, "/" if none: /

Load map ("/" to return to SUBSITE menu): 3

Feeder capacity map, "/" if none: /

- -

Solve with constraints or not? (Y or N): Y

[RUN CONSTRAINED TO FORCE NEEDED LOAD TRANSFERS.]

... SUBSITE in progress ...
... SUBSITE in progress ...

* SUBSITE completed.

[RUN TRSR TO STORE RESULTS IN MAPS. DISPLAY AND REVIEW MAPS GRAPHICS.]
[REFER TO THE COMMENTS ON PAGE IX - 7 REGARDING USE OF THIS INFORMATION.]

- -

SUBSITE Menu
50 - Display Results (DR)

[DISPLAY THE TABULAR RESULTS AND REVIEW THEM.]

Select SUBSITE Function: DR

- -

SUBSITE Result Display Menu
20 - Study Case Substation Loading (SC)

Select SUBSITE Result Display: SC

- -

Substation Data Selection Menu
70 - All (AL)

Select Substation Data For Review: AL

- -

CRT or PRINTER? <RETURN>

- -

Page: 1 LOADSITE -- Release 8.92 -- OCT. 11, 1993 -- 15:21:02
****** WAPDA CADPAD OUTPUT **********

SUBSTATION LOADING -- CONSTRAINED SOLUTION
Study Case : CASE STUDY - KOT LAKHPAT - 1997 Study Year : 1997

<---------- INPUT ---------->						<-------- PERFORMANCE -------->						CAPITAL
ID	NAME	X	Y	KV	MVA	D	LD-KVA	LCX	LCY	%VD	KVA@LV	LOSS	1000Rs
82	OLD K.L.P	61	14	11.00	16100		14374	62	14	10.9	0	561	10032
113	NEW K.L.P	63	20	11.00	30100		29931	65	21	12.1	231	1394	30739
353	RAIWIND	42	64	11.00	26100		25670	35	72	77.9	17400	4963	58711
900	KHANA	67	37	11.00	52100		31775	65	38	25.2	14658	2336	37764

[THIS IS A LITTLE BETTER BUT TWO SUBSTATIONS ARE AT THEIR LIMIT]
[AND RAIWIND VOLTAGE DROP IS VERY HIGH. ADDING THE K. R. KISHAN]
[SUBSTATION IN THIS YEAR WOULD HELP RELIEVE RAIWIND.]

Hit <RETURN> to CONTINUE, or "Q" to QUIT: <RETURN>

- -

Page: 2 LOADSITE -- Release 8.92 -- OCT. 11, 1993 -- 15:21:34
****** WAPDA CADPAD OUTPUT **********

SUBSTATION LOADING -- CONSTRAINED SOLUTION
Study Case : CASE STUDY - KOT LAKHPAT - 1997 Study Year : 1997

Total Unserved Loads : 0 KVA
Center of Unserved Loads : (0, 0)

[THERE IS NO UNSERVED LOAD. THE BARRIERS TOOK CARE OF THE PROBLEM.]

Hit <RETURN> to CONTINUE, or "Q" to QUIT: <RETURN>

- -

Substation Data Selection Menu

Select Substation Data For Review: <RETURN>

- -

SUBSITE Result Display Menu
40 - Case Summary (CS)

Select SUBSITE Result Display: CS

CRT or PRINTER? <RETURN>

- -

Page: 1 LOADSITE -- Release 8.92 -- OCT. 11, 1993 -- 15:21:49
****** WAPDA CADPAD OUTPUT **********

SUBSITE Summary

Base: BASE CASE - KOT LAKHPAT - 1992 - UNConstrained Year: 1992
Study: CASE STUDY - KOT LAKHPAT - 1997 - Constrained Year: 1997

		Base	Study
INPUT...	Number of subs	3	4
	KVA Capacity- 11.00KV	72000	124000
PERFORMANCE...	Load Served-KVA	58938	101750
	Load Unserved-KVA	0	0
	% Utilized- Min	73.66	61.11
	Avg	81.53	87.36
	Max	88.83	99.77
	MAX. % V.D.	44.9	77.9
	Load at Low V.-KVA	20544	32289
COSTS-1000Rs..	Substation	14036.	24482.
	Feeder	79389.	112767.
	Losses	35120.	74032.
	Total Costs	128545.	211280.

Hit <RETURN> to CONTINUE, or "Q" to QUIT: <RETURN>

- -

SUBSITE Result Display Menu

Select SUBSITE Result Display: <RETURN>

- -

[ADD K.R.KISHAN SUBSTATION.]

SUBSITE Menu
20 - Edit Substation Data (ES)

Select SUBSITE Function: ES- -

Substation Data Edit Menu
30 - Modify (MO)

Select Substation Edit Function: MO

- -

Substation ID: 800

- -

```
Old coordinates:  ( 24, 88)
Enter new values: /

Old substation name is:                K.R.KISHAN
Enter new name (10 characters max): K.R.KISHAN

Old voltage:  11.00-KV
Enter new KV: /

Old distance limit: 100 small areas
Enter new limit: /
- - - - - - - - - - - - - - - - - - - - -
Current capacity steps are:

        Year      MVA
        ----      ---
        1998       13

Enter year to modify: 1998
Enter year, Capacity: 1997,13
```

[THIS MOVES K. R. KISHAN FROM 1998 TO 1997 AT 13 MVA CAPACITY.]

```
- - - - - - - - - - - - - - - - - - - - -
Current capacity steps are:

        Year      MVA
        ----      ---
        1997       13

Enter year to modify: /

Do you wish to modify Substation History (Y or N)? N
- - - - - - - - - - - - - - - - - - - - -
Substation ID: /
- - - - - - - - - - - - - - - - - - - - -

Substation Data Edit Menu

Select Substation Edit Function: <RETURN>
- - - - - - - - - - - - - - - - - - - - -

SUBSITE Menu
40 - Solve Subsite (SS)
```

[SOLVE SUBSITE WITH K. R. KISHAN SUBSTATION ADDED.]

```
Select SUBSITE Function: SS
- - - - - - - - - - - - - - - - - - - - -

Base case or Study case? (Enter B or S): S

Enter study year: 1997
```

```
- - - - - - - - - - - - - - - - - - - - -

    Feeder effort map, "/" if none: 65

    Substation site cost map, "/" if none: /

    Load map ("/" to return to SUBSITE menu): 3

    Feeder capacity map, "/" if none: /
- - - - - - - - - - - - - - - - - - - - -

    Solve with constraints or not? (Y or N): Y

[ RUN CONSTRAINED TO FORCE TRANSFER OF SMALL OVERLOAD AT NEW K.L.P. ]

    ... SUBSITE in progress ...
    ... SUBSITE in progress ...

    * SUBSITE completed.

[ RUN TRSR TO STORE RESULTS IN MAPS.  DISPLAY AND REVIEW MAPS GRAPHICS.    ]
[ REFER TO THE COMMENTS ON PAGE IX - 7 REGARDING USE OF THIS INFORMATION. ]
- - - - - - - - - - - - - - - - - - - - -

    SUBSITE Menu
    50 - Display Results (DR)

[ DISPLAY THE TABULAR RESULTS AND REVIEW THEM. ]

    Select SUBSITE Function: DR
- - - - - - - - - - - - - - - - - - - - -

    SUBSITE Result Display Menu
    20 - Study Case Substation Loading (SC)

    Select SUBSITE Result Display: SC
- - - - - - - - - - - - - - - - - - - - -

    Substation Data Selection Menu
    70 - All (AL)

    Select Substation Data For Review: AL
- - - - - - - - - - - - - - - - - - - - -

    CRT or PRINTER? <RETURN>
- - - - - - - - - - - - - - - - - - - - -

Page:  1    LOADSITE --  Release 8.92     -- OCT. 11, 1993 --  15:25:27
****** WAPDA CADPAD OUTPUT ***************************************************

                SUBSTATION LOADING --   CONSTRAINED SOLUTION
 Study Case : CASE STUDY - KOT LAKHPAT - 1997          Study Year : 1997
```


n/k

<---------- INPUT ---------->						<-------- PERFORMANCE -------->						CAPITAL
ID	NAME	X	Y	KV	MVA	D	LD-KVA	LCX	LCY	%VD	KVA@LV	LOSS	1000Rs
82	OLD K.L.P	61	14	11.00	16100		14374	62	14	10.9	0	561	10032
113	NEW K.L.P	63	20	11.00	30100		29931	65	21	12.1	231	1394	30739
353	RAIWIND	42	64	11.00	26100		17752	40	64	24.3	7819	1391	34804
800	K.R.KISHAN	24	88	11.00	13100		7918	23	89	10.1	0	336	25529
900	KHANA	67	37	11.00	52100		31775	65	38	25.2	14658	2336	37764

[THIS IS THE RESULT WE WANTED. RAIWIND VOLTAGE DROP AND LOAD ARE REDUCED.]

Hit <RETURN> to CONTINUE, or "Q" to QUIT: <RETURN>

- -

Page: 2 LOADSITE -- Release 8.92 -- OCT. 11, 1993 -- 15:25:58
****** WAPDA CADPAD OUTPUT **********

SUBSTATION LOADING -- CONSTRAINED SOLUTION
Study Case : CASE STUDY - KOT LAKHPAT - 1997 Study Year : 1997

Total Unserved Loads : 0 KVA
Center of Unserved Loads : (0, 0)

[THERE IS NO UNSERVED LOAD BECAUSE OF THE BARRIERS.]

Hit <RETURN> to CONTINUE, or "Q" to QUIT: <RETURN>

- -

Substation Data Selection Menu

Select Substation Data For Review: <RETURN>

- -

SUBSITE Result Display Menu
40 - Case Summary (CS)

Select SUBSITE Result Display: CS

CRT or PRINTER? <RETURN>

- -

Page: 1 LOADSITE -- Release 8.92 -- OCT. 11, 1993 -- 15:26:04
****** WAPDA CADPAD OUTPUT **********

SUBSITE Summary
Base: BASE CASE - KOT LAKHPAT - 1992 - UNConstrained Year: 1992
Study: CASE STUDY - KOT LAKHPAT - 1997 - Constrained Year: 1997

		Base	Study
INPUT...	Number of subs	3	5
	KVA Capacity- 11.00KV	72000	137000
PERFORMANCE...	Load Served-KVA	58938	101750
	Load Unserved-KVA	0	0

```
                    % Utilized- Min          73.66        60.91
                                Avg          81.53        75.98
                                Max          88.83        99.77
                    MAX. % V.D.               44.9         25.2
                    Load at Low V.-KVA       20544        22708

   COSTS-1000Rs.. Substation                14036.       28642.
                  Feeder                    79389.      110229.
                  Losses                    35120.       48144.
                  Total Costs              128545.      187015.

[ ALTHOUGH THE CHANGES WERE MADE FOR OTHER REASONS,          ]
[ THE TOTAL COST OF THIS RUN IS ALSO SIGNIFICANTLY LOWER. ]

    Hit <RETURN> to CONTINUE, or "Q" to QUIT: <RETURN>
- - - - - - - - - - - - - - - - - - - - - -

    SUBSITE Result Display Menu

    Select SUBSITE Result Display: <RETURN>
- - - - - - - - - - - - - - - - - - - - - -

[ THE PLAN IS COMPLETED FOR 1997.  SAVE THE STUDY CASE FOR 1997 FOR  ]
[ POSSIBLE FUTURE USE AND CHANGE CASE TITLE IN PREPARATION FOR 2002. ]

    SUBSITE Menu
    10 - File Manipulation (FM)

    Select SUBSITE Function: FM

- - - - - - - - - - - - - - - - - - - - - -

    SUBSITE File Manipulation Menu
    20 - Write Data To File (WD)

    Select SUBSITE File Manipulation: WD
- - - - - - - - - - - - - - - - - - - - - -

    Base case or Study case? (Enter B or S): S
- - - - - - - - - - - - - - - - - - - - - -

    Please enter  punch filename: SC97

    *    1 SUBS CAPACITY COST CURVES WRITTEN TO FILE.
    *    1 LINE CAPACITY COST CURVES WRITTEN TO FILE.
    *    8 SUBSTATIONS WRITTEN TO FILE.
    *    8 SUBSTATION HISTORIES WRITTEN TO FILE.
- - - - - - - - - - - - - - - - - - - - - -

    SUBSITE File Manipulation Menu
    60 - Change Case Title (CC)
```

```
    Select SUBSITE File Manipulation: CC
- - - - - - - - - - - - - - - - - - - - -

    Base case or Study case? (Enter B or S): S

    Enter title (40 characters max.): STUDY CASE - KOT LAKHPAT - 2002
- - - - - - - - - - - - - - - - - - - - -

    SUBSITE File Manipulation Menu

    Select SUBSITE File Manipulation: <RETURN>
- - - - - - - - - - - - - - - - - - - - -

[ WE KNOW FROM THE 1997 RUNS THAT NEW K.L.P. WAS OVERLOADED AND WILL BE MORE ]
[ SO IN 2002, SO WE WILL NEED TO ADD MORE CAPACITY IN THAT GENERAL AREA.     ]

    SUBSITE Menu
    20 - Edit Substation Data (ES)

    Select SUBSITE Function: ES
- - - - - - - - - - - - - - - - - - - - -

[ ADD NORTH AT 26 MVA. ]

    Substation Data Edit Menu
    30 - Modify (MO)

    Select Substation Edit Function: MO
- - - - - - - - - - - - - - - - - - - - -
    Substation ID: 1000
- - - - - - - - - - - - - - - - - - - - -
    Old coordinates:  ( 62, 16)
    Enter new values: /

    Old substation name is:                NORTH
    Enter new name (10 characters max): NORTH

    Old voltage:  11.00-KV
    Enter new KV: /

    Old distance limit:  99 small areas
    Enter new limit: /
- - - - - - - - - - - - - - - - - - - - -
    Current capacity steps are:

          Year      MVA
          ----      ---
          2012       26

    Enter year to modify: 2002
    Enter capacity: 26
- - - - - - - - - - - - - - - - - - - - -
```

```
Current capacity steps are:
        Year      MVA
        ----      ---
        2002       26
        2012       26

Enter year to modify: /

Do you wish to modify Substation History (Y or N)? N
- - - - - - - - - - - - - - - - - - - - -
Substation ID: /
- - - - - - - - - - - - - - - - - - - - -

Substation Data Edit Menu

Select Substation Edit Function: <RETURN>
- - - - - - - - - - - - - - - - - - - - -

SUBSITE Menu
40 - Solve Subsite (SS)

[ SOLVE SUBSITE WITH NORTH ADDED. ]

Select SUBSITE Function: SS
- - - - - - - - - - - - - - - - - - - - -

Base case or Study case? (Enter B or S): S

Enter study year: 2002
- - - - - - - - - - - - - - - - - - - - -

Feeder effort map, "/" if none: 53

Substation site cost map, "/" if none: /

Load map ("/" to return to SUBSITE menu): 4

Feeder capacity map, "/" if none: /
- - - - - - - - - - - - - - - - - - - - -

Solve with constraints or not? (Y or N): N

[ RUN UNCONSTRAINED TO ALLOW SUBSTATIONS TO OVERLOAD IF THEY WANT TO. ]

... SUBSITE in progress ...
... SUBSITE in progress ...

* SUBSITE completed.

[ RUN TRSR TO STORE RESULTS IN MAPS.  DISPLAY AND REVIEW MAPS GRAPHICS.   ]
[ REFER TO THE COMMENTS ON PAGE IX - 7 REGARDING USE OF THIS INFORMATION. ]
- - - - - - - - - - - - - - - - - - - - -
```

```
    SUBSITE Menu
    50 - Display Results (DR)

[ DISPLAY THE TABULAR RESULTS AND REVIEW THEM. ]

    Select SUBSITE Function: DR
- - - - - - - - - - - - - - - - - - - - -

    SUBSITE Result Display Menu
    20 - Study Case Substation Loading (SC)

    Select SUBSITE Result Display: SC
- - - - - - - - - - - - - - - - - - - - -

    Substation Data Selection Menu
    70 - All (AL)

    Select Substation Data For Review: AL
- - - - - - - - - - - - - - - - - - - - -

    CRT or PRINTER? <RETURN>
- - - - - - - - - - - - - - - - - - - - -

 Page:  1     LOADSITE --  Release 8.92      -- OCT. 11, 1993 --  15:34:59
 ****** WAPDA CADPAD OUTPUT ***********************************************

                  SUBSTATION LOADING -- UNCONSTRAINED SOLUTION
  Study Case : STUDY CASE - KOT LAKHPAT - 2002            Study Year : 2002

<-------------- INPUT --------------> <-------- PERFORMANCE --------> CAPITAL
   ID    NAME       X    Y     KV MVA  D  LD-KVA LCX LCY  %VD KVA@LV LOSS  1000Rs
   82 OLD K.L.P    61   14 11.00  16100   13759  62  14  5.8       0  371   4914
  113 NEW K.L.P    63   20 11.00  30100   25614  64  25 17.7    9202 1816  11813
  353 PAIWIND      42   64 11.00  26100   22449  42  62 23.7   10476 1772  33489
  800 K.P.KISHAN   24   88 11.00  13100   12499  24  88 12.7    1419  627  22308
  900 KHANA        67   37 11.00  52100   46461  67  39 27.1   28014 4536  39191
 1000 NORTH        62   16 11.00  26 99   26304  65  18 21.8    4859 1501  11626

[ WE GOT LUCKY!  ONLY THE NEW SUBSTATION IS OVERLOADED, BUT ONLY          ]
[ SLIGHTLY.  KHANA IS NOW THE SUBSTATION WITH THE HIGHEST VOLTAGE DROP. ]

    Hit <RETURN> to CONTINUE, or "Q" to QUIT: <RETURN>
- - - - - - - - - - - - - - - - - - - - -

 Page:  2     LOADSITE --  Release 8.92      -- OCT. 11, 1993 --  15:35:19
 ****** WAPDA CADPAD OUTPUT ***********************************************

                  SUBSTATION LOADING -- UNCONSTRAINED SOLUTION
  Study Case : STUDY CASE - KOT LAKHPAT - 2002            Study Year : 2002
```

```
    Total Unserved Loads        :      0 KVA
    Center of Unserved Loads    : (   0,   0)

[ THERE IS NO UNSERVED LOAD BECAUSE THIS IS AN UNCONSTRAINED SOLUTION. ]

    Hit <RETURN> to CONTINUE, or "Q" to QUIT: <RETURN>
- - - - - - - - - - - - - - - - - - - - - -

    Substation Data Selection Menu

    Select Substation Data For Review: <RETURN>
- - - - - - - - - - - - - - - - - - - - - -

    SUBSITE Result Display Menu
    40 - Case Summary (CS)

    Select SUBSITE Result Display: CS

    CRT or PRINTER? <RETURN>
- - - - - - - - - - - - - - - - - - - - - -

 Page:  1     LOADSITE --  Release 8.92      -- OCT. 11, 1993 --   15:35:26
 ****** WAPDA CADPAD OUTPUT ***********************************************

                                SUBSITE Summary
 Base: BASE CASE - KOT LAKHPAT - 1992            - UNConstrained  Year: 1992
Study: STUDY CASE - KOT LAKHPAT - 2002           - UNConstrained  Year: 2002
                                              Base        Study
   INPUT...          Number of subs             3            6
                     KVA Capacity- 11.00KV    72000       163000

   PERFORMANCE...    Load Served-KVA          58938       147086
                     Load Unserved-KVA            0            0
                     % Utilized- Min          73.66        85.38
                                 Avg          81.53        90.73
                                 Max          88.83       101.17
                     MAX. % V.D.               44.9         27.1
                     Load at Low V.-KVA       20544        53969

   COSTS-1000Rs..    Substation               14036.       33580.
                     Feeder                   79389.       89784.
                     Losses                   35120.       84984.
                     Total Costs             128545.      208348.

    Hit <RETURN> to CONTINUE, or "Q" to QUIT: <RETURN>
- - - - - - - - - - - - - - - - - - - - - -

    SUBSITE Result Display Menu

    Select SUBSITE Result Display: <RETURN>
- - - - - - - - - - - - - - - - - - - - - -
```


292

[SOLVE SUBSITE WITH NORTH, CONSTRAINED, TO FORCE TRANSFER FROM NORTH.]

SUBSITE Menu
40 - Solve Subsite (SS)

Select SUBSITE Function: SS
- -

Base case or Study case? (Enter B or S): S

Enter study year: 2002
- -

Feeder effort map, "/" if none: 53

Substation site cost map, "/" if none: /

Load map ("/" to return to SUBSITE menu): 4

Feeder capacity map, "/" if none: /
- -

Solve with constraints or not? (Y or N): Y

... SUBSITE in progress ...
... SUBSITE in progress ...

* SUBSITE completed.

[RUN TRSR TO STORE RESULTS IN MAPS. DISPLAY AND REVIEW MAPS GRAPHICS.]
[REFER TO THE COMMENTS ON PAGE IX - 7 REGARDING USE OF THIS INFORMATION.]
- -

SUBSITE Menu
50 - Display Results (DR)

[DISPLAY THE TABULAR RESULTS AND REVIEW THEM.]

Select SUBSITE Function: DR
- -

SUBSITE Result Display Menu
20 - Study Case Substation Loading (SC)

Select SUBSITE Result Display: SC
- -

Substation Data Selection Menu
70 - All (AL)

Select Substation Data For Review: AL
- -

CRT or PRINTER? <RETURN>

- - - - - - - - - - - - - - - - - - - -

Page: 1 LOADSITE -- Release 8.92 -- OCT. 11, 1993 -- 15:36:42

****** WAPDA CADPAD OUTPUT **********

SUBSTATION LOADING -- CONSTRAINED SOLUTION

Study Case : STUDY CASE - KOT LAKHPAT - 2002 Study Year : 2002

<---------- INPUT ---------->									<-------- PERFORMANCE -------->			CAPITAL
ID	NAME	X	Y	KV	MVA	D	LD-KVA	LCX	LCY	%VD	KVA@LV	LOSS	1000Rs
82	OLD K.L.P	61	14	11.00	16100		14301	62	14	5.9	0	404	4987
113	NEW K.L.P	63	20	11.00	30100		25445	64	25	17.7	8870	1787	11758
353	RAIWIND	42	64	11.00	26100		22449	42	62	23.7	10476	1772	33489
800	K.R.KISHAN	24	88	11.00	13100		12499	24	88	12.7	1418	627	22308
900	KHANA	67	37	11.00	52100		46630	67	39	27.1	28234	4585	39218
1000	NORTH	62	16	11.00	26	99	25762	65	18	21.7	4359	1458	11568

[THIS LOOKS GOOD. THERE ARE NO OVERLOADS BECAUSE IT IS]
[A CONSTRAINED SOLUTION, AND THE LOADINGS LOOK BALANCED.]

Hit <RETURN> to CONTINUE, or "Q" to QUIT: <RETURN>

- - - - - - - - - - - - - - - - - - - -

Page: 2 LOADSITE -- Release 8.92 -- OCT. 11, 1993 -- 15:36:57

****** WAPDA CADPAD OUTPUT **********

SUBSTATION LOADING -- CONSTRAINED SOLUTION

Study Case : STUDY CASE - KOT LAKHPAT - 2002 Study Year : 2002

Total Unserved Loads : 0 KVA
Center of Unserved Loads : (0, 0)

[WE ARE LUCKY AGAIN. THERE IS NO UNSERVED LOAD SO NO BARRIERS ARE]
[NEEDED. WE USED THE FEEDER COST MAP 53 WHICH HAS NO BARRIERS.]

Hit <RETURN> to CONTINUE, or "Q" to QUIT: <RETURN>

- - - - - - - - - - - - - - - - - - - -

Substation Data Selection Menu

Select Substation Data For Review: <RETURN>

- - - - - - - - - - - - - - - - - - - -

SUBSITE Result Display Menu
40 - Case Summary (CS)

Select SUBSITE Result Display: CS

CRT or PRINTER? <RETURN>

- - - - - - - - - - - - - - - - - - - -

Page: 1 LOADSITE -- Release 8.92 -- OCT. 11, 1993 -- 15:39:07

****** WAPDA CADPAD OUTPUT ******

SUBSITE Summary

Base: BASE CASE - KOT LAKHPAT - 1992 - UNConstrained Year: 1992
Study: STUDY CASE - KOT LAKHPAT - 2002 - Constrained Year: 2002

		Base	Study
INPUT...	Number of subs	3	6
	KVA Capacity- 11.00KV	72000	163000
PERFORMANCE...	Load Served-KVA	58938	147086
	Load Unserved-KVA	0	0
	% Utilized- Min	73.66	84.82
	Avg	81.53	90.91
	Max	88.83	99.08
	MAX. % V.D.	44.9	27.1
	Load at Low V.-KVA	20544	53857
COSTS-1000Rs..	Substation	14036.	33580.
	Feeder	79389.	89751.
	Losses	35120.	85064.
	Total Costs	128545.	208394.

Hit <RETURN> to CONTINUE, or "Q" to QUIT: <RETURN>

- -

SUBSITE Result Display Menu

Select SUBSITE Result Display: <RETURN>

- -

[WE ARE FINISHED WITH THE 2002 PLAN. SAVE THE STUDY CASE FOR POSSIBLE]
[FUTURE USE, AND CHANGE THE CASE STUDY TITLE IN PREPARATION FOR 2007.]

SUBSITE Menu
10 - File Manipulation (FM)

Select SUBSITE Function: FM **[Go and save Study case for 2002]**
[and change case title for 2007]

- -

SUBSITE File Manipulation Menu
20 - Write Data To File (WD)

Select SUBSITE File Manipulation: WD

- -

Base case or Study case? (Enter B or S): S

- -

Please enter punch filename: SC02

```
*   1 SUBS CAPACITY COST CURVES WRITTEN TO FILE.
*   1 LINE CAPACITY COST CURVES WRITTEN TO FILE.
*   8 SUBSTATIONS WRITTEN TO FILE.
*   8 SUBSTATION HISTORIES WRITTEN TO FILE.
- - - - - - - - - - - - - - - - - - - - -

SUBSITE File Manipulation Menu
60 - Change Case Title (CC)

Select SUBSITE File Manipulation: CC
- - - - - - - - - - - - - - - - - - - - -

Base case or Study case? (Enter B or S): S

Enter title (40 characters max.): STUDY CASE - KOT LAKHPAT - 2007
- - - - - - - - - - - - - - - - - - - - -

SUBSITE File Manipulation Menu

Select SUBSITE File Manipulation: <RETURN>
- - - - - - - - - - - - - - - - - - - - -

[ FROM THE 2002 RUNS AND THE FACT THAT WE WILL HAVE FIVE YEARS OF LOAD   ]
[ GROWTH, WE EXPECT TO NEED MORE CAPACITY AT RAIWIND AND IN THE NORTHERN ]
[ PART OF THE STUDY AREA.  AS A FIRST TRY, EXPAND RAIWIND AND ADD EAST.  ]

SUBSITE Menu
20 - Edit Substation Data (ES)

Select SUBSITE Function: ES
- - - - - - - - - - - - - - - - - - - - -

Substation Data Edit Menu
30 - Modify (MO)

Select Substation Edit Function: MO
- - - - - - - - - - - - - - - - - - - - -
Substation ID: 353
- - - - - - - - - - - - - - - - - - - - -
Old coordinates:  ( 42, 64)
Enter new values: /

Old substation name is:                RAIWIND
Enter new name (10 characters max): RAIWIND

Old voltage:  11.00-KV
Enter new KV: /

Old distance limit: 100 small areas
Enter new limit: /
- - - - - - - - - - - - - - - - - - - - -
Current capacity steps are:
```

Year	MVA
1990	20
1992	26
2012	52

Enter year to modify: 2007
Enter capacity: 52

[THIS ADDS A 52 MVA CAPACITY STEP AT RAIWIND FOR 2007.]

- -

Current capacity steps are:

Year	MVA
1990	20
1992	26
2007	52
2012	52

[THIS LEAVES TWO STEPS AT THE SAME CAPACITY WHICH WILL BE HANDLED LATER.]

Enter year to modify: /

Do you wish to modify Substation History (Y or N)? N

- -

Substation ID: 1200

- -

Old coordinates: (68, 25)
Enter new values: /

Old substation name is: EAST
Enter new name (10 characters max): EAST

Old voltage: 11.00-KV
Enter new KV: /

Old distance limit: 99 small areas
Enter new limit: /

- -

Current capacity steps are:

Year	MVA
2012	52

Enter year to modify: 2007
Enter capacity: 26

[THIS ADDS A 26 MVA CAPACITY STEP AT EAST FOR 2007.]

```
- - - - - - - - - - - - - - - - - - - - - - -
    Current capacity steps are:

            Year      MVA
            ----      ---
            2007       26
            2012       52

    Enter year to modify: /

    Do you wish to modify Substation History (Y or N)? N
- - - - - - - - - - - - - - - - - - - - - - -
    Substation ID: /
- - - - - - - - - - - - - - - - - - - - - - -

    Substation Data Edit Menu

    Select Substation Edit Function: <RETURN>
- - - - - - - - - - - - - - - - - - - - - - -
```

[SOLVE SUBSITE WITH EAST ADDED AND RAIWIND EXPANDED.]

```
    SUBSITE Menu
    40 - Solve Subsite (SS)

    Select SUBSITE Function: SS
- - - - - - - - - - - - - - - - - - - - - - -

    Base case or Study case? (Enter B or S): S

    Enter study year: 2007
- - - - - - - - - - - - - - - - - - - - - - -

    Feeder effort map, "/" if none: 53

    Substation site cost map, "/" if none: /

    Load map ("/" to return to SUBSITE menu): 5

    Feeder capacity map, "/" if none: /
- - - - - - - - - - - - - - - - - - - - - - -

    Solve with constraints or not? (Y or N): N
```

[RUN UNCONSTRAINED TO ALLOW SUBSTATIONS TO OVERLOAD IF THEY WANT TO.]

```
    ... SUBSITE in progress ...
    ... SUBSITE in progress ...


    * SUBSITE completed.
```

[RUN TRSR TO STORE RESULTS IN MAPS. DISPLAY AND REVIEW MAPS GRAPHICS.]
[REFER TO THE COMMENTS ON PAGE IX - 7 REGARDING USE OF THIS INFORMATION.]
- -

SUBSITE Menu
50 - Display Results (DR)

[DISPLAY THE TABULAR RESULTS AND REVIEW THEM.]

Select SUBSITE Function: DR
- -

SUBSITE Result Display Menu
20 - Study Case Substation Loading (SC)

Select SUBSITE Result Display: SC
- -

Substation Data Selection Menu
70 - All (AL)

Select Substation Data For Review: AL
- -

CRT or PRINTER? <RETURN>
- -

Page: 1 LOADSITE -- Release 8.92 -- OCT. 11, 1993 -- 15:46:15
****** WAPDA CADPAD OUTPUT **********

SUBSTATION LOADING -- UNCONSTRAINED SOLUTION
Study Case : STUDY CASE - KOT LAKHPAT - 2007 Study Year : 2007

<---------- INPUT ---------->						<-------- PERFORMANCE -------->						CAPITAL
ID	NAME	X	Y	KV	MVA D	LD-KVA	LCX	LCY	%VD	KVA@LV	LOSS	1000Rs
82	OLD K.L.P	61	14	11.00	16100	17963	62	14	7.7	0	684	4979
113	NEW K.L.P	63	20	11.00	30100	15354	61	24	17.1	5039	901	7950
353	RAIWIND	42	64	11.00	52100	27832	42	63	27.4	15131	2579	39185
800	K.R.KISHAN	24	88	11.00	13100	15086	23	88	15.1	4152	918	22510
900	KHANA	67	37	11.00	52100	48602	66	41	30.2	25361	4659	33800
1000	NORTH	62	16	11.00	26 99	29788	63	18	11.5	0	1359	8625
1200	EAST	68	25	11.00	26 99	31158	69	26	23.6	7136	1926	17112

[THERE ARE STILL OVERLOADS IN THE NORTH AND LOADINGS ARE NOT BALANCED.]

Hit <RETURN> to CONTINUE, or "Q" to QUIT: <RETURN>
- -

Page: 2 LOADSITE -- Release 8.92 -- OCT. 11, 1993 -- 15:46:35
****** WAPDA CADPAD OUTPUT **********

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SUBSTATION LOADING -- UNCONSTRAINED SOLUTION

Study Case : STUDY CASE - KOT LAKHPAT - 2007 Study Year : 2007

Total Unserved Loads : 0 KVA
Center of Unserved Loads : (0, 0)

[THERE IS NO UNSERVED LOAD BECAUSE THIS IS AN UNCONSTRAINED SOLUTION.]

Hit <RETURN> to CONTINUE, or "Q" to QUIT: <RETURN>

- -

Substation Data Selection Menu

Select Substation Data For Review: <RETURN>

- -

SUBSITE Result Display Menu
40 - Case Summary (CS)

Select SUBSITE Result Display: CS

CRT or PRINTER? <RETURN>

- -

Page: 1 LOADSITE -- Release 8.92 -- OCT. 11, 1993 -- 15:46:41
****** WAPDA CADPAD OUTPUT **********

SUBSITE Summary

Base: BASE CASE - KOT LAKHPAT - 1992 - UNConstrained Year: 1992
Study: STUDY CASE - KOT LAKHPAT - 2007 - UNConstrained Year: 2007

		Base	Study
INPUT...	Number of subs	3	7
	KVA Capacity- 11.00KV	72000	215000
PERFORMANCE...	Load Served-KVA	58938	185783
	Load Unserved-KVA	0	0
	% Utilized- Min	73.66	51.18
	Avg	81.53	94.41
	Max	88.83	119.84
	MAX. % V.D.	44.9	30.2
	Load at Low V.-KVA	20544	56819
COSTS-1000Rs..	Substation	14036.	44025.
	Feeder	79389.	90139.
	Losses	35120.	104208.
	Total Costs	128545.	238373.

Hit <RETURN> to CONTINUE, or "Q" to QUIT: <RETURN>

- -

SUBSITE Result Display Menu

Select SUBSITE Result Display: <RETURN>

- -

[AFTER A REVIEW OF THE GRAPHICAL AND TABULAR]
[RESULTS, WE DECIDE TO ADD WEST SUBSTATION.]

SUBSITE Menu
20 - Edit Substation Data (ES)

Select SUBSITE Function: ES

- -

Substation Data Edit Menu
30 - Modify (MO)

Select Substation Edit Function: MO

- -

Substation ID: 1100

- -

Old coordinates: (52, 33)
Enter new values: /

Old substation name is: WEST
Enter new name (10 characters max): WEST

Old voltage: 11.00-KV
Enter new KV: /

Old distance limit: 99 small areas
Enter new limit: /

- -

Current capacity steps are:

Year	MVA
2012	26

Enter year to modify: 2007
Enter capacity: 26

[THIS ADDS A 26 MVA CAPACITY STEP TO WEST FOR 2007.]

- -

Current capacity steps are:

Year	MVA
2007	26
2012	26

Enter year to modify: /

[THIS LEAVES TWO STEPS OF THE SAME CAPACITY, WHICH WILL BE HANDLED LATER.]

Do you wish to modify Substation History (Y or N)? N

- -

Substation ID: /

- -

Substation Data Edit Menu

Select Substation Edit Function: <RETURN>

- -

SUBSITE Menu
40 - Solve Subsite (SS)

[**SOLVE SUBSITE WITH WEST SUBSTATION ADDED.**]

Select SUBSITE Function: SS

- -

Base case or Study case? (Enter B or S): S

Enter study year: 2007

- -

Feeder effort map, "/" if none: 53

Substation site cost map, "/" if none: /

Load map ("/" to return to SUBSITE menu): 5

Feeder capacity map, "/" if none: /

- -

Solve with constraints or not? (Y or N): Y

[**WE SHOULD HAVE ENOUGH CAPACITY NOW, AND IN THE RIGHT GENERAL AREAS, SO RUN**]
[**A CONSTRAINED SOLUTION BECAUSE WE KNOW SOME LOAD TRANSFER WILL BE NEEDED.**]

... SUBSITE in progress ...
... SUBSITE in progress ...

* SUBSITE completed.

[**RUN TRSR TO STORE RESULTS IN MAPS. DISPLAY AND REVIEW MAPS GRAPHICS.**]
[**REFER TO THE COMMENTS ON PAGE IX - 7 REGARDING USE OF THIS INFORMATION.**]

- -

SUBSITE Menu
50 - Display Results (DR)

[**DISPLAY THE TABULAR RESULTS AND REVIEW THEM.**]

Select SUBSITE Function: DR

- -

SUBSITE Result Display Menu
20 - Study Case Substation Loading (SC)

Select SUBSITE Result Display: SC

- -

Substation Data Selection Menu
70 - All (AL)

Select Substation Data For Review: AL

- -

CRT or PRINTER? <RETURN>

- -

Page: 1 LOADSITE -- Release 8.92 -- OCT. 11, 1993 -- 15:59:14
****** WAPDA CADPAD OUTPUT **********

SUBSTATION LOADING -- CONSTRAINED SOLUTION
Study Case : STUDY CASE - KOT LAKHPAT - 2007 Study Year : 2007

<---------- INPUT ---------->						<-------- PERFORMANCE -------->						CAPITAL
ID	NAME	X	Y	KV	MVA D	LD-KVA	LCX	LCY	%VD	KVA@LV	LOSS	1000Rs
82	OLD K.L.P	61	14	11.00	16100	14105	62	13	6.8	0	486	4773
113	NEW K.L.P	63	20	11.00	30100	27629	64	21	18.9	4096	1538	9228
353	RAIWIND	42	64	11.00	52100	27581	41	63	27.4	14018	2513	39165
800	K.R.KISHAN	24	88	11.00	13100	12999	24	89	13.8	1046	658	21197
900	KHANA	67	37	11.00	52100	39847	68	42	36.9	16513	3872	29528
1000	NORTH	62	16	11.00	26 99	22218	63	16	13.2	2848	920	6882
1100	WEST	52	33	11.00	26 99	13661	54	35	11.5	0	637	11228
1200	EAST	68	25	11.00	26 99	25994	69	26	22.5	5168	1615	15398

Hit <RETURN> to CONTINUE, or "Q" to QUIT: <RETURN>

- -

Page: 2 LOADSITE -- Release 8.92 -- OCT. 11, 1993 -- 15:59:36
****** WAPDA CADPAD OUTPUT **********

SUBSTATION LOADING -- CONSTRAINED SOLUTION
Study Case : STUDY CASE - KOT LAKHPAT - 2007 Study Year : 2007

Total Unserved Loads : 1749 KVA
Center of Unserved Loads : (21, 78)

[WE AGAIN HAVE UNSERVED LOAD THAT WILL HAVE TO BE TAKEN]
[CARE OF BY ADDING BARRIERS TO THE FEEDER COST MAP.]

Hit <RETURN> to CONTINUE, or "Q" to QUIT: <RETURN>

- -

Substation Data Selection Menu

Select Substation Data For Review: <RETURN>

- -

SUBSITE Result Display Menu
40 - Case Summary (CS)

Select SUBSITE Result Display: CS

CRT or PRINTER? <RETURN>

- -

Page: 1 LOADSITE -- Release 8.92 -- OCT. 11, 1993 -- 15:59:52
****** WAPDA CADPAD OUTPUT **********

SUBSITE Summary

Base: BASE CASE - KOT LAKHPAT - 1992 - UNConstrained Year: 1992
Study: STUDY CASE - KOT LAKHPAT - 2007 - Constrained Year: 2007

		Base	Study
INPUT...	Number of subs	3	8
	KVA Capacity- 11.00KV	72000	241000
PERFORMANCE...	Load Served-KVA	58938	184034
	Load Unserved-KVA	0	1749
	% Utilized- Min	73.66	52.54
	Avg	81.53	80.99
	Max	88.83	99.99
	MAX. % V.D.	44.9	36.9
	Load at Low V.-KVA	20544	43689
COSTS-1000Rs..	Substation	14036.	48963.
	Feeder	79389.	88440.
	Losses	35120.	97912.
	Total Costs	128545.	235315.

Hit <RETURN> to CONTINUE, or "Q" to QUIT: <RETURN>

- -

SUBSITE Result Display Menu

Select SUBSITE Result Display: <RETURN>

- -

[GO TO MAP MATHEMATICS AND MAP EDIT TO ADD BARRIERS]
[TO A COPY OF THE FEEDER COST MAP, IN MAP 65, TO HELP SUBSITE]
[WITH UNSERVED LOAD. SEE PAGE IX - 36 FOR MORE EXPLANATION.]

SUBSITE Menu
70 - Map Edit (ME)

Select SUBSITE Function: ME

- -

Map Edit Menu
88 - Map Mathematics (MM)

Select Map Edit Operation: MM

- -

Map Mathematics Menu
10 - Copy a Map (CM)

Select Map Mathematics Function: CM

To Map(I), From Map(J)

Enter I, J: 65,53

Enter I, J: /

- -

Map Mathematics Menu

Select Map Mathematics Function: <RETURN>

- -

Map Edit Menu
41 - Set Line To a Value (SL)

Select Map Edit Operation: SL

Map Number: 65

Map number: 65 Name= BARRIER MAP
Set line from (X1,Y1) to (X2,Y2) to value A

Enter X1,Y1, X2,Y2, AND A: 1,80,42,80,999
Enter X1,Y1, X2,Y2, AND A: 1,50,53,50,999
Enter X1,Y1, X2,Y2, AND A: 52,27,74,27,999
Enter X1,Y1, X2,Y2, AND A: 62,16,62,1,999
Enter X1,Y1, X2,Y2, AND A: /

- -

Map Edit Menu

Select Map Edit Operation: <RETURN>

- -

[SOLVE SUBSITE WITH BARRIERS ADDED TO THE FEEDER COST MAP.]

SUBSITE Menu
40 - Solve Subsite (SS)

Select SUBSITE Function: SS

- -

Base case or Study case? (Enter B or S): S

Enter study year: 2007

- -

Feeder effort map, "/" if none: 65

Substation site cost map, "/" if none: /

Load map ("/" to return to SUBSITE menu): 5

Feeder capacity map, "/" if none: /

- -

Solve with constraints or not? (Y or N): Y

... SUBSITE in progress ...
... SUBSITE in progress ...

* SUBSITE completed.

[RUN TRSR TO STORE RESULTS IN MAPS. DISPLAY AND REVIEW MAPS GRAPHICS.]
[REFER TO THE COMMENTS ON PAGE IX - 7 REGARDING USE OF THIS INFORMATION.]

- -

SUBSITE Menu
40 - Solve Subsite (SS)

[DISPLAY THE TABULAR RESULTS AND REVIEW THEM.]

Select SUBSITE Function: DR

- -

SUBSITE Result Display Menu
20 - Study Case Substation Loading (SC)

Select SUBSITE Result Display: SC

- -

Substation Data Selection Menu
70 - All (AL)

Select Substation Data For Review: AL

- -

CRT or PRINTER? <RETURN>

- -

Page: 1 LOADSITE -- Release 8.92 -- OCT. 11, 1993 -- 16:02:14
****** WAPDA CADPAD OUTPUT **********

SUBSTATION LOADING -- CONSTRAINED SOLUTION
Study Case : STUDY CASE - KOT LAKHPAT - 2007 Study Year : 2007

<---------- INPUT ---------->						<-------- PERFORMANCE -------->						CAPITAL
ID	NAME	X	Y	KV	MVA D	LD-KVA	LCX	LCY	%VD	KVA@LV	LOSS	1000Rs
82	OLD K.L.P	61	14	11.00	16100	15915	61	14	7.7	0	548	8730
113	NEW K.L.P	63	20	11.00	30100	29931	63	21	17.3	4254	1548	16153
353	RAIWIND	42	64	11.00	52100	26914	40	65	27.7	14319	2438	43038
800	K.R.KISHAN	24	88	11.00	13100	12911	24	89	13.5	1046	660	25395
900	KHANA	67	37	11.00	52100	47837	68	40	36.9	25026	4868	31373
1000	NORTH	62	16	11.00	26 99	16604	64	15	14.6	4864	1114	6456
1100	WEST	52	33	11.00	26 99	16444	53	37	27.3	5417	1344	12617
1200	EAST	68	25	11.00	26 99	19227	71	25	22.6	4354	1161	22533

[THIS IS NOT A GREAT BALANCING OF LOADS BUT WE WILL ACCEPT IT.]

Hit <RETURN> to CONTINUE, or "Q" to QUIT: <RETURN>
- -

Page: 2 LOADSITE -- Release 8.92 -- OCT. 11, 1993 -- 16:02:49
****** WAPDA CADPAD OUTPUT **********

SUBSTATION LOADING -- CONSTRAINED SOLUTION
Study Case : STUDY CASE - KOT LAKHPAT - 2007 Study Year : 2007

Total Unserved Loads : 0 KVA
Center of Unserved Loads : (0, 0)

[THERE IS NO UNSERVED LOAD BECAUSE THE BARRIERS TOOK CARE OF THE PROBLEM.]

Hit <RETURN> to CONTINUE, or "Q" to QUIT: <RETURN>
- -

Substation Data Selection Menu

Select Substation Data For Review: <RETURN>
- -

SUBSITE Result Display Menu
40 - Case Summary (CS)

Select SUBSITE Result Display: CS

CRT or PRINTER? <RETURN>
- -

Page: 1 LOADSITE -- Release 8.92 -- OCT. 11, 1993 -- 16:03:20
****** WAPDA CADPAD OUTPUT **********

367

SUBSITE Summary

Base: BASE CASE - KOT LAKHPAT - 1992 - UNConstrained Year: 1992
Study: STUDY CASE - KOT LAKHPAT - 2007 - Constrained Year: 2007

		Base	Study
INPUT...	Number of subs	3	8
	KVA Capacity- 11.00KV	72000	241000
PERFORMANCE...	Load Served-KVA	58938	185783
	Load Unserved-KVA	0	0
	% Utilized- Min	73.66	51.76
	Avg	81.53	80.42
	Max	88.83	99.77
	MAX. % V.D.	44.9	36.9
	Load at Low V.-KVA	20544	59280
COSTS-1000Rs..	Substation	14036.	48963.
	Feeder	79389.	117336.
	Losses	35120.	109448.
	Total Costs	128545.	275747.

Hit <RETURN> to CONTINUE, or "Q" to QUIT: <RETURN>

- -

SUBSITE Result Display Menu

Select SUBSITE Result Display: <RETURN>

- -

[THE PLAN FOR 2007 IS COMPLETE. SAVE THE CASE STUDY FILE FOR POSSIBLE]
[FUTURE USE, AND THE DISPLAY THE SUBSTATION DATA FOR A FINAL REVIEW OF]
[THE COMPLETE SUBSTATION PLAN FOR THE ENTIRE STUDY PERIOD.]

SUBSITE Menu
10 - File Manipulation (FM)

Select SUBSITE Function: FM

- -

SUBSITE File Manipulation Menu
20 - Write Data To File (WD)

Select SUBSITE File Manipulation: WD

- -

Base case or Study case? (Enter B or S): B

- -

Please enter punch filename: BC92

* 1 SUBS CAPACITY COST CURVES WRITTEN TO FILE.
* 1 LINE CAPACITY COST CURVES WRITTEN TO FILE.

```
    *   5 SUBSTATIONS WRITTEN TO FILE.
    *   5 SUBSTATION HISTORIES WRITTEN TO FILE.
- - - - - - - - - - - - - - - - - - - - -
    SUBSITE File Manipulation Menu

    Select SUBSITE File Manipulation: <RETURN>
- - - - - - - - - - - - - - - - - - - - -

    SUBSITE Menu
    20 - Edit Substation Data (ES)

    Select SUBSITE Function: ES
- - - - - - - - - - - - - - - - - - - - -

    Substation Data Edit Menu
    40 - Review (RE)

    Select Substation Edit Function: RE
- - - - - - - - - - - - - - - - - - - - -

    Base case or Study case? (Enter B or S): S
- - - - - - - - - - - - - - - - - - - - -

    Substation Data Selection Menu
    70 - All (AL)

    Select Substation Data For Review: AL
- - - - - - - - - - - - - - - - - - - - -

    CRT or PRINTER? <RETURN>
- - - - - - - - - - - - - - - - - - - - -

Page:  1     LOADSITE --  Release 8.92      -- OCT. 11, 1993 --  14:41:55
****** WAPDA CADPAD OUTPUT ***************************************************

 SUBSITE Input Data ... Study Case-
 ---------------------------------------------------------------------------
```

ID	Name	IX	IY	KV	Dist	Year	MVA
82	OLD K.L.P	61	14	11.00	100	1990	13
						1992	16
113	NEW K.L.P	63	20	11.00	100	1990	26
						1992	30
353	RAIWIND	42	64	11.00	100	1990	20
						1992	26
						2007	52
800	K.R.KISHAN	24	88	11.00	100	1997	13
900	KHANA	67	37	11.00	100	1994	26
						1997	52
1000	NORTH	62	16	11.00	99	2002	26
1100	WEST	52	33	11.00	99	2007	26
1200	EAST	68	25	11.00	99	2007	26
						2012	52

```
[ REMEMBER THAT SEVERAL SUBSTATIONS HAD TWO STEPS WITH THE SAME CAPACITY.  ]
[ THAT DOES NOT AFFECT THE PROGRAM RESULT BUT, FOR SIMPLICITY AND ORDER,   ]
[ THE SECOND OF THE TWO IDENTICAL STEPS WAS REMOVED BEFORE THIS DATA WAS   ]
[ DISPLAYED.  THAT STEP WAS NOT SHOWN.                                     ]

    Hit <RETURN> to CONTINUE, or "Q" to QUIT: <RETURN>
- - - - - - - - - - - - - - - - - - - - - -

[ WE ARE FINISHED.  GO TO THE PRIMARY MENU AND EXIT FROM THE PROGRAM. ]

    Hit <RETURN> to CONTINUE, or "Q" to QUIT: <RETURN>
- - - - - - - - - - - - - - - - - - - - - -

    Substation Data Selection Menu

    Select Substation Data For Review: <RETURN>
- - - - - - - - - - - - - - - - - - - - - -

    Substation Data Edit Menu

    Select Substation Edit Function: <RETURN>
- - - - - - - - - - - - - - - - - - - - - -

    SUBSITE Menu

    Select SUBSITE Function: <RETURN>
- - - - - - - - - - - - - - - - - - - - - -

    Primary Menu
    90 - Exit SUBSITE (EX)

    Select Primary Operation: 90
```

X. FEEDER PLANNING

X. FEEDER PLANNING

A. GENERAL

Distribution feeders are an important part of the distribution system. Feeders are the vital link between the Grid Stations and the consumer. Quality of service and the cost of service depend to a great extent on the quality of the feeder network. This quality includes not only reliability but also the amount of losses, the amount of voltage drops, the power factor, etc. By proper feeder planning, the utility can provide quality service and, at the same time save itself money by controlling or reducing losses, by reducing costly outages, and by reducing capital expenditures as a result of strengthening the system where it will do the most good.

FEEDERSITE is the CADPAD module that gives the planner the capability of doing effective feeder planning. It can help him to do short-, intermediate-, and long-range feeder planning. He can also use FEEDERSITE to fine-tune the Grid Station plans developed using SUBSITE, taking into account the actual feeders of the system. Figure X-1 shows the kinds of data required, much of it from other CADPAD programs, and some of the results that can be realized from using the program.

As a short-range planning tool, FEEDERSITE can help the planner to determine the optimal switching configuration for the existing system and it can help him perform contingency studies by reconfiguring the system for outage conditions chosen by the planner. These outage conditions can include single or multiple contingencies for Grid Stations, Grid Station transformers, feeder breakers, feeders, or sections of feeders.

For intermediate or long-range planning, the program will help the planner to locate optimal feeder routes and to determine the proper sizing of conductors for future load conditions. It can also help him investigate the effects of changing distribution voltages, standard conductor sizes, loading policies, etc. He can also perform contingency studies on the future system.

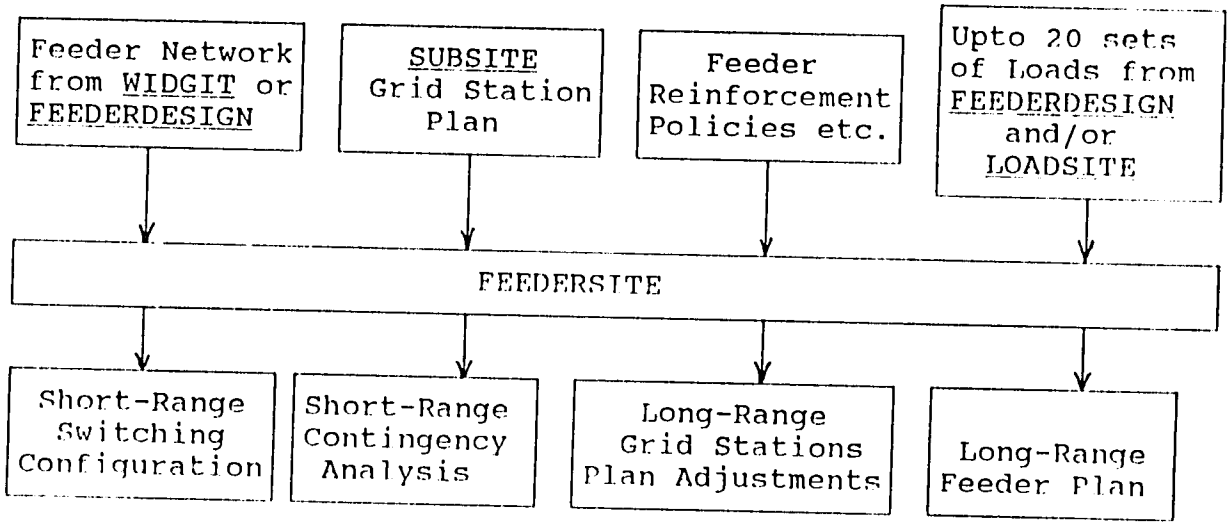

FIGURE X-1 - FEEDERSITE INPUTS AND OUTPUTS

For system alternatives and contingencies, the planner must run different cases, making changes to the data. The program does not design cases, or run cases automatically. However, most changes are easily made.

B. INTRODUCTION TO FEEDERSITE

1. Program Capacities

The FEEDERSITE program is dimensioned to handle the following amounts of data:

- 999 Feeder types
- 7000 Buses
- 20 Load years for each bus
- 14000 Feeder segments (max of 20 connected to a bus)
- 100 Source Nodes
- 5 Capacity steps per source node
- 100 Regulator types

2. Data Requirements

Following is a discussion of the different types of input data required by the program:

a. Feeder Types

Feeder type data can be brought in via files dumped from FEEDERDESIGN or WIDGIT, or they can be entered into the database via the program data editor. Each feeder type consists of the following data fields:

i. Feeder type ID number - A unique integer from 1 to 999, used to identify a feeder type. Unique means that each ID number can only be used once.

ii. Feeder type name - A 14-character alphanumeric description of the feeder type.

iii. Number of phases - Only integer values of 1, 2 or 3 are accepted.

iv. Reconductor type - The feeder type ID of the feeder type to which the program may upgrade this feeder type. This must be defined as a feeder type ID. See Section X.C for an important discussion on these types.

v. Capacity - The maximum power allowed through the feeder, in MVA. There are three different ratings; thermal, economic, and emergency. The user can toggle among these, for data entry and for analysis, by using the "TC" (Toggle Capacity) command for any menu.

vi. Resistance and Reactance - Impedances expressed in per unit on a 100 MVA base, per mile or kilometer. The units system is specified in the System Control Parameters.

vii. Capital Cost - The capital investment required to build or reconductor a feeder to this type, in thousands of rupees, levelized (annualized), per kilometer. This should be 0.0 for existing feeders, but non-zero for new or reconductor types.

viii. Linear Cost - An approximation of the levelized cost of sending power through the feeder, in rupees per kVA per kilometer, including capital costs and costs of losses. This is required only for existing feeders and only if optimization option 3 (load x cost) is selected.

b. Regulator Types

Regulator types data may come in via Card Image files from FEEDERDESIGN or WIDGIT, or may be entered via the program editor. The data fields for regulator types are:

i. Regulator type number - A unique integer from 1 to 999, used to identify a regulator type. These are referenced in the Feeder Segment data.

ii. Regulator type name - A 14-character alphanumeric description of the regulator type.

iii. Capital Cost - The total levelized cost of the regulator, in thousands of rupees.

iv. Voltage rise - The percent at the regulator, typically entered as the rise at the maximum tap setting of the regulator so that minimum voltage drops are obtained from the distribution system study.

c. Bus Locations

Bus locations data normally comes in via a Card Image file from FEEDERDESIGN or WIDGIT, but can also be entered via the program editor. Bus location data consists of the following fields:

i. Bus ID number - Any unique integer from 1 to 32767, used to identify a bus location ID.

ii. Bus name - A 14-character alphanumeric description of the bus. This field is not normally used, except for special buses such as those which are designated as source node buses.

iii. Bus X and Y coordinates - Two fields containing the X and Y coordinates of the bus, in the FEEDERDESIGN coordinate system. Size limit is 99,999,999.99.

iv. Region name - A 14-character alphanumeric name used to identify the bus with a region. The region may define a feeder, Grid Station, subdivision, or whatever the user wishes. This field can be used to retrieve groups of related buses.

v. Source node assignment - Specifies the bus number of the source node that the bus is normally served from. The bus must be defined, and a source node bus must be served from itself.

vi. Phases present and loaded - A three digit code identifying which phases are present and which phases are loaded. The first digit represents phase A, the second phase B, and the third phase C. A value of 0 means the phase is not present, 1 means it is present but not loaded, and 2 means it is both present and loaded.

d. Loads

Load data normally comes in via Card Image files from FEEDERDESIGN, WIDGIT for the base year, and from LOADSITE for future years, However, it also can be entered via the program editor and consists of the following fields also.

i. Bus ID number - Any unique integer from 1 to 32767. The bus must be defined in the bus location data.

ii. Year - Any year defined in the database. Up to 20 years can be defined and a bus can have load entered for any or all of the years defined.

iii. KWATTS and kVARS - Two fields defining the real and reactive components of the load at the bus. Values can range from 0.0 to 99,999.

e. Feeder Segments

Feeder segments connect two buses with a feeder type. They normally come in via Card Image files from FEEDERDESIGN or WIDGIT, but may also be entered via the program editor. Feeder segment data consists of the following fields:

i. Terminal bus numbers - Two numbers identifying two buses at the ends of the segment. The buses must be defined in the bus location data. Bus pairs must be unique, but order is not important.

ii. Switching status - A one digit code indicating the switching status of the segment. 1 means a normally-closed switch, 2 a normally-opened switch, and 0 no switch.

iii. Phasing - A four-digit code defining if the phases and neutral conductor are present, and what physical position they occupy. The first position is for phase A, the second for phase B, the third for phase C, and the fourth for the neutral conductor. A zero in the position means the phase or neutral is not present, and a 1,2,3, or 4 tells which physical position it is in. For example,

2003 means phase A is in position 2 and the neutral is in position 3. Phases B and C are absent.

The WAPDA standard is as follows:

> Facing the Grid Station, if one starts counting from the left:
>
> Phase A is in position 1
> Phase B is in position 2
> Phase C is in position 3

There is no neutral in the 11 kV system. The phase code for this configuration is, therefore, 1230.

iv. Feeder type number - Specifies the feeder type of the segment. The feeder type must be defined.

v. Segment length - Length of the segment in user's coordinate units, this length may or may not be the straight-line distance between the two buses.

vi. Feeder segment name - A 14-character alphanumeric description of the feeder segment. This field is not normally used.

vii. Regulator type number - An integer from 1 to 999 specifying the regulator type of a regulator on the feeder segment. The value is 0 if no regulator is present.

f. Source Nodes

Source nodes are used to define power sources, and can be used to represent Grid Stations, Grid Station transformers, Feeder Breakers, etc. In FEEDERSITE either the Grid Station or the Grid Station transformers should be taken as source nodes. This data can be brought in via a Card Image file from SUBSITE, in which case it would probably represent each Grid Station as a single source node, or via a Card Image file from FEEDERDESIGN or WIDGIT, in which case it may represent each Grid Station transformer or each feeder breaker as a source node. The data can also be entered via the program editor.

Each source node can have up to five years of build. In other words for five different years of the study period, a source node can be set to different combinations of voltage level and capacity. An example might be an existing Grid Station that picks up capacity by load

transfer in one year, changes voltage another year, adds capacity in two other years. The data could be:

Bus	Name	Voltage	MVA	Capital Cost	Build Year
789	Old GS	6.35	7.0	0.0	1984
		6.35	13.0	0.0	1992
		14.43	13.0	20.0	1994
		14.43	26.0	70.0	1997
		14.43	52.0	120.0	2002

Following is a description of the data fields:

i. Source node bus number - A bus number, defined in the bus location data, where a source node is located.

ii. Source node name - A 14-character alphanumeric description of the source node.

iii. Voltage - The line-to-neutral voltage in kV. A different voltage can be specified for each of up to 5 years of build.

iv. MVA Rating - The 3-phase total MVA of capacity. Capacities can be given for up to 5 years of build. This typically represents the normal loading capacity of the utility but could be a de-rated value or an emergency value if the user desires.

v. Capital cost - The total levelized cost, in rupees, of building or upgrading to the capacity step of the build year. Maximum value is 999,999.99. This is used in tabulating the cost of the expansion plan.

vi. Build year - An integer from 1 to 9999 representing the year of build of the voltage level and/or capacity level of a step. Up to five steps are allowed for each source node.

g. System Control Parameters

The system control parameters define global variables such as costs, units, and voltage and power factor limits. They also define the controlling parameters to be used by the program. They are:

i. Unit system - Either English or Metric units.

ii. User unit - How many feet or meters in one coordinate system unit.

iii. Power factor - A percent power factor from 50. to 100. Used to convert kVA load data into kW and kVAR loads.

iv. Cost of losses - A rupee/kW/year figure representing the demand cost of losses and the energy cost of losses combined. For WAPDA, a value of 8000.0 has been used previously. Table X-1 gives the calculation of the cost of losses.

v. Voltage drop limit - A percent value for voltage drop, used only with voltage tapering, as a target, and for displaying of low voltage buses.

vi. Program optimization options and constraints - Covered in Section 3. below.

vii. Load ratio - A percent value used to ratio all loads in the study system up or down. It does not affect the database, only the optimization case being run. A value of 99 ratios loads down one percent and a value of 101 ratios them up one percent.

viii. Cost of switching - The levelized cost, in thousands of rupees, of installing a switch. Entering a value will probably reduce the number of switching operations. Costs of switches are not included in the cost summary so the user should keep that in mind when comparing costs.

ix. Maximum switching operations - The number of switching operations the user wishes to give as a target. If the program exceeds the target a message is given. A value of zero means there is no maximum.

TABLE X-1
CALCULATION OF THE COST OF LOSSES

C = D + 8760 * LF * E = 8000 rupees/kW/year

C = Cost of Losses (Rs/kW/year)

D = Levelized Annual **Demand** Cost of Losses (Rs/kW/year)

This is the cost to build up the system to serve one kW of demand (usually taken as the peak kW). This includes the cost up through the feeders to the 11 kV substation. Some utilities also include some of the substation, sub-transmission, transmission and generation costs.

8760 = Number of Hours per year

LF = Loss Factor
= a * Load Factor + (1-a) * Load Factor ** 2

Load Factor	a	Loss Factor
.5	.15	.29
.5	.30	.33
.6	.15	.40
.6	.30	.43
.7	.15	.52
.7	.30	.55

E = **Energy** cost (Rs/kWHR)

3. Program Optimization Options and Constraints

Table X-2 shows the different options and constraints available to the user when he is preparing to run the feeder optimization. There are quite a few possible combinations of these options but some combinations are not allowed by the program:

- If the user chooses Optimization Option 0, the program will ignore any capacity restrictions and will not reinforce any feeder segments. It will simply evaluate the existing system configuration.

- If the user chooses not to recognize feeder capacities then he cannot choose to reinforce feeders for increased capacity or for voltage relief.

- If the user chooses not to reinforce feeders for capacity, he may not choose to reinforce for voltage relief.

- If the user chooses not to recognize feeder capacities or Grid Station capacities, he may not choose to accept non-radial solutions because there will not be any.

TABLE X-2
AVAILABLE OPTIMIZATION OPTIONS AND CONSTRAINTS

Recognize Grid Station Capacities?	Y or N
Recognize Feeder Capacities?	Y or N
Consider Feeder Reinforcements?	Y or N
Reinforce Feeders for Voltage Relief?	Y or N
Which Optimization Option?	0,1,2, or 3
(0) Base Case, No optimization, (1) Load x Distance (2) Load x Resistance (3) Load x Cost	
Accept Non-Radial Solution?	Y or N

The user will want to choose different combinations of options depending on different circumstances:

- Choose Optimization Option 0 to get a base of comparison for other cases, and to see where the problems are in the existing system configuration.

- Choose Optimization Option 1, and then Optimization Option 2, and compare the results. Option 1 will maximize the reliability and option 2 will minimize the sum of the voltage drops across the system. Comparing these two may give some insights into the system.

- Choose Optimization Option 3 to get the least-cost system, considering both capital costs and cost of losses. The feeder types linear cost data is required for this option.

- Choose not to recognize the Grid Station and feeder capacities and the program will tell how it would utilize the system if it could exceed the capacities. This will give some idea of what the Grid Station and feeder capacities should be. Keep in mind, though, that if the feeder capacities were different, the impedances would also be different and the solution would be different.

- Choose to recognize Grid Station and feeder capacities, and to not consider feeder reinforcements, and the program will tell what loads, if any, cannot be served by the existing system even by switching to an optimal configuration. This will help the user see what areas need relief.

- Choose to recognize Grid Station and feeder capacities, and to consider feeder reinforcement, and the program will tell what feeder reinforcements are needed to serve the loads within the Grid Station capacity restraints and within the possible reinforcements of the feeders. This will help the user see where more Grid Station capacity is needed and where additional feeders may need to be added.

- Choose to reinforce for voltage relief and the program will tell what reinforcements would help increase the voltage at low voltage buses. However, the program does not consider whether it would be economical to do so and the user should compare the cost with the benefit, and also with the cost of other possible solutions such as capacitors and regulators.

- Choose optimization option 3, to recognize the Grid Station and feeder capacities, and not to consider feeder reinforcements, and the program will give you the system which minimizes the cost of losses.

4. How FEEDERSITE Works

a. The Algorithm

FEEDERSITE is designed to model the distribution system of Grid Stations and feeders as a linear transshipment problem that can be solved by linear optimization techniques. It represents buses as nodes, and feeder segments as arcs, and applies constraints according to the loads and capacities in the database, and according to the system control parameters selected by the user.

FEEDERSITE can solve large systems, with up to 7000 buses (nodes) and 14000 feeder segments (arcs) in a short time, because it uses a **linear** optimization algorithm as opposed to an **non-linear** algorithm which would take much more time. That means that every thing in the problem must be represented as linear.

Since distribution systems are non-linear in nature, some approximations are made so they can be modelled and solved as linear. This means that speed of analysis is paid for by some loss in precision and accuracy in the solution.

One major non-linear quantity to be dealt with is the cost of serving load through a feeder segment, as a function of the power flow. So, in order to optimize the cost, non-linear costs must be represented as a linear function, which is done via the linear cost data field in the feeder types data.

The optimization algorithm solves for the power flow in each feeder segment, not including losses, based on the options chosen by the user. After the optimization is complete, the program computes losses, voltage drops, feeder reinforcement steps, costs, etc., based on the results of the optimization and on generally accepted formulae for calculating these quantities.

b. The Program Structure

FEEDERSITE, like the other CADPAD programs, is run via interactive menus. But, unlike the other programs, all the major end-use functions are presented in the Primary Menu and only those functions that can be executed at the time appear in the menu. After the function is selected, the program guides the user to other parts of the program that are needed to complete the function.

The system to be optimized can be set up in two different ways. One is to create a Card Image Case Study file, either in FEEDERDESIGN or in FEEDERSITE, and then have the program optimize the Case Study file. The other way is to select a study system from the database and optimize that. The user can select the entire database or he can include and exclude different parts of the system stored in the database. The second way is much more flexible but there may be times when using a Case Study file is more convenient.

The Card Image, ASCII format, Case Study file can be edited outside the program, but the database, which is a binary, random-access file, can only be edited in the program, either with the program editor or by reading in data from Card Image files of the proper format. One acceptable format is that of a Case Study file.

c. The End-Use Functions

The Primary Menu end-use functions are described below:

i. Optimize Existing Case Study File

This function allows the user to optimize a study system stored in a previously saved Case Study file, allowing him to avoid having to redefine the study system previously defined.

ii. Create Case Study File/Optimize

This allows the user to select a system from the database and then either create a Case Study file of that system or optimize that system. If he creates a Case Study file he may also optimize it.

iii. Edit/Display Data

This gives the user access to the program editor where he may add, modify, delete and display all the types of data.

iv. Auxiliary Data Operations

This selection gives the user access to two functions which can relieve him of the tedious tasks of computing the linear costs for feeder types, and of connecting buses in a new area together with feeder segments.

v. **Create New Database for Case Study File**

This can be useful in two ways, one is to be able to create a new database directly if the user already has a Case Study file, and two is to be able to modify a Case Study file with the program editor by bringing it into a database and then dumping it back to a Case Study file after it is modified.

vi. **Send Data to Other CADPAD Programs**

The user can send bus location data to LOADSITE for the aggregation of forecast loads onto them, and he can send source node data (Grid Stations) to SUBSITE using this selection.

vii. **Receive Data from Other CADPAD Program/Restore from Backup**

This allows the user to read in the following Card Image ASCII files.

- FEEDERSITE database backup file
- FEEDERSITE database format files from FEEDERDESIGN or FEEDERSITE
- Source node data from SUBSITE

viii. **Backup Study System**

This lets the user save selected data in an ASCII file.

ix. **Optimize Database**

This function bypasses the selection process and optimizes the entire database system.

x. **Select Another Database**

This item appears in the menu only after the user has selected a database, and allows him to switch to another.

xi. **Select Another Study System**

This item appears in the menu after the user has selected a study system, and allows him to select another from the same database.

d. Hidden Commands

In addition to the menu selections, the following commands can be executed from any menu prompt:

UP,EX,<RETURN>,/	Go back one menu
PM	Go to Primary menu
TR	Input commands from transfer file
OO,ON,OF	Turn menu displays on and off
AN	Toggle between alpha and numeric command codes displayed in menus
EU	Edit user session constants such as terminal type, graphics options...
CD	Change display device (CRT or printer)
CG	Change graphics device (mouse, joystick, cursor arrows)
CT	Change title of tabular displays
-S	Spool the printer output file
TC	Toggle feeder capacity between thermal, economic, and emergency capacities
CU	Change User Session Constants file
OU	Exit out of user session constants edit
FO	Toggle between Fast Optimization options of memory resident and disk resident Case Study File

A menu of these commands can be displayed by entering a "?" from any menu. Return from this menu by entering "QQ".

5. FEEDERSITE Outputs

a. Graphical Outputs

Input and Output system diagrams are enhanced by zoom, pan, labelling, decluttering, and other features for very flexible graphics displays of the data and the results. Hard copies of all the graphical displays may be obtained.

i. Input System Diagram

This graphical display shows the entire system or the selected system diagram, showing source nodes and feeders, distinguishing between opened, closed, and un-switchable segments, and showing segments created by the CONNECT option. Bus, segment, and source node labeling are available.

ii. Optimized System Diagram

This display shows the entire system or the selected system after optimization. This display shows whether segments were reinforced, switched, overloaded, or unchanged. It also shows low voltage buses and which Grid Stations are serving low voltage buses. It shows overloads Grid Stations and unserved loads. A graphical trace function is also available. Labeling is available for components of the system as well as for the optimization results such as voltages, flows, etc.

iii. Linear Cost Calculation Displays

Graphical representation of the Capacity/Cost curves of the feeder types, along with computed and user-entered linear cost curves, let the user see, graphically, exactly what is involved in the linear cost approximation of a feeder type and its possible reinforcements.

b. Tabular Outputs

Extensive output options are available for viewing and saving the optimization results. Displays are available for out putting optimal power flows in the feeder segments, switching status changes, reinforced segments, source node summary, unserved loads, non-radial segments, and input data review. Several of these displays have multiple options of selection criteria available for the display of data.

As an example, optimal power flows can be displayed for neighboring segments of a given bus, by selected source nodes (with optional criteria of: all, source node loading, voltage drop, source node name or number, coordinate window, capacity, and capital cost), and by selected feeder-segments (also with optional criterion of: all, feeder loading, line loss, bus number or name, coordinate window, feeder type, and regulator type). Source node summaries also have multiple display criterion available.

c. Outputs to Other Programs

Feeder segment data can be sent to FEEDERDESIGN so the user can transfer switching changes and/or feeder reinforcements to that program for more detailed analysis with Load Flow, Short Circuit, etc. modules. These changes can also be stored in the FEEDERSITE database. Source node data can be sent to SUBSITE.

6. Typical Application

There are many ways to use FEEDERSITE and different paths to the same end. The procedure steps below are just one of many ways the program can be applied.

a. Run FEEDERDESIGN and create either a FEEDERSITE Case Study file or a FEEDERSITE database file.

b. In FEEDERSITE either create a database from the Case Study file or create a database and bring in the data from the database file.

c. Run the program to reconfigure the base year switching, using either the Case Study file from FEEDERDESIGN or the system stored in the database.

d. Run the program for the base year, existing configuration, and compare those results with the results of step c. to see the improvement.

e. In LOADSITE determine what areas will develop in the future, and add buses in FEEDERSITE to serve the future areas. Use a separate region name for the future buses.

f. Run the CONNECT option to add feeders connecting the future buses to each other. Manually add segments to connect appropriate future buses to buses in the existing system. In other words, tie in the future feeders with the existing feeders.

g. Send bus data to LOADSITE and run NODESIM to assign forecast loads to the buses for the forecast years.

h. Bring loads from NODESIM into the FEEDERSITE database for the forecast years. Also the user may bring in Grid Station data sent from a SUBSITE database.

i. Add reinforcement sequences and reinforcement feeder types to the database. Add any other data not yet completed. Use the program to compute linear costs in all existing feeder types.

j. Run the program for different years, starting with the first forecast year and ending when the user thinks he has gone more than far enough into the future. The program will add feeders in future areas as they are needed. Manually connect new Grid Stations into the feeder system when they become available.

k. Examine results, make adjustments, rerun, etc. Run contingency cases and alternate scenarios, etc. Make lots of runs. This is where all the data collection work pays off.

Section XI contains a sample FEEDERSITE session.

C. FEEDER REINFORCEMENT TYPES AND SEQUENCES

The feeder reinforcement types, and the reinforcement sequences defined by them, are very important to the successful use of FEEDERSITE. The reinforcement type specified for the existing feeder type tells what type the feeder segment should be reinforced to if the flow in the segment exceeds the capacity of the existing feeder type. The reinforcement type specified for the first reinforcement feeder type tells what type the feeder segment should be reinforced to if the flow in the segment exceeds the capacity of the first reinforcement type, and so on up to some maximum feeder capacity. This is referred to as the reinforcement sequence of the existing feeder type and should be set up for every existing feeder type.

One important aspect of the feeder types is the capital cost. For existing feeders the cost of the feeder types should be zero because they have already been built. Capital costs for the reinforcement feeder types should represent the annualized capital cost, in thousands of rupees, to build or reinforce the feeder segment from its existing feeder type to the reinforcement feeder type. Therefore, because the cost of building a feeder segment may depend on what is already there, different reinforcement feeder types might be needed, even though the end result is the same kind of feeder. Remember, the capital cost is the cost to reinforce

from the existing feeder type and not from the previous feeder type in the reinforcement sequence.

Table X-3 shows reinforcement sequences for the existing WAPDA feeder types. If we assume that the cost of reinforcing to a given feeder type is independent of the existing feeder type, the feeder type data can be set up as shown in Table X-4. Note that the cost is different if the existing feeder type was "None", so a different set of reinforcement feeder types is needed for that situation. The "None" feeder type is used in areas where feeders will need to be built in the future study years. The program will detect when they are needed, and determine what size they should be.

An important thing to remember when looking at feeder reinforcement costs for future years is that when FEEDERSITE is run for a certain year, the feeder costs are for all the reinforcements made from the base year system. The cost reinforcements from the previous study year would be approximately the difference in the reinforcement costs for the two study years. Each FEEDERSITE run is a snapshot picture in time, independent of any runs made previously.

In Table X-4, the (Rs 1000) costs are the annualized capital costs per km, and the Rs/KVA costs are the linear costs which are calculated by the program at the user's request.

TABLE X-3
REINFORCEMENT SEQUENCES FOR EXISTING FEEDER TYPES

From			To			
100	None	0.0	-->N.Gopher	-->N.Rabbit	-->N.Dog	-->N.Osprey
105	Gopher	3.2		-->R.Rabbit	-->R.Dog	-->R.Osprey
104	Rabbit	3.8			-->R.Dog	-->R.Osprey
103	Dog	5.8				-->R.Osprey
116	Osprey	12.6	-->Osprey			
101	Panther	9.9	-->Panther			
109	CU7/.193	6.5				-->R.Osprey
110	CU7/.136	3.8			-->R.Dog	-->R.Osprey
111	CU#3	2.3	-->R.Gopher	-->R.Rabbit	-->R.Dog	-->R.Osprey
112	CU#5	1.7	-->R.Gopher	-->R.Rabbit	-->R.Dog	-->R.Osprey
113	CU#8	1.1	-->R.Gopher	-->R.Rabbit	-->R.Dog	-->R.Osprey
114	GSL#8	0.1	-->R.Gopher	-->R.Rabbit	-->R.Dog	-->R.Osprey
117	Pelican	11.3	-->Pelican			
201	UG 2AWG	3.0				
202	UG 4/0	6.4	-->N.UG 4/0			
203	UG 500M	10.2				
204	UG1000M	15.1				

N. = New construction
R. = Rehabilitated or Reinforced

TABLE X-4
FEEDER TYPES WITH REINFORCEMENT SEQUENCES

- - - INPUT - FEEDER TYPE DATA -

TYPE NUMBER	TYPE NAME	NUMBER OF PHASES	RECON-DUCTOR TYPE	THERMAL CAPACITY (MVA)	PER MILE/KILOMETER RESIS (PU ON 100 MVA)	REACT	COSTS (Rs1000)	COSTS Rs/KVA
100	NONE	3	305	0.000	0.000	0.000	0.0	0.00
101	PANTHER	3	101	9.906	0.139	0.266	0.0	80.23
103	DOG	3	401	5.848	0.277	0.312	0.0	83.69
104	RABBIT	3	403	3.848	0.544	0.333	0.0	83.78
105	GOPHER	3	404	3.219	1.099	0.343	0.0	83.79
109	CU 7/.193	3	401	6.477	0.134	0.287	0.0	82.98
110	CU 7/.136	3	403	3.810	0.272	0.307	0.0	83.69
111	CU #3 SWG	3	404	2.286	0.550	0.328	0.0	83.78
112	CU #5 SWG	3	405	1.715	0.776	0.338	0.0	83.79
113	CU #8 SWG	3	405	1.143	1.361	0.354	0.0	83.79
114	GSL #8	3	405	0.095	7.852	0.613	0.0	83.79
116	OSPREY	3	116	12.573	0.102	0.262	0.0	74.64
117	PELICAN	3	117	11.278	0.119	0.266	0.0	78.39
201	UG 2AWG	3	502	3.048	0.733	0.224	0.0	130.50
202	UG 4/0 AWG	3	503	6.382	0.242	0.204	0.0	90.31
203	UG 500 MCM	3	504	10.192	0.116	0.192	0.0	68.96
204	UG 1000 MC	3	204	15.145	0.072	0.184	0.0	64.04
301	N. OSPREY	3	301	12.573	0.102	0.262	80.4	1.00
303	N. DOG	3	301	5.848	0.277	0.312	27.7	1.00
304	N. RABBIT	3	303	3.848	0.545	0.333	23.5	1.00
305	N. GOPHER	3	304	3.219	1.099	0.343	18.1	1.00
401	R. OSPREY	3	401	12.573	0.102	0.262	68.6	1.00
403	R. DOG	3	401	5.848	0.277	0.312	18.0	1.00
404	R. RABBIT	3	403	3.848	0.545	0.333	14.0	1.00
405	R. GOPHER	3	404	3.219	1.099	0.343	8.6	1.00
502	R. UG 4/0	3	503	6.382	0.242	0.204	108.0	1.00
503	R. UG 500M	3	504	10.192	0.116	0.192	262.0	1.00
504	R.UG 1000M	3	504	15.145	0.072	0.184	411.0	1.00

Note: Capital Costs of reinforcement types for overhead conductors are based on the WAPDA Work Order System, dated 03/11/93. Those costs are annualized with a 20% factor and 25% is added for installation costs. The underground costs are estimated by taking six times the cost of an overhead conductor of roughly the same capacity.

XI. FEEDERSITE PROCEDURE EXAMPLE

XI. FEEDERSITE PROCEDURE EXAMPLE

This section consists of a copy of the screen displays during a sample FEEDERSITE planning session. Prior to this session, the database had been prepared.

In this session, the system consisted of 3 substations taken from the database. An unserved load problem was checked out and solved, and segments were added for possible reconfiguration of the system. Cases were run with two different optimization options, and with and without reinforcement for voltage correction.

For the sake of saving space, program menus are shown in their complete form the first time they are used, but thereafter only the chosen option is shown. When no option was chosen, all options are removed.

Explanatory comments are added, inside of brackets, [ ], and in boldface type.

User entries are underlined.

The "- - - - - - - - - - - - - -" lines indicate where the program refreshes the screen.

For this session all output was sent to the screen. For study work the user will want to send results to the printer after reviewing them on the screen.

When running FEEDERSITE, the user should use graphical displays to review results, check out problem areas, and decide where to add segments for reconfiguration. That is not shown in this session.

A. SUMMARY OF THE FEEDERSITE SESSION

Select the study system by excluding Grid Stations and buses not wanted
Re-select the study system (for demonstration) by excluding everything and then including the Grid Stations wanted
Set the Control Parameters to 20% voltage drop, minimize load * distance, recognize source node and feeder capcities, and reinforce feeders for both capacity and voltage improvement
Optimize the system
Review the results, noting unserved load exists
Check out the reason for the unserved load
Correct the problem in the feeder types data
Add segments that the program can use to reconfigure the system
Select the system again
Optimize the system with the same control parameters as before
Review the results, no unserved load this time
Optimize the system again without reinforcing for voltage improvement
Review the results
Optimize the system again, minimizing load * linear cost
Review the results.

B. SAMPLE FEEDERSITE SESSION

```
Database: NONE        Study System: NO    CSF: NONE
-----------------------------------------------------

Primary Menu
OE - Optimize Existing Case Study File
CC - Create Case Study File/Optimize
ED - Edit/Display Data
AD - Auxiliary Data Operations
CN - Create New Data Base from Case Study File
SD - Send Data to Other CADPAD Programs
RD - Receive Data from Other Programs/Restore from Backup
BS - Backup Study System
OD - Optimize Database
EX - Exit FEEDERSITE

[ OPTIMIZE THE SYSTEM FROM AN EXISTING FEEDERSITE DATABASE. ]

Enter Primary Function: CC
- - - - - - - - - - - - - - - - - - - - -

Enter Data Base Name ( <7 CHARS ): DATA2
- - - - - - - - - - - - - - - - - - - - -
Page   1   FEEDERSITE    --   Release 12.92    --    11:51:45        14-OCT-93

SKP FDRSITE 13 MAR 93

[ THE DISPLAY BELOW SHOWS THE DIMENSIONS OF THE DATABASE AS SPECIFIED  ]
[ BY THE USER AT THE TIME THE DATABASE WAS CREATED.  IT ALSO SHOWS HOW ]
[ MANY OF EACH TYPE OF DATA HAVE BEEN USED AND HOW MANY ARE FREE TO BE ]
[ USED FOR ADDITIONS TO THE DATABASE.                                  ]

    Date created:     09:38:53        13-MAR-93
    Last accessed:    09:35:59        14-OCT-93
    Last modified:    09:21:22         7-APR-93

          Current data base storage statistics

    Data type            maximum  current  available
    ------------------   -------  -------  ---------
    Feeder Type              100       25         75
    Source Node               20       14          6
    Bus Location            5000     4601        399
    Feeder Segment          5000     4603        397
    Load Data                 10        5          5
    Regulator Type             2        0          2

File fetched:  DATA2
Do you wish to continue using this data base
( Y or N )? Y
- - - - - - - - - - - - - - - - - - - - -
```

```
Please select one of the following years:

        1990    1995    2000    2005    2010

Study Year (<5 DIGITS): 1990
- - - - - - - - - - - - - - - - - - - - -
[ WHEN THE FILE IS FETCHED THE ENTIRE DATA BASE IS AUTOMATICALLY INCLUDED.  ]
[ ONE WAY TO SPECIFY THE STUDY SYSTEM IS BY EXCLUDING THE UNWANTED REGIONS, ]
[ BY REGION NAME, AND THE UNWANTED BUSES THAT ARE NOT IN THE EXCLUDED       ]
[ REGIONS, AS IS DONE BY THE FOLLOWING ENTRIES.                             ]

    Database: DATA2     Study System: YES  CSF: NONE
    -----------------------------------------------------

Specify Study System
DS - Define Study Year
ID - Include Data in Study System
ED - Exclude Data from Study System
DD - Display Data
AD - Auxiliary Data Operations
PS - Process Study System

Enter Specify Study System Command: ED
- - - - - - - - - - - - - - - - - - - - -

    Database: DATA2     Study System: YES  CSF: NONE
    -----------------------------------------------------

Exclude From Study System by
ED - Entire Data Base
SA - Source-Node Assignment
RN - Region Name
CW - Coordinate Window
BN - Bus Number

Enter Exclude Option: RN
- - - - - - - - - - - - - - - - - - - - -

Region name (<15 CHARS): FAR T-1
Region name (<15 CHARS): FAR T-2
Region name (<15 CHARS): F.ABAD T-1
Region name (<15 CHARS): F.ABAD T-2
Region name (<15 CHARS): SUK T-1
Region name (<15 CHARS): SUK T-2
Region name (<15 CHARS): JOY T-1
Region name (<15 CHARS): JOY T-2
Region name (<15 CHARS): <RETURN>
- - - - - - - - - - - - - - - - - - - - -

    Database: DATA2     Study System: YES  CSF: NONE
    -----------------------------------------------------
```

```
Exclude From Study System by
BN - Bus Number

Enter Exclude Option: BN
- - - - - - - - - - - - - - - - - - - - -

Bus Id number (<32768): 6001
Bus Id number (<32768): 6002
Bus Id number (<32768): 6003
Bus Id number (<32768): /

- - - - - - - - - - - - - - - - - - - - -
[ ANOTHER WAY TO SPECIFY THE SAME STUDY SYSTEM IS TO EXCLUDE THE  ]
[ ENTIRE DATABASE AND THEN INCLUDE THE REGIONS YOU WANT, BY NAME, ]
[ AS IS DONE BY THE FOLLOWING ENTRIES.                            ]
- - - - - - - - - - - - - - - - - - - - -

    Database: DATA2     Study System: YES  CSF: NONE
    ---------------------------------------------------

Exclude From Study System by
ED - Entire Data Base

Enter Exclude Option: ED
- - - - - - - - - - - - - - - - - - - - -

Are you sure - CLEAR the ENTIRE Study System
( Y or N )? Y
- - - - - - - - - - - - - - - - - - - - -

    Database: DATA2     Study System: YES  CSF: NONE
    ---------------------------------------------------

Specify Study System
ID - Include Data in Study System

Enter Specify Study System Command: ID
- - - - - - - - - - - - - - - - - - - - -

    Database: DATA2     Study System: YES  CSF: NONE
    ---------------------------------------------------

Include in Study System by
ED - Entire Data Base
SA - Source-Node Assignment
RN - Region Name
CW - Coordinate Window
BN - Bus Number

Enter Include Option: RN
- - - - - - - - - - - - - - - - - - - - -
```

```
Region name (<15 CHARS): SKP T-1
Region name (<15 CHARS): SKP T-2
Region name (<15 CHARS): ATTA T-1
Region name (<15 CHARS): ATTA T-2
Region name (<15 CHARS): ATM T-1
Region name (<15 CHARS): ATM T-2
Region name (<15 CHARS): <RETURN>
- - - - - - - - - - - - - - - - - - - - -

    Database: DATA2      Study System: YES   CSF: NONE
    ---------------------------------------------------------

Include in Study System by

Enter Include Option: <RETURN>
- - - - - - - - - - - - - - - - - - - - -

    Database: DATA2      Study System: YES   CSF: NONE
    ---------------------------------------------------------

Specify Study System
PS - Process Study System

Enter Specify Study System Command: PS
- - - - - - - - - - - - - - - - - - - - -

    Database: DATA2      Study System: YES   CSF: NONE
    ---------------------------------------------------------

Process Study System
OS - Optimize Study System
SS - Save Study System in Case Study File
BS - Backup Study System
SD - Send Data to Other CADPAD Programs

[ THE SYSTEM IS NOW DEFINED; GO AHEAD AND OPTIMIZE IT. ]

Enter Process Study System Command: OS
- - - - - - - - - - - - - - - - - - - - -

[ THE PROGRAM DISPLAYS THE SYSTEM CONTROL PARAMETERS AND GIVES   ]
[ YOU A CHANCE TO CHANGE ANY OR ALL OF THEM  BEFORE PROCEEDING.  ]

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SKP FDRSITE 13 MAR 93
```

--- WAPDA CADPAD--- INPUT - SYSTEM CONTROL PARAMETERS ---- Year: 1990 ----

Unit System	METERS Per User Units	Power Factor/ For Flows	Cost of Losses (Rs/kW per Year)	Voltage Drop Limit	Feeder Capacity
Metric	1.0000	80.00%/ No	8000.00	12.00%	Thermal

Optimization Option	-- Observe Limits -- Source Node	Feeder	Reinforce Feeders	Reinforce for Voltage	Non-Radial Solution
Base Case	No	No	n/a	n/a	n/a

Load Ratio Percent	Cost of a New Switch	Max Switching Operations	Recognize Unswitchables	Observe Old Linear Costs
100.00	n/a	0 - Don't Care	No	n/a

[MODIFY SOME OF THE CONTROL PARAMETERS, INCLUDING]
[TO REINFORCE FOR CAPACITY & VOLTAGE CORRECTION.]

Hit <RETURN> to CONTINUE, Type <E> to EDIT this data: E
- -

Database: DATA2 Study System: YES CSF: NONE

System Control Parameter Editor

EM - English/Metric Units	Metric
FM - Feet/Meters per User Unit	1.0000 METERS
PF - Power Factor - In Flow/Loss Calc	80.00% - No
CL - Cost of Losses	Rs8000.00
VD - Voltage Drop Limit	12.00%
OC - Optimization Criteria	0 - Base Case
RS - Recognize Source Node Capacity	No
RF - Recognize Feeder Type Capacity	No
RC - Reinforce for Capacity	n/a
RV - Reinforce for Voltage	n/a
NR - Non-Radial Solution	n/a
PL - Percent Load Ratio	100.00%
CS - Cost of Adding a Switch	n/a
MS - Maximum Switching Operations	0 - Don't care
MA - Modify All Parameters	
RU - Recognize Unswitchables	No
OL - Observe Old Linear Costs	n/a
TC - Toggle Capacities of Feeders	

Enter Parameter to Modify: VD
- -

Voltage Drop Limit (12.00 Percent): 20

```
Will NOT reinforce feeder segments since
request to NOT reinforce segments was specified.
- - - - - - - - - - - - - - - - - - - - -

    Database: DATA2      Study System: YES   CSF: NONE
    ---------------------------------------------------

System Control Parameter Editor
OC - Optimization Criteria

Enter Parameter to Modify: OC
- - - - - - - - - - - - - - - - - - - -

    Optimization Options:
    0 - Run Base Case (Do Not Optimize)
    1 - Minimize Load x Distance
    2 - Minimize Load x Resistance
    3 - Minimize Load x Linear Cost

Enter Option ( 0 ): 2

Other parameters have been reset. Please check carefully.

Hit <RETURN> to continue. <RETURN>
- - - - - - - - - - - - - - - - - - - -

    Database: DATA2      Study System: YES   CSF: NONE
    ---------------------------------------------------

System Control Parameter Editor
RS - Recognize Source Node Capacity      No

Enter Parameter to Modify: RS
- - - - - - - - - - - - - - - - - - - -

Recognize source-node capacity limits
( Y or N )? Y
- - - - - - - - - - - - - - - - - - - -

    Database: DATA2      Study System: YES   CSF: NONE
    ---------------------------------------------------

System Control Parameter Editor
RF - Recognize Feeder Type Capacity      No

Enter Parameter to Modify: RF
- - - - - - - - - - - - - - - - - - - -

Recognize feeder capacity limits
( Y or N )? Y
- - - - - - - - - - - - - - - - - - - -
```

```
Database: DATA2      Study System: YES  CSF: NONE
-------------------------------------------------------

System Control Parameter Editor
RC - Reinforce for Capacity                    No

Enter Parameter to Modify: RC
- - - - - - - - - - - - - - - - - - - - -

Reinforce feeder segments
( Y or N )? Y
- - - - - - - - - - - - - - - - - - - - -

Database: DATA2      Study System: YES  CSF: NONE
-------------------------------------------------------

System Control Parameter Editor
RV - Reinforce for Voltage                     No

Enter Parameter to Modify: RV
- - - - - - - - - - - - - - - - - - - - -

Reinforce segments to meet voltage drop limit
( Y or N )? Y
- - - - - - - - - - - - - - - - - - - - -

Database: DATA2      Study System: YES  CSF: NONE
-------------------------------------------------------

System Control Parameter Editor

[ WHEN YOU HAVE FINISHED MODIFYING THE SYSTEM CONTROL PARAMETERS, ]
[ DISPLAY THEM AND CHECK THE CHANGES YOU MADE, BEFORE PROCEEDING. ]

Enter Parameter to Modify: <RETURN>
- - - - - - - - - - - - - - - - - - - - -

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SKP FDRSITE 13 MAR 93

--- WAPDA CADPAD--- INPUT - SYSTEM CONTROL PARAMETERS ---- Year: 1990 ----

 Unit    METERS Per    Power Factor/   Cost of Losses    Voltage      Feeder
System   User Units    For Flows       (Rs/kW per Year)  Drop Limit   Capacity

Metric     1.0000      80.00%/ No      8000.00           20.00%       Thermal
```

Optimization Option	-- Observe Limits -- Source Node	Feeder	Reinforce Feeders	Reinforce for Voltage	Non-Radial Solution
Load x Resistance	Yes	Yes	Yes	Yes	No

Load Ratio Percent	Cost of a New Switch	Max Switching Operations	Recognize Unswitchables	Observe Old Linear Costs
100.00	n/a	0 - Don't Care	No	n/a

Hit <RETURN> to CONTINUE, Type <E> to EDIT this data: <RETURN>

[THE CHANGES ARE OK, SO GO AHEAD WITH THE OPTIMIZATION.]

- -

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... Data Acquisition in progress

... Optimization in progress

... Base Case Calculations in progress

Database: DATA2 Study System: YES CSF: NONE

Base Case Summary

Maximum voltage drop: 20.86
Unserved load: 6.85
Total cost: 25233.00

... Optimization in progress

Optimized Case Summary

Maximum voltage drop: 17.06
Unserved load: 0.38
Total cost: 27584.00

[THE PROGRAM SOLVES THE BASE CASE AND DISPLAYS A SUMMARY OF THE RESULTS.]
[IT THEN PERFORMS THE OPTIMIZATION SPECIFIED IN THE SYSTEM CONTROL]
[PARAMETERS AND DISPLAYS A SUMMARY OF THOSE RESULTS. IN THIS RUN THE COST]
[COST OF THE OPTIMIZED SYSTEM IS HIGHER, AS SHOWN IN THE SUMMARIES ABOVE,]
[BECAUSE REINFORCEMENTS WERE MADE TO THE FEEDER NETWORK AND THERE WAS]
[LESS UNSERVED LOAD (IN OTHER WORDS MORE LOAD WAS SERVED.)]

Hit <RETURN> to continue. <RETURN>

*** Optimization completed.

- -

Database: DATA2 Study System: YES CSF: NONE

Process Optimization Results
SF - Send Results to FEEDERDESIGN
SR - Store Results in Data Base
DR - Display Results
EX - Exit Process Optimization Results

[NOW GO AND LOOK AT THE DETAILS OF THE RESULTS OF THE OPTIMIZATION.]

Enter Process Results Option: DR

Database: DATA2 Study System: YES CSF: NONE

Display Optimization Results
OP - Optimal Power Flow
SS - Switching Status Changes
RS - Reinforced Segments
SN - Source Node Summary
UL - Unserved Loads
ID - Input Data Review
GD - Graphic Displays
QD - Quick Data Review
NR - Non-Radial Segments

[AT THIS POINT THE USER NORMALLY GOES TO THE GRAPHIC DISPLAYS TO GET AN]
[OVERALL VISUAL PICTURE OF WHERE THERE ARE VOLTAGE PROBLEMS AND UNSERVED]
[LOAD. HE ALSO CAN SEE WHERE THERE ARE OVERLOADED SEGMENTS AND GRID]
[STATIONS, AND WHERE FEEDER SEGMENTS HAVE BEEN REINFORCED. HE CAN ALSO]
[USE THE ZOOM AND LABEL FEATURES OF THE GRAPHICAL DISPLAYS TO GET TO THE]
[DETAILS OF THE PROBLEM AREAS. THESE STEPS CANNOT BE SHOWN IN THIS]
[FORMAT, SO WE GO NOW TO THE TABULAR DISPLAYS TO REVIEW THE RESULTS.]

Enter Display Results Option: UL

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********** WAPDA CADPAD OUTPUT - UNSATISFIED LOADS **********

UNSATISFIED LOAD BUS ---- NAME ----	NUMBER	ADD. CAP. NEEDED-KVA	SERVED BY SOURCE ND NO.	---- NAME ----	LIM. CAP. SEG'S FROM-BUS / TO-BUS
	3901	17	-------	NONE -------	
	3899	149	-------	NONE -------	
	522	73	-------	NONE -------	
	521	141	2	SKP T-1	
					431 / 477
					477 / 478

```
[ THIS DISPLAY SHOWS THAT THERE IS UNSERVED LOAD AT FOUR BUSES.  AT BUS  ]
[ 521 SOME OF THE LOAD WAS SERVED, SO THE PROGRAM TELLS US WHERE IT WAS  ]
[ SERVED FROM AND WHAT ELEMENTS WERE AT THEIR LIMITING CAPACITY SO THAT  ]
[ THE REMAINING LOAD COULD NOT BE SERVED.  TWO SEGMENTS ARE AT THEIR     ]
[ CAPACITY LIMIT, PREVENTING LOADS FROM BEING SERVED. WE CANNOT TELL WHY ]
[ THE OTHER LOADS ARE NOT BEING SERVED, BUT IT COULD BE FOR THE SAME     ]
[ REASON IF THOSE BUSES ARE SERVED THROUGH BUS521.                       ]

Hit <RETURN> to CONTINUE. <RETURN>
- - - - - - - - - - - - - - - - - - - -

    Database: DATA2      Study System: YES  CSF: NONE
    ---------------------------------------------------

Display Optimization Results
SN - Source Node Summary

Enter Display Results Option: SN
- - - - - - - - - - - - - - - - - - - -

    Database: DATA2      Study System: YES  CSF: NONE
    ---------------------------------------------------

Select Source Nodes for Summary
AL - All
SL - Source-Node Loading
VD - Voltage Drop
SN - Source-Node Number
NA - Name
CW - Coordinate Window
CA - Capacity
CC - Capital Cost
SS - System Summary

Enter Select Source Nodes Command: AL
- - - - - - - - - - - - - - - - - - - -

[ THE FOLLOWING IS AN IMPORTANT DISPLAY SUMMARIZING      ]
[ THE RESULTS BY GRID STATION AND FOR THE TOTAL SYSTEM.  ]

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SKP FDRSITE 13 MAR 93


*** WAPDA CADPAD OUTPUT - SOURCE NODE SUMMARY (ENTIRE SYSTEM) ****************
NUMBER  DESCRIPTION    (X, Y SOURCE NODE LOCATION)  (X, Y LOAD CENTER LOCATION)
        ----------------------------* - - - - - COSTS(Rs1000)- - - - - *
         MAX %      LOAD     CAP.    %      LOSS/FEEDER/SOURCE          TOTAL
         V.DROP    -----MVA-----    CAP.
```

```
  1 SKP                    (  402376.500, 3505767.500)  (  401098.531, 3506015.000)
      17.1      21.5    26.0    83.     9076    1014       0              10090
 431 SKP T-1               (  402363.313, 3505779.000)  (  402006.438, 3504858.750)
      12.2      20.8    26.0    80.     7141      95       0               7236
1039 ATTA ABAD             (  413795.000, 3505084.500)  (  411515.281, 3505630.500)
       9.9      25.8    26.0    99.     7188      25       0               7213
1069 ATTA T-2              (  413798.000, 3505089.250)  (  413392.375, 3505318.500)
       3.3      18.1    26.0    70.     1062       0       0               1062
Hit <RETURN> to CONTINUE, Type <Q> to QUIT this display: <RETURN>
- - - - - - - - - - - - - - - - - - - - - -

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*** WAPDA CADPAD OUTPUT - SOURCE NODE SUMMARY (ENTIRE SYSTEM) ****************
NUMBER  DESCRIPTION    (X, Y SOURCE NODE LOCATION)  (X, Y LOAD CENTER LOCATION)
        ----------------------------* - - - - - COSTS(Rs1000)- - - - - *
        MAX %     LOAD     CAP.    %       LOSS/FEEDER/SOURCE              TOTAL
        V.DROP   -----MVA-----   CAP.

3375 A.T.M.                (  408770.094, 3507767.250)  (  406307.938, 3508503.000)
       6.3       5.1     13.0    39.     1461       0       0               1461
3479 A.T.M T-1             (  408770.500, 3507766.750)  (  408641.406, 3507898.000)
       3.5       7.3     13.0    56.      514       7       0                521
SYSTEM  17.1     98.7    130.0    76.    26442    1142       0             27584
-----------------------------------------------------------------------------------
Hit <RETURN> to CONTINUE. <RETURN>
- - - - - - - - - - - - - - - - - - - - -

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*********** WAPDA CADPAD OUTPUT - SYSTEM SUMMARY ******************************
MAX %     LOAD     CAP.    %    UNSERVED    LOSS/FEEDER/SOURCE/SWITCH    TOTAL
V.DROP   -----MVA-----   CAP.   LD (MVA)    --------- COSTS (Rs1000) --------
  17.1    98.7    130.0    76.    0.380    26442    1142       0    0.00    27584
Hit <RETURN> to CONTINUE. <RETURN>
- - - - - - - - - - - - - - - - - - - - -

   Database: DATA2      Study System: YES   CSF: NONE
   ---------------------------------------------------
```

```
Display Optimization Results
NR - Non-Radial Segments

Enter Display Results Option: NR
- - - - - - - - - - - - - - - - - - - - -

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**** WAPDA CADPAD OUTPUT - Non-Radial Segments ********************
    Bus Name and Number
-------------------------------------------------------------------
       Receiving Buses          Initial   Final   N/R Segment Name

   ********* NO Non-Radial Segments were Found ****************

Hit <RETURN> to CONTINUE. <RETURN>
- - - - - - - - - - - - - - - - - - - - -

    Database: DATA2      Study System: YES  CSF: NONE
    -------------------------------------------------------

Display Optimization Results
SS - Switching Status Changes

Enter Display Results Option: SS
- - - - - - - - - - - - - - - - - - - - -

    Database: DATA2      Study System: YES  CSF: NONE
    -------------------------------------------------------

Switching Status Changes
AL - All
NR - Non-Radials
NS - New Switches
SO - Switches Opened
SC - Switches Closed
SS - Switching Status Statistics

Enter Switch Status Report: AL
- - - - - - - - - - - - - - - - - - - - -

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SKP FDRSITE 13 MAR 93

**** WAPDA CADPAD OUTPUT - Segment Switching Changes *************
    Bus Name and Number
-------------------------------------------------------------------
       Receiving Buses          Initial   Final   N/R Segment Name
```

```
456
    455     0-CLOSED  2-OPEN
523
    519     0-CLOSED  2-OPEN
3901
    521     0-CLOSED  2-OPEN
3901
    522     0-CLOSED  2-OPEN
3899
    523     0-CLOSED  2-OPEN
3899
    524     0-CLOSED  2-OPEN
1189
   1039     1-CLOSED  2-OPEN      ** Connected *
1112
   1052     1-CLOSED  2-OPEN      ** Connected *
```

Hit <RETURN> to CONTINUE, Type <Q> to QUIT this display: <RETURN>

```
- - - - - - - - - - - - - - - - - - - - - -
[ FOR BREVITY, ONLY THE FIRST AND LAST PAGES OF THIS DISPLAY ARE SHOWN.      ]
[ SEGMENTS MAY BE OPENED BY THE PROGRAM, DURING OPTIMIZATION, FOR TWO        ]
[ REASONS.  FIRST, IF A SEGMENT IS NOT NEEDED, WHICH WOULD OCCUR IF A BUS    ]
[ AT THE END OF A BRANCH OF A FEEDER HAD NO LOAD, THEN THE PROGRAM WILL      ]
[ OPEN THE LAST SEGMENT OF THE FEEDER.  SECOND, IF THE PROGRAM DECIDES TO    ]
[ RECONFIGURE THE FEEDER NETWORK, REARRANGING A FEEDER OR SWITCHING LOAD     ]
[ BETWEEN FEEDERS OR GRID STATIONS, IT WILL OPEN ONE SEGMENT AND CLOSE       ]
[ ANOTHER SEGMENT TO CHANGE A ROUTING FOR SERVING THE LOAD.  THE SEGMENTS    ]
[ WITH THE NAME "** CONNECTED *" ARE SEGMENTS THAT WERE CREATED USING THE    ]
[ "CONNECT" FUNCTION IN FEEDERSITE.  IF A SEGMENT IS CLOSED BY THE PROGRAM   ]
[ AND THEN OPENED AGAIN, AS MIGHT HAPPEN IN A CASE WHERE THE USER SPECIFIES  ]
[ THAT A NON-RADIAL SOLUTION IS NOT ALLOWED, THE DISPLAY WILL SHOW THE       ]
[ INITIAL AND FINAL STATUSES BOTH AS OPEN, BUT THE LINE WILL BE FLAGGED      ]
[ WITH A "*" TO SHOW THAT HAD HAPPENED.                                      ]
- - - - - - - - - - - - - - - - - - - - - -
```

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**** WAPDA CADPAD OUTPUT - Segment Switching Changes **********

```
    Bus Name and Number
-------------------------------------------------------------------
       Receiving Buses        Initial   Final   N/R Segment Name

                 4111
                    1324     1-CLOSED  2-OPEN      ** Connected *
                 4447
                    1372     1-CLOSED  2-OPEN      ** Connected *
                 4445
                    1372     1-CLOSED  2-OPEN      ** Connected *
                 4443
                    1372     1-CLOSED  2-OPEN      ** Connected *
```

```
3479
   3375     1-CLOSED  2-OPEN    .    ** Connected *
3944
   3931     1-CLOSED  2-OPEN       ** Connected *
4068
   3936     1-CLOSED  2-OPEN       ** Connected *
```

Hit <RETURN> to CONTINUE. <RETURN>

Database: DATA2 Study System: YES CSF: NONE

Switching Status Changes

Enter Switch Status Report: <RETURN>

Database: DATA2 Study System: YES CSF: NONE

Display Optimization Results

RS - Reinforced Segments

Enter Display Results Option: RS

Database: DATA2 Study System: YES CSF: NONE

Display Reinforced Segments
AL - All
IC - to Increase Capacity
IV - to Improve Voltage
SU - Summary

Enter Reinforced Segments to Display: AL

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SKP FDRSITE 13 MAR 93

```
* WAPDA CADPAD OUTPUT - FEEDER SEGMENTS REINFORCED TO INCREASE CAPACITY *
FROM BUS/TO BUS          TYPE-BEFORE/TYPE-AFTER SEGMENT NAME COSTS(1000S)

26        114 GSL #8                                                0.5
  27        405 RECON G

48        114 GSL #8                                                8.2
  47        405 RECON G
```

```
50        114 GSL #8
  48        405 RECON G                                          1.7

65        114 GSL #8
3981        405 RECON G                                          2.1

70        114 GSL #8
  65        405 RECON G                                          3.4
```

Hit <RETURN> to CONTINUE, Type <Q> to QUIT this display: <RETURN>

```
- - - - - - - - - - - - - - - - - - - - - - -
[ FOR BREVITY, ONLY THE FIRST AND LAST PAGES OF THIS DISPLAY ARE SHOWN.      ]
[ SEGMENTS MAY BE REINFORCED BY THE PROGRAM, DURING OPTIMIZATION, FOR TWO    ]
[ REASONS.  FIRST, IF THERE IS NO ALTERNATE WAY TO SERVE LOAD AND THE LOAD   ]
[ EXCEEDS THE CAPACITY, THE PROGRAM WILL REINFORCE THE SEGMENT IF IT CAN.    ]
[ IF THE SEGMENT IS AT ITS MAXIMUM REINFORCEMENT STEP, IT CANNOT BE          ]
[ REINFORCED AND THE RESULT IS UNSERVED LOAD, AS OCCURRED IN THIS RUN.       ]
[ SECOND, THE PROGRAM WILL REINFORCE A SEGMENT IF IT DETERMINES THAT DOING   ]
[ SO WILL CONTRIBUTE TO MINIMIZING THE OBJECTIVE FUNCTION, WHICH IS          ]
[ SPECIFIED BY THE USER WHEN HE CHOOSES THE OPTIMIZATION OPTION.             ]
- - - - - - - - - - - - - - - - - - - - - - -
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* WAPDA CADPAD OUTPUT - FEEDER SEGMENTS REINFORCED TO INCREASE CAPACITY +
FROM BUS/TO BUS            TYPE-BEFORE/TYPE-AFTER SEGMENT NAME COSTS(1000$)

4027        104 RABBIT
  200         403 RECON D                                        7.5

4060        103 DOG
    1         401 RECON O                                        0.1

4061        103 DOG
 4060         401 RECON O                                        5.0

4062        103 DOG
 4061         401 RECON O                                        2.7

4115        112 CU #5 SWG
  481         403 RECON D                                        3.9

                                                        --------------
                                                              433.1
```

Hit <RETURN> to CONTINUE. <RETURN>

```
- - - - - - - - - - - - - - - - - - - - - - -
Page   1  FEEDERSITE    --  Release 12.92    --    12:04:28          14-OCT-93

SKP FDRSITE 13 MAR 93
```

```
* WAPDA CADPAD OUTPUT - FEEDER SEGMENTS REINFORCED TO IMPROVE VOLTAGE **
FROM BUS/TO BUS          TYPE-BEFORE/TYPE-AFTER SEGMENT NAME COSTS(1000S)

                200      403 RECON D                                  3.3
                  199      401 RECON O

                201      403 RECON D                                 15.2
                 4027      401 RECON O


                202      403 RECON D                                 14.5
                  201      401 RECON O

                203      403 RECON D                                 24.2
                  202      401 RECON O

                204      403 RECON D                                  5.1
                  203      401 RECON O

Hit <RETURN> to CONTINUE, TYPE <Q> TO QUIT THIS DISPLAY: <RETURN>
- - - - - - - - - - - - - - - - - - - - - -
[ FOR BREVITY, ONLY THE FIRST AND LAST PAGES OF THIS DISPLAY ARE SHOWN.      ]
[ SEGMENTS ARE REINFORCED TO IMPROVE VOLTAGE ONLY IF THE USER SELECTS THAT   ]
[ OPTION IN THE SYSTEM CONTROL PARAMETERS.  THE PROGRAM REINFORCES SEGMENTS  ]
[ TO IMPROVE VOLTAGE AFTER THE OPTIMIZATION IS COMPLETED AND AFTER THE       ]
[ SEGMENTS HAVE BEEN REINFORCED FOR CAPACITY.  THE PROGRAM REINFORCES        ]
[ SEGMENTS TO IMPROVE VOLTAGE UNTIL EITHER THE VOLTAGE IS WITHIN THE         ]
[ SPECIFIED LIMIT OR UNTIL THE REINFORCEMENT LIMIT IS REACHED.  THESE        ]
[ REINFORCEMENTS ARE NOT COST JUSTIFIED SO THE COST/BENEFIT JUSTIFICATION    ]
[ MUST BE DONE BY THE USER BY SOME METHOD OUTSIDE OF THE FEEDERSITE PROGRAM. ]
- - - - - - - - - - - - - - - - - - - - - -
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* WAPDA CADPAD OUTPUT - FEEDER SEGMENTS REINFORCED TO IMPROVE VOLTAGE **
FROM BUS/TO BUS          TYPE-BEFORE/TYPE-AFTER SEGMENT NAME COSTS(1000S)

                4009     104 RABBIT                                  10.5
                  4010     401 RECON C

                4010     104 RABBIT                                  22.0
                   227     401 RECON O

                4027     403 RECON D                                 10.9
                   200     401 RECON O
                                                  --------------
                                                  TOTAL     708.5
Hit <RETURN> to CONTINUE. <RETURN>
- - - - - - - - - - - - - - - - - - - - - -
```


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[THE FOLLOWING TABLE SUMMARIZES THE REINFORCEMENTS MADE BY THE PROGRAM]
[DURING THE OPTIMIZATION. "ADDED" MEANS THAT MANY KILOMETERS OF FEEDER]
[WERE REINFORCED TO THAT TYPE, AND "REMOVED" MEANS THAT MANY KILOMETERS]
[OF THAT TYPE OF FEEDER WERE REPLACED BY ANOTHER TYPE. THE FINAL RESULTS]
[FOR THE SYSTEM ARE GIVEN, ALONG WITH THE COSTS OF REINFORCEMENTS.]

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* WAPDA CADPAD OUTPUT - Radial Circuit Inventory of Lines by Type ***

Line Type	Description	Added	Removed	Final	Capital
		---------- Kilometers		----------	Costs(1000$)
100	NONE	0.00	0.00	0.00	0.0
101	PANTHER	0.00	0.00	3.02	0.0
103	DOG	0.00	4.41	246.31	0.0
104	RABBIT	0.00	5.73	179.83	0.0
105	GOPHER	0.00	4.40	128.81	0.0
106	WASP	0.00	0.00	0.00	0.0
107	ANT	0.00	0.00	0.49	0.0
108	GNAT	0.00	0.00	0.00	0.0
109	CU 7/.193	0.00	0.00	0.82	0.0
110	CU 7/.136	0.00	0.00	0.00	0.0
111	CU #3 SWG	0.00	0.00	1.36	0.0
112	CU #5 SWG	0.00	1.14	6.41	0.0
113	CU #8 SWG	0.00	0.53	6.04	0.0
114	GSL #8	0.00	17.70	21.63	0.0
116	OSPREY	0.00	0.00	0.00	0.0
117	PELICAN	0.00	0.00	0.00	0.0
201	UG 2AWG	0.00	0.00	0.17	0.0

Hit <RETURN> to CONTINUE, Type <Q> to QUIT this display: <RETURN>
- -

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SKP FDRSITE 13 MAR 93

* WAPDA CADPAD OUTPUT - Radial Circuit Inventory of Lines by Type ***

Line Type	Description	Added	Removed	Final	Capital
		---------- Kilometers		----------	Costs(1000$)
202	UG 4/0 AWG	0.00	0.00	0.73	0.0
203	UG 500 MCM	0.00	0.00	0.73	0.0
204	UG 1000 MC	0.00	0.00	0.00	0.0
303	NEW LINE D	0.00	0.00	0.00	0.0
401	RECON O	10.88	0.00	10.88	818.3
403	RECON D	4.66	0.00	4.66	142.1
404	RECON R	0.66	0.00	0.66	9.5
405	RECON G	17.70	0.00	17.70	171.7
	Totals for Segments in the Radial System:			630.26	1141.6

[WE ARE FINISHED WITH THIS RUN. RETURN TO THE PRIMARY MENU.]

Hit <RETURN> to CONTINUE. <RETURN>

- -

Database: DATA2 Study System: YES CSF: NONE

Display Optimization Results

Enter Display Results Option: <RETURN>

- -

Database: DATA2 Study System: YES CSF: NONE

Process Optimization Results
EX - Exit Process Optimization Results

Enter Process Results Option: EX

- -

Database: DATA2 Study System: YES CSF: NONE

Process Study System

Enter Process Study System Command: <RETURN>

- -

Database: DATA2 Study System: YES CSF: NONE

Specify Study System

Enter Specify Study System Command: <RETURN>

- -

Database: DATA2 Study System: YES CSF: NONE

Primary Menu
ED - Edit/Display Data

[GO TO THE EDITOR AND CHECK OUT THE SEGMENTS THAT ARE CAPACITY]
[LIMITED, AND THEN FIX THE PROBLEM IF THAT IS WHAT CAUSED IT.]

Enter Primary Function: ED

- -

```
Database: DATA2      Study System: YES   CSF: NONE
-----------------------------------------------------

Edit Functions
AD - Add
MO - Modify
DE - Delete
DI - Display
SD - System Diagram

Enter Data Edit Function: DI
- - - - - - - - - - - - - - - - - - -

Database: DATA2      Study System: NO   CSF: NONE
-----------------------------------------------------

Display Data Category
AL - All
FT - Feeder Type
SN - Source Node
BL - Bus Location
FS - Feeder Segment
LD - Load Data
RT - Regulator Type
SC - System Control Parameters
SD - System Diagram
DB - Data Base Statistics
```

[DISPLAY THE FEEDER SEGMENT DATA FOR THE TWO SEGMENTS LIMITING THE FLOW.]

```
Enter Data Category to Display: FS
- - - - - - - - - - - - - - - - - - -

Database: DATA2      Study System: NO   CSF: NONE
-----------------------------------------------------

Display Feeder Segment
AL - All
SI - Single
SE - Sequence
NA - Name
SF - Specific Field

Select Feeder Segment Grouping for Display: SI
- - - - - - - - - - - - - - - - - - - -

Bus Number (<32768): 477
Terminal Bus (<32768): 431
- - - - - - - - - - - - - - - - - - - -
Page   1   FEEDERSITE    --   Release 12.92    --    12:06:44          14-OCT-93

SKP FDRSITE 13 MAR 93
```

```
- - - INPUT - FEEDER SEGMENT DATA - - -  - - - - - - - - - - - - - - - - - - - - - -
  BUS NUMBER 1  BUS NUMBER 2   STATUS     NAME        LENGTH          NAME
------- TERMINAL BUSES ------  ------ -FEEDER TYPE-  ------       -REGULATOR-
    NAME                NAME     PHASES    NUMBER       NAME          NUMBER

       431              477    UNSWBL UG 2AWG              1.0
                                 ABC       201                              0

Hit <RETURN> to CONTINUE. <RETURN>
- - - - - - - - - - - - - - - - - - - - - -

Bus Number (<32768): 477
Terminal Bus (<32768): 478
- - - - - - - - - - - - - - - - - - - - - -
Page   1  FEEDERSITE    --  Release 12.92    --    12:07:16        14-OCT-93

SKP FDRSITE 13 MAR 93

- - - INPUT - FEEDER SEGMENT DATA - - -  - - - - - - - - - - - - - - - - - - - - - -
  BUS NUMBER 1  BUS NUMBER 2   STATUS     NAME        LENGTH          NAME
------- TERMINAL BUSES ------  ------ -FEEDER TYPE-  ------       -REGULATOR-
    NAME                NAME     PHASES    NUMBER       NAME          NUMBER

       477              478    UNSWBL UG 2AWG             16.5
                                 ABC       201                              0

[ WE SEE THAT BOTH SEGMENTS WHICH ARE LIMITING THE FLOW ARE THE SAME TYPE,  ]
[ TYPE 201, UG 2AWG.  NOW GO AND DISPLAY THE FEEDER TYPE DATA TO SEE WHY IT ]
[ DID NOT REINFORCE TO A HIGHER CAPACITY TYPE OF FEEDER.                    ]

Hit <RETURN> to CONTINUE. <RETURN>
- - - - - - - - - - - - - - - - - - - - - -

Bus Number (<32768): /
- - - - - - - - - - - - - - - - - - - - - -

    Database: DATA2      Study System: NO    CSF: NONE
    ---------------------------------------------------

Display Feeder Segment

Select Feeder Segment Grouping for Display: <RETURN>
- - - - - - - - - - - - - - - - - - - - - -

    Database: DATA2      Study System: NO    CSF: NONE
    ---------------------------------------------------

Display Data Category
FT - Feeder Type

Enter Data Category to Display: FT
- - - - - - - - - - - - - - - - - - - - - -
```

Database: DATA2 Study System: NO CSF: NONE

Display Feeder Type
AL - All
SI - Single
SE - Sequence
NA - Name
SF - Specific Field

Select Feeder Type Grouping for Display: AL

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SKP FDRSITE 13 MAR 93

--- INPUT - FEEDER TYPE DATA ---

TYPE NUMBER	TYPE NAME	NUMBER OF PHASES	RECON-DUCTOR TYPE	THERMAL CAPACITY (MVA)	PER MILE/KILOMETER RESIS (PU ON 100 MVA)	PER MILE/KILOMETER REACT (PU ON 100 MVA)	COSTS (Rs1000)	COSTS Rs/KVA
100	NONE	3	405	0.000	0.000	0.000	0.0	0.00
101	PANTHER	3	101	9.906	0.139	0.266	0.0	80.23
103	DOG	3	401	5.848	0.277	0.312	0.0	83.69
104	RABBIT	3	403	3.848	0.544	0.333	0.0	83.78
105	GOPHER	3	404	3.219	1.099	0.343	0.0	83.79
106	WASP	3	401	6.153	0.272	0.302	0.0	83.69
107	ANT	3	403	4.020	0.550	0.328	0.0	83.78
108	GNAT	3	108	2.800	0.919	0.348	0.0	150.22
109	CU 7/.193	3	401	6.477	0.134	0.287	0.0	82.98
110	CU 7/.136	3	401	3.810	0.272	0.307	0.0	83.69
111	CU #3 SWG	3	403	2.286	0.550	0.328	0.0	83.78
112	CU #5 SWG	3	403	1.715	0.776	0.338	0.0	83.79
113	CU #8 SWG	3	404	1.143	1.361	0.354	0.0	83.79
114	GSL #8	3	405	0.095	7.852	0.613	0.0	83.79
116	OSPREY	3	116	12.573	0.102	0.262	0.0	74.64
117	PELICAN	3	117	11.278	0.119	0.266	0.0	78.39

Hit <RETURN> to CONTINUE, Type <Q> to QUIT this display: <RETURN>

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[DO NOT USE THESE REINFORCEMENT]
[FEEDER TYPES FOR FUTURE STUDIES.]
[SEE SECTION X.C OF THIS MANUAL.]

--- INPUT - FEEDER TYPE DATA ---

TYPE NUMBER	TYPE NAME	NUMBER OF PHASES	RECON-DUCTOR TYPE	THERMAL CAPACITY (MVA)	PER MILE/KILOMETER RESIS (PU ON 100 MVA)	PER MILE/KILOMETER REACT (PU ON 100 MVA)	COSTS (Rs1000)	COSTS Rs/KVA
201	UG 2AWG	3	201	3.048	0.733	0.224	0.0	130.50
202	UG 4/0 AWG	3	202	6.382	0.242	0.204	0.0	90.31

254

203 UG 500 MCM	3	203	10.192	0.116	0.192	0.0	68.06
204 UG 1000 MC	3	204	15.145	0.072	0.184	0.0	64.04
303 NEW LINE D	3	303	5.848	0.277	0.312	46.6	106.53
401 RECON O	3	401	12.573	0.102	0.262	75.2	83.85
403 RECON D	3	401	5.848	0.277	0.312	30.5	83.80
404 RECON R	3	403	3.848	0.545	0.333	14.4	83.79
405 RECON G	3	404	3.219	1.099	0.343	9.7	83.79
502 R. UG 4/0	3	502	6.382	0.242	0.204	108.0	1.00

```
[ THE PROBLEM IS THAT TYPE 201 CANNOT BE REINFORCED. GO AHEAD AND CHANGE ]
[ IT SO TO REINFORCE TO A HIGHER CAPACITY FEEDER TYPE.  LET IT REINFORCE ]
[ TO FEEDER TYPE 502, WHICH IS THE NEXT HIGHER CAPACITY FOR UNDERGROUND. ]

Hit <RETURN> to CONTINUE. <RETURN>
- - - - - - - - - - - - - - - - - - - - -

    Database: DATA2      Study System: NO    CSF: NONE
    ---------------------------------------------------

Display Feeder Type

Select Feeder Type Grouping for Display: <RETURN>
- - - - - - - - - - - - - - - - - - - - -

    Database: DATA2      Study System: NO    CSF: NONE
    ---------------------------------------------------

Display Data Category

Enter Data Category to Display: <RETURN>
- - - - - - - - - - - - - - - - - - - - -

    Database: DATA2      Study System: NO    CSF: NONE
    ---------------------------------------------------

Edit Functions
MO - Modify

Enter Data Edit Function: MO
- - - - - - - - - - - - - - - - - - - - -

    Database: DATA2      Study System: NO    CSF: NONE
    ---------------------------------------------------

Modify Data Category
FT - Feeder Type
SN - Source Node
BL - Bus Location
FS - Feeder Segment
LD - Load Data
RT - Regulator Type
SC - System Control Parameters
```

```
Enter Data Category to Modify: FT
- - - - - - - - - - - - - - - - - - - - - -

Id Number (<1000): 201
- - - - - - - - - - - - - - - - - - - - - -
Page   1  FEEDERSITE    --  Release 12.92    --   12:10:03        14-OCT-93

- -  MODIFY - FEEDER TYPE DATA - - - - - - - - - - - - - - - - - - - - - - - - - - -
                        NUMBER RECON-  THERMAL -------- PER MILE/KILOMETER ------
-------- TYPE -------- OF    DUCTOR CAPACITY   RESIS     REACT    ---- COSTS ---
  NUMBER        NAME  PHASES  TYPE   (MVA)     (PU ON 100 MVA) (Rs1000) Rs/KVA

    201 UG 2AWG         3      201     3.048    0.733    0.224        0.0 130.50

New data:
,,,502
- - - - - - - - - - - - - - - - - - - - - -
Page   1  FEEDERSITE    --  Release 12.92    --   12:10:27        14-OCT-93

- - - INPUT - FEEDER TYPE DATA - - - - - - - - - - - - - - - - - - - - - - - - - - -
                        NUMBER RECON-  THERMAL -------- PER MILE/KILOMETER ------
-------- TYPE -------- OF    DUCTOR CAPACITY   RESIS     REACT    ---- COSTS ---
  NUMBER        NAME  PHASES  TYPE   (MVA)     (PU ON 100 MVA) (Rs1000) Rs/KVA

    201 UG 2AWG         3      502     3.048    0.733    0.224        0.0 130.50

Type <S> to Save, <Q> to Quit without saving the new data: S

Id Number (<1000): /
- - - - - - - - - - - - - - - - - - - - - -

    Database: DATA2     Study System: NO   CSF: NONE
    ----------------------------------------------------

Modify Data Category

Enter Data Category to Modify: <RETURN>
- - - - - - - - - - - - - - - - - - - - - -

    Database: DATA2     Study System: NO   CSF: NONE
    ----------------------------------------------------
[ WE THINK WE HAVE SOLVED THE PROBLEM OF THE UNSERVED LOADS.  NOW GO AND ADD ]
[ SOME SEGMENTS BETWEEN BUSES ON DIFFERENT BRANCHES OF A FEEDER, BETWEEN     ]
[ DIFFERENT FEEDERS OF A GRID STATION, AND BETWEEEN FEEDERS OF DIFFERENT     ]
[ GRID STATIONS, SO THAT THE PROGRAM CAN CHOOSE FROM THEM ANY SEGMENTS WHICH ]
[ WILL IMPROVE THE FEEDER NETWORK.  THE USER SHOULD REVIEW THE SYSTEM        ]
[ DIAGRAM ON THE SCREEN OR, PREFERABLY, ON A LARGER PLOT, TO SEE WHAT BUSES  ]
[ COULD BE CONNECTED TOGETHER EASILY AND TO SEE WHAT ADDITIONS MIGHT MAKE    ]
[ SENSE.  THE USER MAKES A LIST OF SEGMENTS TO BE ADDED FOR THIS PURPOSE AND ]
[ THEN ADDS THEM AS SHOWN BELOW.  THE ADDITION OF ONLY ONE SEGMENT IS SHOWN  ]
[ BUT OTHERS WERE ALSO ADDED AT THE SAME TIME AND IN THE SAME WAY.           ]
```

```
Edit Functions
AD - Add

Enter Data Edit Function: AD
- - - - - - - - - - - - - - - - - - - - - -

    Database: DATA2      Study System: NO    CSF: NONE
    ---------------------------------------------------

Add Data Category
FT - Feeder Type
SN - Source Node
BL - Bus Location
FS - Feeder Segment
LD - Load Data
RT - Regulator Type

Enter Data Category to Add: FS
- - - - - - - - - - - - - - - - - - - - - -

Bus Number (<32768): 3878
Terminal Bus (<32768): 3773
- - - - - - - - - - - - - - - - - - - - - -
Page   1  FEEDERSITE    --  Release 12.92    --   12:12:22        14-OCT-93

- - - INPUT - FEEDER SEGMENT DATA - - -  - - - - - - - - - - - - - - - - - - - - -
                        STATUS PHASES FEEDER                                REGULATOR
- TERMINAL BUSES -      ------ ------ TYPE    LENGTH    -- SEGMENT --       TYPE
NUMBER 1  NUMBER 2      U/C/O/A  ABCN NUMBE                 NAME            NUMBER

    3773       3878     n/a      n/a   n/a      n/a       * Undefined *      n/a

New data:
,,1,1234,100/
- - - - - - - - - - - - - - - - - - - - - -
Page   1  FEEDERSITE    --  Release 12.92    --   12:12:59        14-OCT-93

- - - INPUT - FEEDER SEGMENT DATA - - -  - - - - - - - - - - - - - - - - - - - - -
  BUS NUMBER 1  BUS NUMBER 2   STATUS     NAME        LENGTH          NAME
------- TERMINAL BUSES ------  ------ -FEEDER TYPE-  ------        -REGULATOR-
    NAME                NAME   PHASES    NUMBER       NAME            NUMBER

      3773              3878   CLOSED NONE                956.6
                               ABCN     100                                  0

Type <S> to Save, <Q> to Quit without saving the new data: S

- - - - - - - - - - - - - - - - - - - - - -
[ NOTE THAT THE SEGMENT ADDED IS OF TYPE 100, WHICH HAS ZERO CAPACITY.  IF ]
[ THE PROGRAM USES THIS SEGMENT, IT HAS TO PAY THE PRICE OF BUILDING A NEW ]
[ FEEDER AS DEFINED IN THE REINFORCEMENT SEQUENCE OF THE FEEDER TYPE DATA. ]
- - - - - - - - - - - - - - - - - - - - - -
```

```
Bus Number (<32768): 1
- - - - - - - - - - - - - - - - - - - - -

    Database: DATA2     Study System: NO   CSF: NONE
    ---------------------------------------------------

Add Data Category

Enter Data Category to Add: <RETURN>
- - - - - - - - - - - - - - - - - - - - -

    Database: DATA2     Study System: NO   CSF: NONE
    ---------------------------------------------------

Edit Functions

Enter Data Edit Function: <RETURN>
- - - - - - - - - - - - - - - - - - - - -

    Database: DATA2     Study System: NO   CSF: NONE
    ---------------------------------------------------

Primary Menu
CC - Create Case Study File/Optimize

[ OPTIMIZE THE SYSTEM AGAIN. ]

Enter Primary Function: CC     - - - - - - - - - - - - - - - - - - - - -

Please select one of the following years:

        1990    1995    2000    2005    2010

Study Year (<5 DIGITS): 1990
- - - - - - - - - - - - - - - - - - - - -

    Database: DATA2     Study System: YES  CSF: NONE
    ---------------------------------------------------

Specify Study System
ED - Exclude Data from Study System

[ THE SYSTEM MUST BE SPECIFIED AGAIN AFTER GOING TO THE PRIMARY MENU. ]

Enter Specify Study System Command: ED
- - - - - - - - - - - - - - - - - - - - -

    Database: DATA2     Study System: YES  CSF: NONE
    ---------------------------------------------------
```

```
Exclude From Study System by
ED - Entire Data Base

Enter Exclude Option: ED
- - - - - - - - - - - - - - - - - - - - -

Are you sure - CLEAR the ENTIRE Study System
( Y or N )? Y
- - - - - - - - - - - - - - - - - - - - -

    Database: DATA2      Study System: YES  CSF: NONE
    -------------------------------------------------------

Specify Study System
DS - Define Study Year

Enter Specify Study System Command: ID
- - - - - - - - - - - - - - - - - - - - -

    Database: DATA2      Study System: YES  CSF: NONE
    -------------------------------------------------------

Include in Study System by
RN - Region Name

Enter Include Option: RN
- - - - - - - - - - - - - - - - - - - - -

Region name (<15 CHARS): SKP T-1
Region name (<15 CHARS): SKP T-2
Region name (<15 CHARS): ATTA T-1
Region name (<15 CHARS): ATTA T-2
Region name (<15 CHARS): ATM T-1
Region name (<15 CHARS): ATM T-2
Region name (<15 CHARS): <RETURN>
- - - - - - - - - - - - - - - - - - - - -

    Database: DATA2      Study System: YES  CSF: NONE
    -------------------------------------------------------

Include in Study System by

Enter Include Option: <RETURN>
- - - - - - - - - - - - - - - - - - - - -

    Database: DATA2      Study System: YES  CSF: NONE
    -------------------------------------------------------


Specify Study System
PS - Process Study System
```

```
Enter Specify Study System Command: PS
- - - - - - - - - - - - - - - - - - - - -

    Database: DATA2      Study System: YES  CSF: NONE
    ----------------------------------------------------

Process Study System
OS - Optimize Study System

Enter Process Study System Command: OS
- - - - - - - - - - - - - - - - - - - - -
Page   1  FEEDERSITE    --  Release 12.92    --   12:33:20        14-OCT-93

SKP FDRSITE 13 MAR 93

--- WAPDA CADPAD--- INPUT - SYSTEM CONTROL PARAMETERS ---- Year: 1990 ----

 Unit    METERS Per    Power Factor/  Cost of Losses    Voltage      Feeder
System    User Units    For Flows    (Rs/kW per Year)  Drop Limit   Capacity

Metric      1.0000      80.00%/ No      8000.00          20.00%      Thermal


  Optimization  -- Observe Limits --  Reinforce   Reinforce    Non-Radial
     Option      Source Node   Feeder   Feeders   for Voltage    Solution

Load x Resistance   Yes        Yes       Yes         Yes           No


Load Ratio   Cost of a    Max Switching    Recognize     Observe Old
  Percent   New Switch    Operations    Unswitchables   Linear Costs

   100.00       n/a       0 - Don't Care        No           n/a
```

[WE WANT TO DO THE SAME THING AGAIN SO THERE ARE NO CHANGES HERE.]

```
Hit <RETURN> to CONTINUE, Type <E> to EDIT this data: <RETURN>
- - - - - - - - - - - - - - - - - - - - -
Page   1  FEEDERSITE    --  Release 12.92    --   12:33:27        14-OCT-93

... Data Acquisition in progress

... Optimization in progress

    Database: DATA2      Study System: YES  CSF: NONE
    ----------------------------------------------------

Base Case Summary

    Maximum voltage drop: 20.86
    Unserved load:            6.85
    Total cost:           25233.00
```


31.1

```
... Optimization in progress

Optimized Case Summary

    Maximum voltage drop: 17.06
    Unserved load:            0.00
    Total cost:           28241.00

Hit <RETURN> to continue. <RETURN>

*** Optimization completed.
- - - - - - - - - - - - - - - - - - - - -

    Database: DATA2     Study System: YES  CSF: NONE
    ----------------------------------------------------

Process Optimization Results
DR - Display Results

[ GO AND LOOK AT THE RESULTS AGAIN. ]

Enter Process Results Option: DR
- - - - - - - - - - - - - - - - - - - - -

    Database: DATA2     Study System: YES  CSF: NONE
    ----------------------------------------------------

Display Optimization Results
UL - Unserved Loads

Enter Display Results Option: UL
- - - - - - - - - - - - - - - - - - - - -

[ NOW THIS IS OK.  PROVIDING REINFORCEMENT OF FEEDER ]
[ TYPE 102 TOOK CARE OF THE UNSERVED LOAD PROBLEM.   ]

* There are no unserved loads.
- - - - - - - - - - - - - - - - - - - - -

    Database: DATA2     Study System: YES  CSF: NONE
    ----------------------------------------------------

Display Optimization Results
SN - Source Node Summary

Enter Display Results Option: SN
- - - - - - - - - - - - - - - - - - - - -

    Database: DATA2     Study System: YES  CSF: NONE
    ----------------------------------------------------
```


362

```
Select Source Nodes for Summary
AL - All

Enter Select Source Nodes Command: AL
- - - - - - - - - - - - - - - - - - - - - - -
Page   1  FEEDERSITE    --  Release 12.92    --   12:37:08        14-OCT-93

SKP FDRSITE 13 MAR 93

*** WAPDA CADPAD OUTPUT - SOURCE NODE SUMMARY (ENTIRE SYSTEM) ****************
NUMBER  DESCRIPTION   (X, Y SOURCE NODE LOCATION)  (X, Y LOAD CENTER LOCATION)
        ----------------------------* - - - - - COSTS(Rs1000)- - - - - *
         MAX %      LOAD     CAP.    %       LOSS/FEEDER/SOURCE          TOTAL
         V.DROP    -----MVA-----   CAP.

    1 SKP             (  402376.500, 3505767.500)  (  401075.063, 3506022.000)
        17.1      21.4     26.0   82.     9106   1026       0           10132

  431 SKP T-1         (  402363.313, 3505779.000)  (  401916.094, 3504984.500)
        14.6      21.2     26.0   81.     7770    135       0            7905

 1039 ATTA ABAD       (  413795.000, 3505084.500)  (  411499.813, 3505680.750)
         9.9      25.6     26.0   98.     7075    131       0            7206

 1069 ATTA T-2        (  413798.000, 3505089.250)  (  413367.750, 3505157.750)
         2.8      18.7     26.0   72.     1227     11       0            1238

Hit <RETURN> to CONTINUE, Type <Q> to QUIT this display: <RETURN>
- - - - - - - - - - - - - - - - - - - - - - -
Page   2  FEEDERSITE    --  Release 12.92    --   12:37:11        14-OCT-93

SKP FDRSITE 13 MAR 93

*** WAPDA CADPAD OUTPUT - SOURCE NODE SUMMARY (ENTIRE SYSTEM) ****************
NUMBER  DESCRIPTION   (X, Y SOURCE NODE LOCATION)  (X, Y LOAD CENTER LOCATION)
        ----------------------------* - - - - - COSTS(Rs1000)- - - - - *
         MAX %      LOAD     CAP.    %       LOSS/FEEDER/SOURCE          TOTAL
         V.DROP    -----MVA-----   CAP.

 3375 A.T.M.          (  408770.094, 3507767.250)  (  406377.688, 3508470.750)
         5.6       4.7     13.0   36.     1209      0       0            1209

 3479 A.T.M T-1       (  408770.500, 3507766.750)  (  408517.563, 3508010.000)
         3.5       7.5     13.0   58.      523     26       0             549

 SYSTEM  17.1      99.1    130.0   76.    26911   1330       0           28241
-----------------------------------------------------------------------------

Hit <RETURN> to CONTINUE. <RETURN>
- - - - - - - - - - - - - - - - - - - - - - -
Page   1  FEEDERSITE    --  Release 12.92    --   12:37:13        14-OCT-93
```

SKP FDRSITE 13 MAR 93

********** WAPDA CADPAD OUTPUT - SYSTEM SUMMARY **********

MAX % V.DROP	LOAD -----MVA-----	CAP.	% CAP.	UNSERVED LD (MVA)	LOSS/FEEDER/SOURCE/SWITCH --------- COSTS (Rs1000)				TOTAL --------
17.1	99.1	130.0	76.	0.000	26911	1330	0	0.00	28241

[THE COSTS ARE HIGHER NOW BECAUSE MORE SEGMENTS]
[WERE REINFORCED AND MORE LOAD WAS SERVED.]

Hit <RETURN> to CONTINUE. <RETURN>
- -

Database: DATA2 Study System: YES CSF: NONE

Display Optimization Results
SS - Switching Status Changes

Enter Display Results Option: SS
- -

Database: DATA2 Study System: YES CSF: NONE

Switching Status Changes
AL - All

Enter Switch Status Report: AL
- -

Page 1 FEEDERSITE -- Release 12.92 -- 12:37:33 14-OCT-93

SKP FDRSITE 13 MAR 93

**** WAPDA CADPAD OUTPUT - Segment Switching Changes **********

Bus Name and Number		Receiving Buses	Initial	Final	N/R	Segment Name
413	412		0-CLOSED	2-OPEN		
456	455		0-CLOSED	2-OPEN		
841	839		0-CLOSED	2-OPEN		
881	879		0-CLOSED	2-OPEN		
913	912		0-CLOSED	2-OPEN		
996						

```
                    995     0-CLOSED  2-OPEN
               1159
                   1039     0-CLOSED  2-OPEN
               1353
                   1046     1-CLOSED  2-OPEN

Hit <RETURN> to CONTINUE, Type <Q> to QUIT this display: <RETURN>
- - - - - - - - - - - - - - - - - - - - - -
[ FOR BREVITY, ONLY THE FIRST AND LAST PAGES OF THIS DISPLAY ARE SHOWN. ]
- - - - - - - - - - - - - - - - - - - - - -

Page   5  FEEDERSITE    --  Release 12.92    --   12:37:48        14-OCT-93

SKP FDRSITE 13 MAR 93

**** WAPDA CADPAD OUTPUT - Segment Switching Changes *************
    Bus Name and Number
-------------------------------------------------------------------
       Receiving Buses          Initial   Final   N/R Segment Name

               3664
                   3661     0-CLOSED  2-OPEN
               3713
                   3700     0-CLOSED  2-OPEN
               3708
                   3706     0-CLOSED  2-OPEN
               3764
                   3763     0-CLOSED  2-OPEN
               3810
                   3788     0-CLOSED  2-OPEN
               3878
                   3877     0-CLOSED  2-OPEN
               3944
                   3931     1-CLOSED  2-OPEN       ** Connected *
               4068
                   3936     1-CLOSED  2-OPEN       ** Connected *

Hit <RETURN> to CONTINUE. <RETURN>
- - - - - - - - - - - - - - - - - - - - -

    Database: DATA2     Study System: YES  CSF: NONE
    ---------------------------------------------------

Switching Status Changes

Enter Switch Status Report: <RETURN>
- - - - - - - - - - - - - - - - - - - - -

    Database: DATA2     Study System: YES  CSF: NONE
    ---------------------------------------------------
```

Display Optimization Results
RS - Reinforced Segments

Enter Display Results Option: RS
- -

Database: DATA2 Study System: YES CSF: NONE

Display Reinforced Segments
AL - All

Enter Reinforced Segments to Display: AL
- -

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SKP FDRSITE 13 MAR 93

* WAPDA CADPAD OUTPUT - FEEDER SEGMENTS REINFORCED TO INCREASE CAPACITY *

FROM BUS/TO BUS	TYPE-BEFORE/TYPE-AFTER	SEGMENT NAME	COSTS(1000S)
26	114	GSL #8	0.5
27	405	RECON G	
48	114	GSL #8	8.2
47	405	RECON G	
50	114	GSL #8	1.7
48	405	RECON G	
65	114	GSL #8	2.1
3981	405	RECON G	
70	114	GSL #8	3.4
65	405	RECON G	

Hit <RETURN> to CONTINUE, Type <Q> to QUIT this display: <RETURN>
- -

[FOR BREVITY, THE FIRST AND LAST PAGES OF THIS DISPLAY ARE SHOWN,]
[PLUS THE FOLLOWING TWO SEGMENTS, FROM PAGE 5 OF THE DISPLAY, THAT]
[RESULTED FROM THE FEEDER TYPE CHANGE THAT WAS MADE.]

477	201	UG 2AWG	0.1
431	502	R. UG 4/0	
478	201	UG 2AWG	1.8
477	502	R. UG 4/0	

- -

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SKP FDRSITE 13 MAR 93

```
* WAPDA CADPAD OUTPUT - FEEDER SEGMENTS REINFORCED TO INCREASE CAPACITY *
FROM BUS/TO BUS          TYPE-BEFORE/TYPE-AFTER SEGMENT NAME COSTS(1000S)

                4060      103 DOG                                    0.1
                   1        401 RECON O

                4061      103 DOG                                    5.0
                4060        401 RECON O

                4062      103 DOG                                    2.7
                4061        401 RECON O

                4115      112 CU #5 SWG                              3.9
                 481        403 RECON D
                                                        --------------
                                                        TOTAL     571.9
Hit <RETURN> to CONTINUE. <RETURN>
- - - - - - - - - - - - - - - - - - - - - - -
Page   1  FEEDERSITE    --  Release 12.92    --   12:38:28        14-OCT-93

SKP FDRSITE 13 MAR 93

* WAPDA CADPAD OUTPUT - FEEDER SEGMENTS REINFORCED TO IMPROVE VOLTAGE **
FROM BUS/TO BUS          TYPE-BEFORE/TYPE-AFTER SEGMENT NAME COSTS(1000S)

                200       104 RABBIT                                 5.6
                199         401 RECON O

                201       104 RABBIT                                25.5
               4027         401 RECON O

                202       104 RABBIT                                24.4
                201         401 RECON O

                203       104 RABBIT                                40.8
                202         401 RECON O

                204       104 RABBIT                                 8.6
                203         401 RECON O

Hit <RETURN> to CONTINUE, Type <Q> to QUIT this display: <RETURN>
- - - - - - - - - - - - - - - - - - - - - - -
[ FOR BREVITY, ONLY THE FIRST AND LAST PAGES OF THIS DISPLAY ARE SHOWN. ]
- - - - - - - - - - - - - - - - - - - - - - -
Page   8  FEEDERSITE    --  Release 12.92    --   12:38:42        14-OCT-93

SKP FDRSITE 13 MAR 93

* WAPDA CADPAD OUTPUT - FEEDER SEGMENTS REINFORCED TO IMPROVE VOLTAGE **
FROM BUS/TO BUS          TYPE-BEFORE/TYPE-AFTER SEGMENT NAME COSTS(1000S)
```

4009	104 RABBIT		10.5
4010	401 RECON O		
4010	104 RABBIT		22.0
227	401 RECON O		
4027	104 RABBIT		18.4
200	401 RECON O		
		TOTAL	758.5

Hit <RETURN> to CONTINUE. <RETURN>

- -

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SKP FDRSITE 13 MAR 93

* WAPDA CADPAD OUTPUT - Radial Circuit Inventory of Lines by Type ***

Line Type	Description	Added	Removed	Final	Capital
		---------- Kilometers		----------	Costs(1000S)
100	NONE	0.00	12.30	0.00	0.0
101	PANTHER	0.00	0.00	3.02	0.0
103	DOG	0.00	5.41	241.75	0.0
104	RABBIT	0.00	5 73	178.12	0.0
105	GOPHER	0.00	4.40	125.87	0.0
106	WASP	0.00	0.00	0.00	0.0
107	ANT	0.00	0.00	0.49	0.0
108	GNAT	0.00	0.00	0.00	0.0
109	CU 7/.193	0.00	0.00	0.82	0.0
110	CU 7/.136	0.00	0.00	0.00	0.0
111	CU #3 SWG	0.00	0.00	1.36	0.0
112	CU #5 SWG	0.00	1.14	6.41	0.0
113	CU #8 SWG	0.00	0.53	6.04	0.0
114	GSL #8	0.00	16.75	21.63	0.0
116	OSPREY	0.00	0.00	0.00	0.0
117	PELICAN	0.00	0.00	0.00	0.0
201	UG 2AWG	0.00	0.02	0.15	0.0

Hit <RETURN> to CONTINUE, Type <Q> to QUIT this display: <RETURN>

- -

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SKP FDRSITE 13 MAR 93

* WAPDA CADPAD OUTPUT - Radial Circuit Inventory of Lines by Type ***

Line Type	Description	Added	Removed	Final	Capital
		---------- Kilometers		----------	Costs(1000S)
202	UG 4/0 AWG	0.00	0.00	0.73	0.0
203	UG 500 MCM	0.00	0.00	0.73	0.0
204	UG 1000 MC	0.00	0.00	0.00	0.0

303	NEW LINE D	0.00	0.00	0.00	0.0
401	RECON O	11.89	0.00	11.89	894.2
403	RECON D	4.71	0.00	4.71	143.5
404	RECON R	0.66	0.00	0.66	9.5
405	RECON G	29.00	0.00	29.00	281.3
502	R. UG 4/0	0.02	0.00	0.02	1.9
	Totals for Segments in the Radial System:			633.39	1330.4

Hit <RETURN> to CONTINUE. <RETURN>

Database: DATA2 Study System: YES CSF: NONE

Display Optimization Results

Enter Display Results Option: <RETURN>

Database: DATA2 Study System: YES CSF: NONE

Process Optimization Results
EX - Exit Process Optimization Results

Enter Process Results Option: EX

[NOW RE-OPTIMIZE THE SYSTEM WITHOUT REINFORCING FOR VOLTAGE DROP.]

Database: DATA2 Study System: YES CSF: NONE

Process Study System
OS - Optimize Study System

Enter Process Study System Command: OS

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SKP FDRSITE 13 MAR 93

--- WAPDA CADPAD--- INPUT - SYSTEM CONTROL PARAMETERS ---- Year: 1990 ----

Unit System	METERS Per User Units	Power Factor/ For Flows	Cost of Losses (Rs/kW per Year)	Voltage Drop Limit	Feeder Capacity
Metric	1.0000	80.00%/ No	8000.00	20.00%	Thermal

Optimization Option	-- Observe Limits -- Source Node	Feeder	Reinforce Feeders	Reinforce for Voltage	Non-Radial Solution
Load x Resistance	Yes	Yes	Yes	Yes	No

Load Ratio Percent	Cost of a New Switch	Max Switching Operations	Recognize Unswitchables	Observe Old Linear Costs
100.00	n/a	0 - Don't Care	No	n/a

Hit <RETURN> to CONTINUE, Type <E> to EDIT this data: E
- -

Database: DATA2 Study System: YES CSF: NONE

System Control Parameter Editor
RV - Reinforce for Voltage Yes

Enter Parameter to Modify: RV
- -

Reinforce segments to meet voltage drop limit
(Y or N)? N
- -

Database: DATA2 Study System: YES CSF: NONE

System Control Parameter Editor

Enter Parameter to Modify: <RETURN>
- -

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SKP FDRSITE 13 MAR 93

--- WAPDA CADPAD--- INPUT - SYSTEM CONTROL PARAMETERS ---- Year: 1990 ----

Unit System	METERS Per User Units	Power Factor/ For Flows	Cost of Losses (Rs/kW per Year)	Voltage Drop Limit	Feeder Capacity
Metric	1.0000	80.00%/ No	8000.00	20.00%	Thermal

Optimization Option	-- Observe Limits -- Source Node	Feeder	Reinforce Feeders	Reinforce for Voltage	Non-Radial Solution
Load x Resistance	Yes	Yes	Yes	No	No

316

Load Ratio Percent	Cost of a New Switch	Max Switching Operations	Recognize Unswitchables	Observe Old Linear Costs
100.00	n/a	0 - Don't Care	No	n/a

Hit <RETURN> to CONTINUE, Type <E> to EDIT this data: <RETURN>
- -

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... Data Acquisition in progress

... Optimization in progress

Database: DATA2 Study System: YES CSF: NONE

Base Case Summary

Maximum voltage drop: 20.86
Unserved load: 6.85
Total cost: 25233.00

... Optimization in progress

Optimized Case Summary

Maximum voltage drop: 24.57
Unserved load: 0.00
Total cost: 30785.00

Hit <RETURN> to continue. <RETURN>

*** Optimization completed.
- -

Database: DATA2 Study System: YES CSF: NONE

Process Optimization Results
DR - Display Results

[LOOK AT THE RESULTS AND COMPARE WITH THE PREVIOUS RUN.]

Enter Process Results Option: DR
- -

Database: DATA2 Study System: YES CSF: NONE

Display Optimization Results
UL - Unserved Loads

```
Enter Display Results Option: UL
- - - - - - - - - - - - - - - - - - - - -

* There are no unserved loads.
- - - - - - - - - - - - - - - - - - - - -

    Database: DATA2      Study System: YES  CSF: NONE
    ---------------------------------------------------

Display Optimization Results
SN - Source Node Summary

Enter Display Results Option: SN
- - - - - - - - - - - - - - - - - - - - -

    Database: DATA2      Study System: YES  CSF: NONE
    ---------------------------------------------------

Select Source Nodes for Summary
AL - All

Enter Select Source Nodes Command: AL
- - - - - - - - - - - - - - - - - - - - -
Page   1  FEEDERSITE    --  Release 12.92    --   12:44:05        14-OCT-93

SKP FDRSITE 13 MAR 93

*** WAPDA CADPAD OUTPUT - SOURCE NODE SUMMARY (ENTIRE SYSTEM) ****************
NUMBER  DESCRIPTION   (X, Y SOURCE NODE LOCATION)  (X, Y LOAD CENTER LOCATION)
        ----------------------------* - - - - - COSTS(Rs1000)- - - - - *
         MAX %      LOAD    CAP.    %      LOSS/FEEDER/SOURCE          TOTAL
         V.DROP   -----MVA-----  CAP.

    1 SKP            (  402376.500, 3505767.500)  (  401075.063, 3506022.000)
        24.6      21.4    26.0   82.   12408    268       0            12676

  431 SKP T-1        (  402363.313, 3505779.000)  (  401916.094, 3504984.500)
        14.6      21.2    26.0   81.    7770    135       0             7905

 1039 ATTA ABAD      (  413795.000, 3505084.500)  (  411499.813, 3505680.750)
         9.9      25.6    26.0   98.    7075    131       0             7206

 1069 ATTA T-2       (  413798.000, 3505089.250)  (  413367.750, 3505157.750)
         2.8      18.7    26.0   72.    1227     11       0             1238

Hit <RETURN> to CONTINUE, Type <Q> to QUIT this display: <RETURN>
- - - - - - - - - - - - - - - - - - - - -
Page   2  FEEDERSITE    --  Release 12.92    --   12:44:07        14-OCT-93

SKP FDRSITE 13 MAR 93
```

```
*** WAPDA CADPAD OUTPUT - SOURCE NODE SUMMARY (ENTIRE SYSTEM) ****************
NUMBER  DESCRIPTION    (X, Y SOURCE NODE LOCATION)  (X, Y LOAD CENTER LOCATION)
        ----------------------------* - - - - - COSTS(Rs1000)- - - - - *
         MAX %      LOAD     CAP.    %       LOSS/FEEDER/SOURCE          TOTAL
         V.DROP    -----MVA-----   CAP.

 3375 A.T.M.          (  408770.094, 3507767.250)  (  406377.688, 3508470.750)
          5.6      4.7     13.0   36.     1209      0       0            1209

 3479 A.T.M T-1       (  408770.500, 3507766.750)  (  408517.563, 3508010.000)
          3.5      7.5     13.0   58.      523     26       0             549

 SYSTEM  24.6     99.1    130.0   76.    30213       572        0     30785
-----------------------------------------------------------------------------
```

[THE FEEDER COSTS DECREASED BUT THE COST OF LOSSES INCREASED MORE.]

```
Hit <RETURN> to CONTINUE. <RETURN>
- - - - - - - - - - - - - - - - - - - - - -
Page   1  FEEDERSITE    --  Release 12.92    --   12:44:09        14-OCT-93

SKP FDRSITE 13 MAR 93

*********** WAPDA CADPAD OUTPUT - SYSTEM SUMMARY ****************************

MAX %      LOAD     CAP.    %    UNSERVED   LOSS/FEEDER/SOURCE/SWITCH   TOTAL
V.DROP    -----MVA-----  CAP.  LD (MVA)    --------- COSTS (Rs1000) --------

  24.6     99.1    130.0   76.    0.000    30213     572       0    0.00    30785

Hit <RETURN> to CONTINUE. <RETURN>
- - - - - - - - - - - - - - - - - - - - - -

    Database: DATA2     Study System: YES  CSF: NONE
    ---------------------------------------------------

Display Optimization Results
SS - Switching Status Changes

Enter Display Results Option: SS
- - - - - - - - - - - - - - - - - - - - - -

    Database: DATA2     Study System: YES  CSF: NONE
    ---------------------------------------------------

Switching Status Changes
AL - All

Enter Switch Status Report: AL
- - - - - - - - - - - - - - - - - - - - - -
Page   1  FEEDERSITE    --  Release 12.92    --   12:44:16        14-OCT-93
```

SKP FDRSITE 13 MAR 93

**** WAPDA CADPAD OUTPUT - Segment Switching Changes **********
Bus Name and Number

Receiving Buses	Initial	Final	N/R Segment Name
413			
412	0-CLOSED	2-OPEN	
456			
455	0-CLOSED	2-OPEN	
841			
839	0-CLOSED	2-OPEN	
881			
879	0-CLOSED	2-OPEN	
913			
912	0-CLOSED	2-OPEN	
996			
995	0-CLOSED	2-OPEN	
1159			
1039	0-CLOSED	2-OPEN	
1353			
1046	1-CLOSED	2-OPEN	

Hit <RETURN> to CONTINUE, Type <Q> to QUIT this display: <RETURN>
- -
[FOR BREVITY, ONLY THE FIRST AND LAST PAGES OF THIS DISPLAY ARE SHOWN.]
- -
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SKP FDRSITE 13 MAR 93

**** WAPDA CADPAD OUTPUT - Segment Switching Changes **********
Bus Name and Number

Receiving Buses	Initial	Final	N/R Segment Name
3664			
3661	0-CLOSED	2-OPEN	
3713			
3700	0-CLOSED	2-OPEN	
3708			
3706	0-CLOSED	2-OPEN	
3764			
3763	0-CLOSED	2-OPEN	
3810			
3788	0-CLOSED	2-OPEN	
3878			
3877	0-CLOSED	2-OPEN	
3944			
3931	1-CLOSED	2-OPEN	** Connected *

```
                    4068
                       3936    1-CLOSED  2-OPEN      ** Connected *

Hit <RETURN> to CONTINUE. <RETURN>
- - - - - - - - - - - - - - - - - - - - - -

    Database: DATA2     Study System: YES  CSF: NONE
    ---------------------------------------------------

Switching Status Changes

Enter Switch Status Report: <RETURN>
- - - - - - - - - - - - - - - - - - - - - -

    Database: DATA2     Study System: YES  CSF: NONE
    ---------------------------------------------------

Display Optimization Results
RS - Reinforced Segments

Enter Display Results Option: RS
- - - - - - - - - - - - - - - - - - - - - -

    Database: DATA2     Study System: YES  CSF: NONE
    ---------------------------------------------------

Display Reinforced Segments
AL - All

Enter Reinforced Segments to Display: AL
- - - - - - - - - - - - - - - - - - - - - -
Page   1  FEEDERSITE    --  Release 12.92    --   12:44:33        14-OCT-93

SKP FDRSITE 13 MAR 93

* WAPDA CADPAD OUTPUT - FEEDER SEGMENTS REINFORCED TO INCREASE CAPACITY *
FROM BUS/TO BUS          TYPE-BEFORE/TYPE-AFTER SEGMENT NAME COSTS(1000S)

                    26       114 GSL #8                                0.5
                      27       405 RECON G

                    48       114 GSL #8                                8.2
                      47       405 RECON G

                    50       114 GSL #8                                1.7
                      48       405 RECON G

                    65       114 GSL #8                                2.1
                    3981       405 RECON G

                    70       114 GSL #8                                3.4
                      65       405 RECON G
```

Hit <RETURN> to CONTINUE, Type <Q> to QUIT this display: <RETURN>
- -

[FOR BREVITY, THE FIRST AND LAST PAGES OF THIS DISPLAY ARE SHOWN,]
[PLUS THE FOLLOWING TWO SEGMENTS, FROM PAGE 5 OF THE DISPLAY, THAT]
[RESULTED FROM THE FEEDER TYPE CHANGE THAT WAS MADE.]

```
477      201 UG 2AWG                                  0.1
  431      502 R. UG 4/0
478      201 UG 2AWG                                  1.8
  477      502 R. UG 4/0
```

- -

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SKP FDRSITE 13 MAR 93

* WAPDA CADPAD OUTPUT - FEEDER SEGMENTS REINFORCED TO INCREASE CAPACITY *

```
FROM BUS/TO BUS          TYPE-BEFORE/TYPE-AFTER SEGMENT NAME COSTS(1000S)

4060      103 DOG                                     0.1
     1      401 RECON O

4061      103 DOG                                     5.0
  4060      401 RECON O

4062      103 DOG                                     2.7
  4061      401 RECON O

4115      112 CU #5 SWG                               3.9
   481      403 RECON D
                                          --------------
                                          TOTAL     571.9
```

Hit <RETURN> to CONTINUE. <RETURN>
- -

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SKP FDRSITE 13 MAR 93

* WAPDA CADPAD OUTPUT - FEEDER SEGMENTS REINFORCED TO IMPROVE VOLTAGE **

```
FROM BUS/TO BUS          TYPE-BEFORE/TYPE-AFTER SEGMENT NAME COSTS(1000S)

      *************** NO FEEDER SEGMENTS REINFORCED ***************
```

Hit <RETURN> to CONTINUE. <RETURN>
- -

Page 1 FEEDERSITE -- Release 12.92 -- 12:45:14 14-OCT-93

SKP FDRSITE 13 MAR 93

* WAPDA CADPAD OUTPUT - Radial Circuit Inventory of Lines by Type ***

```
   Line                    Added      Removed      Final      Capital
   Type   Description  ---------- Kilometers ---------- Costs(1000S)
```


376

100	NONE	0.00	12.30	0.00	0.0
101	PANTHER	0.00	0.00	3.02	0.0
103	DOG	0.00	3.11	244.05	0.0
104	RABBIT	0.00	0.00	183.84	0.0
105	GOPHER	0.00	0.75	129.52	0.0
106	WASP	0.00	0.00	0.00	0.0
107	ANT	0.00	0.00	0.49	0.0
108	GNAT	0.00	0.00	0.00	0.0
109	CU 7/.193	0.00	0.00	0.82	0.0
110	CU 7/.136	0.00	0.00	0.00	0.0
111	CU #3 SWG	0.00	0.00	1.36	0.0
112	CU #5 SWG	0.00	1.14	6.41	0.0
113	CU #8 SWG	0.00	0.53	6.04	0.0
114	GSL #8	0.00	16.75	21.63	0.0
116	OSPREY	0.00	0.00	0.00	0.0
117	PELICAN	0.00	0.00	0.00	0.0
201	UG 2AWG	0.00	0.02	0.15	0.0

Hit <RETURN> to CONTINUE, Type <Q> to QUIT this display: <RETURN>
- -

Page 2 FEEDERSITE -- Release 12.92 -- 12:45:16 14-OCT-93

SKP FDRSITE 13 MAR 93

* WAPDA CADPAD OUTPUT - Radial Circuit Inventory of Lines by Type ***

Line Type	Description	Added	Removed	Final	Capital Costs(1000$)
		---------- Kilometers		----------	
202	UG 4/0 AWG	0.00	0.00	0.73	0.0
203	UG 500 MCM	0.00	0.00	0.73	0.0
204	UG 1000 MC	0.00	0.00	0.00	0.0
303	NEW LINE D	0.00	0.00	0.00	0.0
401	RECON O	3.11	0.00	3.11	234.2
403	RECON D	1.18	0.00	1.18	36.1
404	RECON R	1.28	0.00	1.28	18.4
405	RECON G	29.00	0.00	29.00	281.3
502	R. UG 4/0	0.02	0.00	0.02	1.9
	Totals for Segments in the Radial System:			633.39	571.9

Hit <RETURN> to CONTINUE. <RETURN>
- -

Database: DATA2 Study System: YES CSF: NONE

Display Optimization Results

Enter Display Results Option: <RETURN>
- -

```
    Database: DATA2     Study System: YES  CSF: NONE
    ----------------------------------------------------

Process Optimization Results
EX - Exit Process Optimization Results

Enter Process Results Option: EX

- - - - - - - - - - - - - - - - - - - - -
[NOW RE-OPTIMIZE THE SYSTEM USING OPTION 3 - LOAD * LINEAR COST]
- - - - - - - - - - - - - - - - - - - - -

    Database: DATA2     Study System: YES  CSF: NONE
    ----------------------------------------------------

Process Study System
OS - Optimize Study System

Enter Process Study System Command: OS
- - - - - - - - - - - - - - - - - - - - -
Page   1  FEEDERSITE    --  Release 12.92    --   12:45:39        14-OCT-93

SKP FDRSITE 13 MAR 93

--- WAPDA CADPAD--- INPUT - SYSTEM CONTROL PARAMETERS ---- Year: 1990 ----

 Unit    METERS Per   Power Factor/  Cost of Losses    Voltage      Feeder
System    User Units    For Flows   (Rs/kW per Year)  Drop Limit   Capacity

Metric       1.0000     80.00%/ No      8000.00          20.00%      Thermal


  Optimization  -- Observe Limits --  Reinforce   Reinforce    Non-Radial
     Option      Source Node   Feeder   Feeders   for Voltage    Solution

Load x Resistance   Yes        Yes       Yes          No           No


Load Ratio   Cost of a   Max Switching    Recognize     Observe Old
  Percent   New Switch    Operations    Unswitchables   Linear Costs

   100.00       n/a       0 - Don't Care        No           n/a

Hit <RETURN> to CONTINUE, Type <E> to EDIT this data: E
- - - - - - - - - - - - - - - - - - - - -

    Database: DATA2     Study System: YES  CSF: NONE
    ----------------------------------------------------

System Control Parameter Editor
OC - Optimization Criteria              2 - Load x Resistance
```

```
Enter Parameter to Modify: OC
- - - - - - - - - - - - - - - - - - - - -

    Optimization Options:

    0 - Run Base Case (Do Not Optimize)
    1 - Minimize Load x Distance
    2 - Minimize Load x Resistance
    3 - Minimize Load x Linear Cost

Enter Option ( 2 ): 3

Other parameters have been reset. Please check carefully.

Hit <RETURN> to continue. <RETURN>
- - - - - - - - - - - - - - - - - - - - -

    Database: DATA2      Study System: YES  CSF: NONE
    ----------------------------------------------------

System Control Parameter Editor

Enter Parameter to Modify: <RETURN>
- - - - - - - - - - - - - - - - - - - - -
Page   1  FEEDERSITE    --  Release 12.92    --   12:45:56        14-OCT-93

SKP FDRSITE 13 MAR 93

--- WAPDA CADPAD--- INPUT - SYSTEM CONTROL PARAMETERS ---- Year: 1990 ----

 Unit    METERS Per    Power Factor/  Cost of Losses    Voltage      Feeder
System    User Units    For Flows    (Rs/kW per Year)  Drop Limit   Capacity

Metric       1.0000     80.00%/ No      8000.00          20.00%      Thermal


  Optimization  -- Observe Limits --  Reinforce   Reinforce    Non-Radial
     Option      Source Node   Feeder   Feeders   for Voltage    Solution

Load x Lin. Cost    Yes         Yes       Yes          No           No


Load Ratio   Cost of a   Max Switching    Recognize     Observe Old
  Percent    New Switch   Operations    Unswitchables   Linear Costs

   100.00    Rs    0.00  0 - Don't Care        No            No

Hit <RETURN> to CONTINUE, Type <E> to EDIT this data: <RETURN>
- - - - - - - - - - - - - - - - - - - - -
Page   1  FEEDERSITE    --  Release 12.92    --   12:45:57        14-OCT-93

... Data Acquisition in progress
```


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```
... Optimization in progress

    Database: DATA2      Study System: YES  CSF: NONE
    ----------------------------------------------------

Base Case Summary

    Maximum voltage drop: 20.86
    Unserved load:            6.85
    Total cost:           25233.00

... Optimization in progress

Optimized Case Summary

    Maximum voltage drop: 23.43
    Unserved load:            0.00
    Total cost:           29520.00

Hit <RETURN> to continue. <RETURN>

*** Optimization completed.
- - - - - - - - - - - - - - - - - - - -

    Database: DATA2      Study System: YES  CSF: NONE
    ----------------------------------------------------

Process Optimization Results
DR - Display Results

[ LOOK AT THE RESULTS AND COMPARE WITH THE PREVIOUS RUN. ]

Enter Process Results Option: DR
- - - - - - - - - - - - - - - - - - - -

    Database: DATA2      Study System: YES  CSF: NONE
    ----------------------------------------------------

Display Optimization Results
UL - Unserved Loads

Enter Display Results Option: UL
- - - - - - - - - - - - - - - - - - - -

* There are no unserved loads.
- - - - - - - - - - - - - - - - - - - -

    Database: DATA2      Study System: YES  CSF: NONE
    ----------------------------------------------------
```

Display Optimization Results
SN - Source Node Summary

Enter Display Results Option: SN
- - - - - - - - - - - - - - - - - - - -

Database: DATA2 Study System: YES CSF: NONE

Select Source Nodes for Summary
AL - All

Enter Select Source Nodes Command: AL
- - - - - - - - - - - - - - - - - - - -

Page 1 FEEDERSITE -- Release 12.92 -- 12:49:12 14-OCT-93

SKP FDRSITE 13 MAR 93

*** WAPDA CADPAD OUTPUT - SOURCE NODE SUMMARY (ENTIRE SYSTEM) ***********
NUMBER DESCRIPTION (X, Y SOURCE NODE LOCATION) (X, Y LOAD CENTER LOCATION)
----------* - - - - - COSTS(Rs1000)- - - - - *

	MAX % V.DROP	LOAD -----MVA-----	CAP.	% CAP.	LOSS/FEEDER/SOURCE			TOTAL
1 SKP		(402376.500, 3505767.500)					(400990.656, 3505842.000)	
	23.4	21.1	26.0	81.	11737	245	0	11982
431 SKP T-1		(402363.313, 3505779.000)					(401787.531, 3505033.000)	
	10.7	20.8	26.0	80.	6850	101	0	6951
1039 ATTA ABAD		(413795.000, 3505084.500)					(411430.656, 3505521.000)	
	9.9	23.2	26.0	89.	6548	118	0	6666
1069 ATTA T-2		(413798.000, 3505089.250)					(413210.406, 3505339.250)	
	3.3	21.2	26.0	82.	1784	20	0	1804

Hit <RETURN> to CONTINUE, Type <Q> to QUIT this display: <RETURN>
- - - - - - - - - - - - - - - - - - - -

Page 2 FEEDERSITE -- Release 12.92 -- 12:49:15 14-OCT-93

SKP FDRSITE 13 MAR 93

*** WAPDA CADPAD OUTPUT - SOURCE NODE SUMMARY (ENTIRE SYSTEM) ***********
NUMBER DESCRIPTION (X, Y SOURCE NODE LOCATION) (X, Y LOAD CENTER LOCATION)
----------* - - - - - COSTS(Rs1000)- - - - - *

	MAX % V.DROP	LOAD -----MVA-----	CAP.	% CAP.	LOSS/FEEDER/SOURCE			TOTAL
3375 A.T.M.		(408770.094, 3507767.250)					(406307.938, 3508503.000)	
	6.3	5.1	13.0	39.	1461	0	0	1461

```
 3479 A.T.M T-1        (  408770.500, 3507766.750)  (  408507.875, 3508283.750)
          4.4       7.7     13.0    59.      618      38       0             656

 SYSTEM  23.4      99.1    130.0    76.    28998        522        0     29520
-----------------------------------------------------------------------------
```

[THIS IS A LITTLE CHEAPER THAN THE PREVIOUS RUN.]

```
Hit <RETURN> to CONTINUE. <RETURN>
- - - - - - - - - - - - - - - - - - - - -
Page   1  FEEDERSITE    --  Release 12.92    --   12:49:16        14-OCT-93

SKP FDRSITE 13 MAR 93

*********** WAPDA CADPAD OUTPUT - SYSTEM SUMMARY ******************************

MAX %      LOAD     CAP.    %    UNSERVED   LOSS/FEEDER/SOURCE/SWITCH   TOTAL
V.DROP    -----MVA-----  CAP.  LD (MVA)    --------- COSTS (Rs1000) --------

  23.4     99.1    130.0    76.    0.000    29003     520       0    0.00    29523

Hit <RETURN> to CONTINUE. <RETURN>
- - - - - - - - - - - - - - - - - - - - -

    Database: DATA2      Study System: YES  CSF: NONE
    -------------------------------------------------------

Display Optimization Results
SS - Switching Status Changes

Enter Display Results Option: SS
- - - - - - - - - - - - - - - - - - - - -

    Database: DATA2      Study System: YES  CSF: NONE
    -------------------------------------------------------

Switching Status Changes
AL - All

Enter Switch Status Report: AL
- - - - - - - - - - - - - - - - - - - - -
Page   1  FEEDERSITE    --  Release 12.92    --   12:49:25        14-OCT-93

SKP FDRSITE 13 MAR 93

**** WAPDA CADPAD OUTPUT - Segment Switching Changes *************
    Bus Name and Number
-----------------------------------------------------------------
       Receiving Buses          Initial   Final   N/R Segment Name

                  410
                     409     0-CLOSED  2-OPEN
```

```
 456
    455     0-CLOSED  2-OPEN
3784
    841     1-CLOSED  2-OPEN
3845
    869     0-CLOSED  2-OPEN
 908
    906     0-CLOSED  2-OPEN
 996
    995     0-CLOSED  2-OPEN
1189
   1039     1-CLOSED  2-OPEN       ** Connected *
1159
   1039     0-CLOSED  2-OPEN
```

Hit <RETURN> to CONTINUE, Type <Q> to QUIT this display: <RETURN>

- -

[FOR BREVITY, ONLY THE FIRST AND LAST PAGES OF THIS DISPLAY ARE SHOWN.]

- -

Page 5 FEEDERSITE -- Release 12.92 -- 12:49:31 14-OCT-93

SKP FDRSITE 13 MAR 93

**** WAPDA CADPAD OUTPUT - Segment Switching Changes **********
Bus Name and Number

```
       Receiving Buses          Initial   Final   N/R Segment Name

                    3786
                       3665     1-CLOSED  2-OPEN
                    3895
                       3717     1-CLOSED  2-OPEN
                    3826
                       3731     1-CLOSED  2-OPEN
                    3878
                       3773     1-CLOSED  2-OPEN
                    3777
                       3773     0-CLOSED  2-OPEN
                    3810
                       3788     0-CLOSED  2-OPEN
                    3936
                       3934     0-CLOSED  2-OPEN
                    3944
                       3943     0-CLOSED  2-OPEN
```

Hit <RETURN> to CONTINUE. <RETURN>

- -

Database: DATA2 Study System: YES CSF: NONE

Switching Status Changes

```
Enter Switch Status Report: <RETURN>
- - - - - - - - - - - - - - - - - - - - -

    Database: DATA2      Study System: YES  CSF: NONE
    ---------------------------------------------------

Display Optimization Results
RS - Reinforced Segments

Enter Display Results Option: RS
- - - - - - - - - - - - - - - - - - - - -

    Database: DATA2      Study System: YES  CSF: NONE
    ---------------------------------------------------

Display Reinforced Segments
AL - All

Enter Reinforced Segments to Display: IC
- - - - - - - - - - - - - - - - - - - - -
Page   1  FEEDERSITE    --  Release 12.92    --   12:49:44        14-OCT-93

SKP FDRSITE 13 MAR 93

* WAPDA CADPAD OUTPUT - FEEDER SEGMENTS REINFORCED TO INCREASE CAPACITY *
FROM BUS/TO BUS          TYPE-BEFORE/TYPE-AFTER SEGMENT NAME COSTS(1000$)

                    26       114 GSL #8                                0.5
                      27       405 RECON G

                    48       114 GSL #8                                8.2
                      47       405 RECON G

                    50       114 GSL #8                                1.7
                      48       405 RECON G

                    65       114 GSL #8                                2.1
                    3981       405 RECON G

                    70       114 GSL #8                                3.4
                      65       405 RECON G

Hit <RETURN> to CONTINUE, Type <Q> to QUIT this display: <RETURN>
- - - - - - - - - - - - - - - - - - - - -
[ FOR BREVITY, THE FIRST AND LAST PAGES OF THIS DISPLAY ARE SHOWN,  ]
[ PLUS THE FOLLOWING TWO SEGMENTS, FROM PAGE 5 OF THE DISPLAY, THAT ]
[ RESULTED FROM THE FEEDER TYPE CHANGE THAT WAS MADE.               ]

                   477       201 UG 2AWG                               0.1
                     431       502 R. UG 4/0
```

```
                    478        201 UG 2AWG                                  1.8
                      477        502 R. UG 4/0

- - - - - - - - - - - - - - - - - - - - - -
Page  18  FEEDERSITE    --  Release 12.92    --    12:50:08        14-OCT-93

SKP FDRSITE 13 MAR 93

* WAPDA CADPAD OUTPUT - FEEDER SEGMENTS REINFORCED TO INCREASE CAPACITY *
FROM BUS/TO BUS          TYPE-BEFORE/TYPE-AFTER SEGMENT NAME COSTS(1000S)

                    4060       103 DOG                                      0.1
                         1       401 RECON O

                    4061       103 DOG                                      5.0
                      4060       401 RECON O

                    4062       103 DOG                                      2.7
                      4061       401 RECON O

                    4115       112 CU #5 SWG                                3.9
                       481       403 RECON D
                                                              --------------
                                                              TOTAL     522.1
Hit <RETURN> to CONTINUE. <RETURN>
- - - - - - - - - - - - - - - - - - - - - -

    Database: DATA2     Study System: YES  CSF: NONE
    ----------------------------------------------------

Display Reinforced Segments

Enter Reinforced Segments to Display: <RETURN>
- - - - - - - - - - - - - - - - - - - - - -

    Database: DATA2     Study System: YES  CSF: NONE
    ----------------------------------------------------

Display Optimization Results
NR - Non-Radial Segments

Enter Display Results Option: NR
- - - - - - - - - - - - - - - - - - - - - -
Page   1  FEEDERSITE    --  Release 12.92    --    12:50:22        14-OCT-93

SKP FDRSITE 13 MAR 93

**** WAPDA CADPAD OUTPUT - Non-Radial Segments ********************
    Bus Name and Number
-------------------------------------------------------------------
       Receiving Buses          Initial   Final   N/R Segment Name
```


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********* NO Non-Radial Segments were Found ****************

Hit <RETURN> to CONTINUE. <RETURN>
- -

Database: DATA2 Study System: YES CSF: NONE

Display Optimization Results

Enter Display Results Option: <RETURN>
- -

Database: DATA2 Study System: YES CSF: NONE

Process Optimization Results
EX - Exit Process Optimization Results

Enter Process Results Option: EX
- -

Database: DATA2 Study System: YES CSF: NONE

Process Study System

Enter Process Study System Command: <RETURN>
- -

Database: DATA2 Study System: YES CSF: NONE

Specify Study System

Enter Specify Study System Command: <RETURN>
- -

Database: DATA2 Study System: YES CSF: NONE

Primary Menu
EX - Exit FEEDERSITE

Enter Primary Function: EX
- -

Database: DATA2 Study System: YES CSF: NONE

```
Output File Disposition
SA - Save
DE - Delete
SS - Spool/Save
SD - Spool/Delete
RP - Return to Primary Menu

Enter file disposition: SA
- - - - - - - - - - - - - - - - - - - - -
```

XII. TRANSFERRING LOADS FROM LOADSITE TO FEEDERSITE

XII. TRANSFERRING LOADS FROM LOADSITE TO FEEDERSITE

LOADSITE produces load maps, giving the amount of load in each small-area. FEEDERSITE defines the feeder bus locations in a WIDGIT/FEEDERDESIGN coordinate system. NODESIM, with input from the user regarding the boundaries of the study window, matches up the two coordinate systems and assigns the small-area loads to the FEEDERSITE buses.

NODESIM is accessed through the Load Model Menu of either LOADSITE version, DLF or SLF. Before NODESIM is run, the user must create a Card Image file containing the bus information. This is normally done from FEEDERSITE with the "Send Data to Other CADPAD Programs" function, but could also be similarly done from FEEDERDESIGN.

It is important to edit the first line of the Card Image file from FEEDERSITE to LOADSITE, to put in the correct FEEDERSITE/WIDGIT coordinates of the lower left and upper right corners of the full LOADSITE map. Otherwise the bus locations will not be correct.

A. STANDARD PROCEDURE

The standard NODESIM procedure is as follows:

1. From the NODESIM Input Option Menu, accessed from NODESIM via the Load Model Menu, enter "CI" to receive Bus Location data from a Card Image file from FEEDERSITE.

2. Give the Card Image file name, in answer to the prompt "Please enter the card image data filename:"

3. The program prompts "Enter map to store FEEDERSITE loads, "/" if none:". If there are loads in the Card Image file, and if the user wants to store them, he enters the map number. Otherwise enter "/".

   Note: In SLF, steps 3 and 4 are done in reverse order.

4. The program creates a map of bus assignments. DLF uses Map 22, but in SLF the user specifies which map to use, in response to the prompt "Enter map to store bus locations". Each cell of the map will contain zero if there is no bus in the small-area, the bus number plus phase information if there is one bus in the small-area, and the negative of one bus number plus phase information if there is more than one bus in the small-area. In the last case, information for the other buses is stored elsewhere. Messages will be displayed if there are more than 20 buses in a small-area, or if there are more than 1000 small areas containing more than one bus.

5. In SLF only, the program displays the lower left X and Y coordinates, the lower right X and Y coordinates and a window height, in FEEDERSITE/WIDGIT coordinates. SLF next requests the lower left X and Y coordinates, the lower right X and Y coordinates and the window height in LOADSITE coordinates. SLF displays the data given by the user and asks if it is correct. The user responds.

6. In SLF only, the program prompts for a Feeder Cost map number. The user enters the map number.

7. In SLF only, the program prompts for a map to store bus assignments. The user enters the map number.

8. In SLF only, the program asks "Was small-area load map already calculated (Y or N)?". This should have been done already so answer "Y" and enter the load map number at the prompt.

9. In SLF only, the program requests "Year of this iteration" and the user responds with a valid forecast year.

10. The program aggregates the small-area loads to the buses.

11. The program takes the user to the NODESIM Output Destination Menu where he enters "FS" to send results to FEEDERSITE.

12. The user specifies whether the loads will "Modify Existing FEEDERSITE Database" with a response of "M", or whether they will "Add the Load to FEEDERSITE Database" with a response of "A".

13. The user provides a filename in response to the prompt "Please enter the Card Image output filename:"

14. The program dumps the loads and buses to the Card Image file, which can then be read into the FEEDERSITE database with the FEEDERSITE "Receive Data from Other CADPAD Programs" function.

B. SPECIAL PROCEDURE FOR CONGESTED AREAS

A problem may occur, during step 4. of the Standard Procedure, when either the cells are too big or the nodes are too close together, causing many cells to contain multiple buses. This most often occurs in congested city areas. If only a few cells exceeded 20 buses, the user probably does not need to be concerned about it.

If many messages were given about exceeding either of the limits, the user should go through the procedure given below to get a better distribution of the loads onto the buses.

If in FEEDERSITE the user answered YES, to put loads on buses without existing loads, there is one thing he can try before going

through the special procedure. Go back to FEEDERSITE, but this time answer NO, to not allocate load to buses with no phases loaded. This reduces the number of buses available and may reduce the problem to a level where the user does not need to run the special procedure below.

Basically, the special procedure splits the area into 4 quadrants, creating 4 times as many cells that are one-fourth the size of the original cells, and distributes the loads into the smaller cells. There are now more cells for the same number of buses and the chance of exceeding the limits is greatly reduced. Figure XII-1 shows how the files and maps are handled.

The procedure is as follows:

a) Check the transfer files TRXF1.DAT through TRXF7.DAT for proper input and output file names, database name, year, and quadrant coordinates.

b) Enter FEEDERSITE and execute the transfer file TRXF1 from the Primary Menu. This transfer file dumps out 4 files of bus data to LOADSITE, one file for each quadrant.

c) If the FEEDERSITE database had Spot Loads on any of the buses, representing feeder loads, industrial loads, etc., which are not represented in the LOADSITE load map, remove them from the files being sent to LOADSITE. If the user does not want NODESIM to assign load to those buses, also set the phase code of those buses to zero.

d) Enter SLF and check to see that the load map is ready. Run the transfer file TRXF2. This transfer file will not run in DLF because it uses the Map Mathematics function, Move Window, which is not available in DLF. The transfer file exits from SLF.

e) Enter DLF or SLF (whichever is used for the forecast) and run the transfer file TRXF3. The transfer file runs NODESIM for the upper left quadrant and exits from the program.

f) Repeat step e) for transfer files TRXF4, TRXF5, and TRXF6 which run NODESIM for the lower left, upper right and lower right quadrants. The last one leaves the user in the program so he can compare the load maps from LOADSITE with the load maps created from the FEEDERSITE Loads. Compare graphically and/or with Map Statistics Maps 41 and 46, which are the FEEDERSITE and LOADSITE loads for the upper left quadrant. Do the same with Maps 42 and 47, Maps 43 and 48, and Maps 44 and 49 for the other three quadrants. This is only useful in the base year for which FEEDERDESIGN/FEEDERSITE loads were created from circuit transformer data or actual load data.

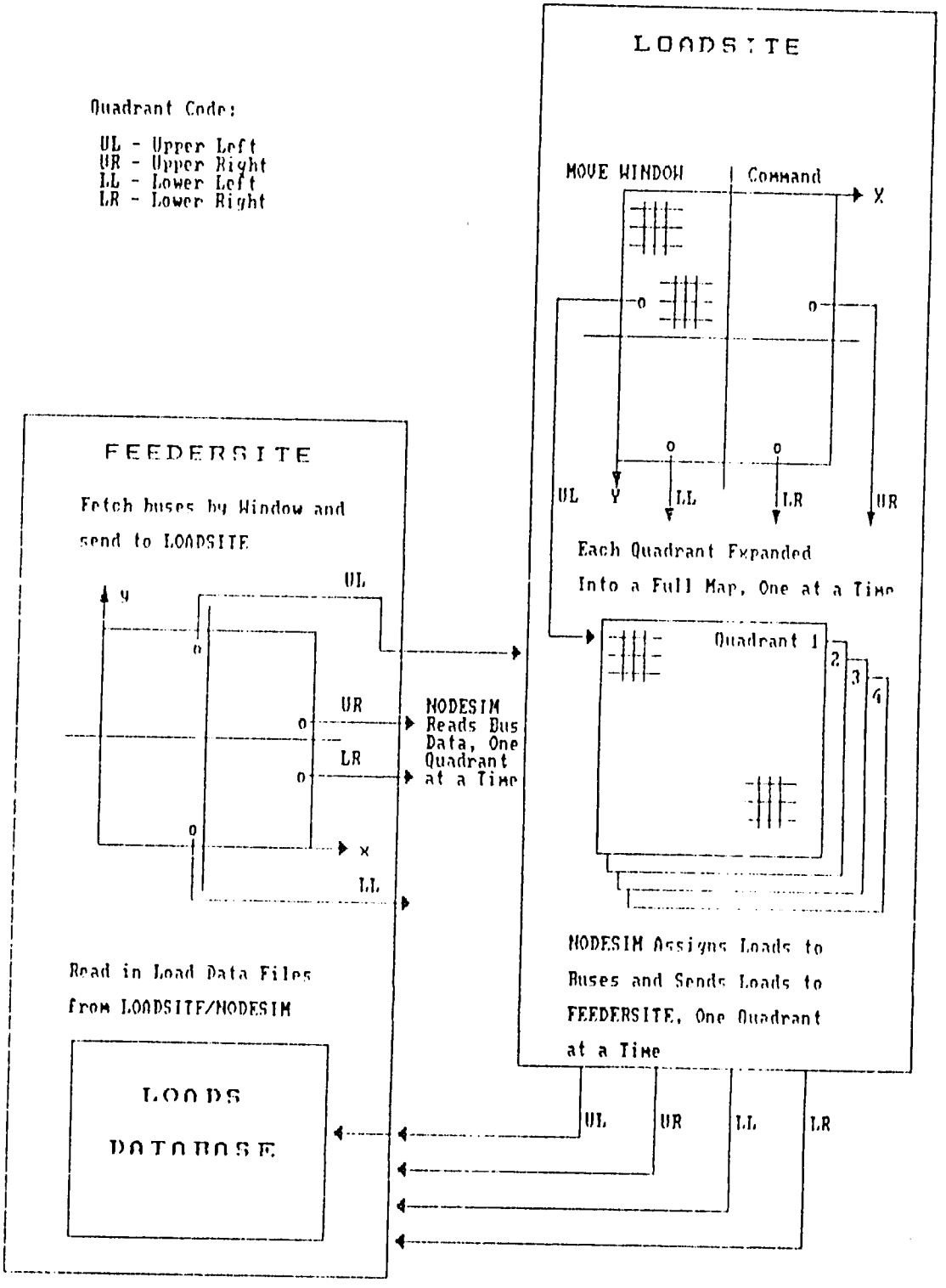

Figure XII-1
Running NODESIM for Each Quadrant to Reduce
the Multiple-Nodes-Per-Cell Problem

"nodesim"

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g) Enter FEEDERSITE and run transfer file TRXF7 to read the loads into the FEEDERSITE database.

h) Add any spot loads to the appropriate buses, if needed, for FEEDERSITE analysis.

PAKISTAN
WATER AND POWER DEVELOPMENT AUTHORITY

CADPAD

DISTRIBUTION PLANNING

APPLICATION MANUAL

APPENDICES A-E

VOLUME 4 OF 4

WAPDA
POWER DISTRIBUTION WING
LAHORE, PAKISTAN

JULY 1994

PAKISTAN
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APPENDIX - A

TRANSFER FILES

TRANSFER FILES

Transfer files may be used in the CADPAD programs to relieve the user from repetitive and tiring keyboard entry, to spare the user from having to repeat procedures if he makes a mistake (or worse yet, from making mistakes without realizing it), and to speed up the procedures involving keyboard entry. In short, they make the user's life much easier and increase the quality and quantity of his work.

Transfer files are ASCII (Card Image) files containing commands and responses to program prompts that the user would normally enter via the keyboard while interactively running the program. Instead of entering them interactively he can put them in a transfer file before running the program and then, from inside the program, shift program control to the transfer file.

A transfer file is created outside of the program using the VAX editor. Program control is transferred to the transfer file by entering a "TR" command at a menu prompt, and then giving the transfer file name at the file name request prompt. Transfer file responses are echoed to the CRT as they are executed. Transfer files must have a file extension .DAT , but when answering the name prompt, the .DAT should be omitted. Transfer file names are limited to six or less characters.

A transfer file must respond to all prompts and menus that will be encountered during its execution. Each line of the transfer file contains the response to a single program prompt and each line begins in column 1. Columns after those read by the program can be used for comments. Menu prompts only read two characters but some informational prompts read more. Comments may also be inserted with lines containing asterisks in columns 1 and 2.

Transfer files can not invoke other transfer files. A "TR" command encountered in a transfer file will transfer control back to the keyboard.

Some suggestions regarding the use of transfer files:

- Turn off the menus at the beginning of the file and turn them on again at the end. This allows you to monitor progress more easily as the transfer file contents appear and scroll on the screen.

- Be liberal with comments.

- Think of transfer files as being programs written in program control language. Write them to accomplish specific, repetitive tasks.

- Build a library of transfer files for the more common tasks and operations.

- Become familiar with the interactive operation of the program and then implement the knowledge in a transfer file.

- Use the alphabetic menu commands instead of the numerics. That makes it easier to read and follow the transfer file steps.

- Test and check each transfer file thoroughly. Do not use them blindly. Make sure they work, and monitor the results.

- Use transfer files for complex sequences and procedures during which the user can easily lose his place or make mistakes in the interactive mode.

- Transfer files are written to start at a certain menu (normally the primary menu). Make sure they are executed from the correct menu.

Following, in alphabetical order, are transfer files developed so far in the CADPAD work. The users will probably want to add more. A short description and listing are given for each transfer file. The actual files are on the VAX, with the FORTRAN utility programs, in the directory $DISK0:[CADPAD.UTIL]. When a directory is set up for a study, the transfer files should be copied to the study directory by entering the command "COPY $DISK0:[CADPAD.UTIL]TR*.DAT []" from the study directory. They will then be available for use from within the CADPAD programs.

Some studies will be using nine customer classes and others will use ten. The transfer files must be checked to see if they are set up for the right number of classes and, if not, they must be modified using the VAX Editor.

Whenever transfer files are referred to in this manual, the name of the transfer file is underlined (eg. TRX1).

LIST OF TRANSFER FILES

TP194	Part 1 of SLF special procedure for 1994 iteration
TP294	Part 2 of SLF special procedure for 1994 iteration
TP197	Part 2 of SLF special procedure for 1997 iteration
TR132	Makes map of FEEDERSITE buses vs. LOADSITE loads
TRBLOC	Makes bus numbers map and file from bus location map
TRBORD	Makes border Map 50 from SAR51 data in Map 51
TRCBB	Checks for out-of-bounds customers in base year
TRCBH	Checks for out-of-bounds customers in horizon year
TRDNG	Deletes negative growth in DLF forecast load maps
TRFCMP	Makes feeder cost Map 47
TRGSB	Makes Grid Station service boundaries in Map 65
TROB	Opens both databases in DLF or SLF
TRPIC	Makes map of how many customer classes are in each cell
TRPR35	Outputs Map 35 in tabular display format
TRSA	Makes service area Map 64 with data in the file
TRSR	Stores results of SUBSITE in maps
TRX1	Part 1 of DLF procedure - splits pri peaks from base
TRX2	Part 2 of DLF procedure - splits sec peaks from base
TRX3	Part 3 of DLF procedure - loads manual customers
TRX4	Part 4 of DLF procedure - identifies new customer cells
TRX5	Part 5 of DLF procedure - 1st part of create start years
TRX6	Part 6 of DLF procedure - 2nd part of create start years
TRXF1	Sends 4 quadrants of bus data from FEEDERSITE to LOADSITE
TRXF2	Splits load map into 4 quadrants
TRXF3	Processes upper left quadrant in NODESIM
TRXF4	Processes lower left quadrant in NODESIM
TRXF5	Processes upper right quadrant in NODESIM
TRXF6	Processes lower right quadrant in NODESIM
TRXF7	Reads 4 quadrants of loads into FEEDERSITE from LOADSITE
XTRDLF	Alternate load forecast procedure for DLF

TP194

This transfer file is used in any iteration year, but will probably be used only in the first iteration year, of the Special SLF Forecast Procedure, to modify the preference maps so that they give the desired "scattering" of growth. It sets up the preference map for Tubewells (class 6), and then scales and powers the preference maps developed by the SLF Algorithm for the other eight classes, according to values selected by the user. This, along with the WRR Utility Program and the transfer file TP294, will be iteratively run several times, for the base year, in order to determine the appropriate power values.

Before this transfer file is run, the following must be done:

- The Preference Maps must be developed by running the SLF Algorithm, starting at the base year and following the prompts and procedures of the algorithm. Exit from the procedure when the preference maps are completed.

- Verify, and modify if necessary, the map numbers of maps used by the transfer file.

- Enter values for the Power functions for the preference maps, except for Tubewells, in the lines flagged with three asterisks (***). The first time, use a value of 1. In later runs, enter values determined by examining the modified preference maps that resulted from the previous running of TP194, WRR, and TP294. Increase the power (maximum is 3.999) to give the original preference maps more weight; reduce the power to give them less weight. This way you can control whether the growth will be concentrated in the high preference areas or scattered more to other areas.

This transfer file produces the following:

- A completed preference map for Tubewells.

- A modified preference map for each of the other classes.

- Map Backup files of the modified preference maps, one for each class. These will be further modified by the WRR utility program and the transfer file TP294.

```
OF      **********  TP194  **********  MODIFY PREF MAPS - PART 1
OF
SM                SPATIAL MODEL
ME                MAP EDIT
CI                CARD IMAGE
MBPREF              LOAD PREF MAPS
MM                MAP MATH
CM                 COPY MAP  -- TO CREATE T/W PREF MAP W/ PROXIMITY
22,13
/
PR                PROXIMITY -- DISTANCE OF 2
22,2,22
TH               THRESHOLD -- KEEP ONLY 1'S, WHICH ARE ADJACENT CELL
22,0,1,0,1
/
SD                SPATIAL DISPLAY
MB
MBPREF
17,25               PREF MAPS W/ TUBEWELLS MODIFIED
/
/
/                   RETURN TO MAP MATH
SC               SCALE FROM 0 TO 10 SO POWER CAN GO UP TO 3.99
17,0,10
18,0,10
19,0,10
20,0,10
21,0,10
23,0,10
24,0,10
25,0,10
/
PO               POWER PREF MAP TO A POWER < 4 (MAX RESULT < 10000)
17,17,1.0           DOM LOW      ***
18,18,1.0           DOM MED      ***
19,19,1.2           DOM HGH      ***
20,20,1.0           COM LOW      ***
21,21,.50           COM MED      ***
23,23,1.0           IND LOW      ***
24,24,.50           IND MED      ***
25,25,.60           IND HGH      ***
/
TH               THRESHOLD -- DELETE NEGATIVES
17,0,0,99999,99999    DOM LOW
18,0,0,99999,99999    DOM MED
19,0,0,99999,99999    DOM HGH
20,0,0,99999,99999    COM LOW
21,0,0,99999,99999    COM MED
23,0,0,99999,99999    IND LOW
```

```
24,0,0,99999,99999    IND MED
25,0,0,99999,99999    IND HGH
/
SD                 SPATIAL DISPLAY
MB                   MAP BACKUP
P17                  PREF DOM LOW
17,17
/
/
MB
P18                  PREF DOM MED
18,18
/
/
MB
P19                  PREF DOM HGH
19,19
/
/
MB
P20                  PREF COM LOW
20,20
/
/
MB
P21                  PREF COM MED
21,21
/
/
MB
P22                  PREF TUBEWELLS
22,22
/
/
MB
P23                  PREF IND LOW
23,23
/
/
MB
P24                  PREF IND MED
24,24
/
/
MB
P25                  PREF IND HGH
25,25
/
/
MB
```

MBLU7	AVAIL LAND
7,7	
/	
/	
MB	
MBWATR	WATER
29,29	
/	
/	RETURN TO SPATIAL DISPLAY
/	RETURN TO MAP MATH
/	RETURN TO MAP EDIT
/	RETURN TO SPATIAL MODEL
/	RETURN TO PRIMARY MENU
TR	RETURN CONTROL TO KEYBOARD

TP294

A version of this transfer file is used in each iteration year of the Special SLF Forecast Procedure, to modify the preference maps so they give the desired "scattering" of growth, and so the growth goes into the desired areas. A copy of this file should be made for each forecast iteration year, and each one given a name that indicates the year of the iteration (eg. TP298 for 1998.)

The transfer file changes the maps created by WRR into the modified preference maps that will be used in forecasting that iteration. It then ratios preference values in selected parts of each preference map up or down to shift growth to or from those areas. The user selects the areas and ratios. Then it reduces the amount of land that can be used in each cell for that iteration, allocates growth to the cells, adjusts land amounts in the land-use maps and the vacant-useable land map, saves the results, and converts the new land-use maps into a load map for the iteration year.

Before this transfer file is run, the following must be set up:

- Map Backup file of land-use maps from the previous iteration (the base year when running the first iteration).
- A set of Map Backup files from the WRR Utility Program, one per class, a different set for each iteration year.
- Maps 55-65 available for use by the transfer file.
- Area definitions and ratio values for those areas, in the section of the transfer file labelled "RATIO AREAS UP OR DOWN", and land reduction multipliers and amounts of growth in the section labelled "REDUCE LAND AND ALLOCATE GROWTH".
- Names of all files being read in or dumped out by the transfer file. The names will be different for each iteration year.
- The year, hour, and load map number for converting to load.

This transfer file produces the following:

- Preference maps used for growth allocation for this iteration.
- New land-use maps, including the new growth.
- New vacant-useable land map, reduced by the iteration growth.
- Map Backup files of revised land-use maps and preference maps.
- Load map for the iteration.

```
OF     **********  TP294  **********  MODIFY PREF MAPS - PART 2
OF
SM                SPATIAL MODEL
ME                MAP EDIT
CI                CARD IMAGE
MBLU92              LAND USE 1992                    ***
CI                CARD IMAGE
P17W                LOAD PREF MAP -- DOM LOW         ***
CI                CARD IMAGE
P18W                LOAD PREF MAP -- DOM MED         ***
CI                CARD IMAGE
P19W                LOAD PREF MAP -- DOM HGH         ***
CI                CARD IMAGE
P20W                LOAD PREF MAP -- COM LOW         ***
CI                CARD IMAGE
P21W                LOAD PREF MAP -- COM MED         ***
CI                CARD IMAGE
P22W                LOAD PREF MAP -- TUBEWELLS       ***
CI                CARD IMAGE
P23W                LOAD PREF MAP -- IND LOW         ***
CI                CARD IMAGE
P24W                LOAD PREF MAP -- IND MED         ***
CI                CARD IMAGE
P25W                LOAD PREF MAP -- IND HGH         ***
MM                MAP MATH
CM                  COPY LAND USE MAPS TO WORKSPACE MAPS FOR COMPARING
55,7                 WITH GROWN LAND USE MAPS AFTER THIS TRANSFER FILE
56,8
57,9
58,10
59,11
60,12
61,13
62,14
63,15
64,16
65,7                MAP 65 = TEMP STORAGE OF AVAIL LAND
/
AS                ADD/SUBTRACT --CHANGE RANKS TO PREFERENCE VALUES
17,-1,17,0,17,5130  DOM LOW -- LAST NUMBER = MAX RANK + 1 FROM WRR
18,-1,18,0,18,5032  DOM MED                  ***
19,-1,19,0,19,4742  DOM HGH                  ***
20,-1,20,0,20,4885  COM LOW                  ***
21,-1,21,0,21,5331  COM MED                  ***
22,-1,22,0,22, 526  TUBEWELL                 ***
23,-1,23,0,23,4057  IND LOW                  ***
24,-1,24,0,24,4967  IND MED                  ***
25,-1,25,0,25,4711  IND HGH                  ***
/
```

```
TH                  THRESHOLD -- SET 0 PREF CELLS TO 0
17,0,0,0,5129         DOM LOW -- LAST NUMBER = MAX RANK FROM WRR
18,0,0,0,5031         DOM MED                    ***
19,0,0,0,4741         DOM HGH                    ***
20,0,0,0,4884         COM LOW                    ***
21,0,0,0,5330         COM MED                    ***
22,0,0,0, 525         TUBEWELL                   ***
23,0,0,0,4056         IND LOW                    ***
24,0,0,0,4966         IND MED                    ***
25,0,0,0,4710         IND HGH                    ***
/
MU                  MULTIPLY -- RESTRICT PREFERENCES TO SERVICE AREA ONLY
17,1,17,51,0          DOM LOW
18,1,18,51,0          DOM MED
19,1,19,51,0          DOM HGH
20,1,20,51,0          COM LOW
21,1,21,51,0          COM MED
22,1,22,51,0          TUBEWELLS
23,1,23,51,0          IND LOW
24,1,24,51,0          IND MED
25,1,25,51,0          IND HGH
/
SC                  SCALE PREF MAPS FROM 0 TO 100
17,0,100              SCALE PREF MAP  -  DOM LOW
18,0,100              SCALE PREF MAP  -  DOM MED
19,0,100              SCALE PREF MAP  -  DOM HGH
20,0,100              SCALE PREF MAP  -  COM LOW
21,0,100              SCALE PREF MAP  -  COM MED
22,0,100              SCALE PREF MAP  -  TUBEWELLS
23,0,100              SCALE PREF MAP  -  IND LOW
24,0,100              SCALE PREF MAP  -  IND MED
25,0,100              SCALE PREF MAP  -  IND HGH
/                                         ****** RATIO AREAS UP OR DOWN *****
/                     RETURN TO MAP EDIT
SB                  SET BLOCK TO A VALUE TO RATIO PREF IN SOUTH - DOM LOW
29                    MAP 29
1,1,100,115,1.000                  ***
1,41,100,115,.9907                 ***
/
MM                  MAP MATH
MU                  MULTIPLY
17,1,17,29,0
/
/                   RETURN TO MAP EDIT
SB                  SET BLOCK TO A VALUE TO RATIO PREF IN SOUTH - DOM MED
29                    MAP 29
1,1,100,115,1.00                   ***
```

```
1,41,100,115,.963                    ***
/
MM                  MAP MATH
MU                  MULTIPLY
18,1,18,29,0
/
/                     RETURN TO MAP EDIT
SB                  SET BLOCK TO A VALUE TO RATIO PREF IN SOUTH - COM LOW
29                    MAP 29
1,1,100,115,1.000                    ***
1,41,100,115,1.01                    ***
/
MM                   MAP MATH
MU                   MULTIPLY
20,1,20,29,0
/
/                    RETURN TO MAP EDIT
SB                        DOM HGH
29
1,1,100,115,1.000                    ***
1,41,100,115,.984                    ***
/
MM
MU
19,1,19,29,0
/
/
SB                        COM MED
29
1,1,100,115,1.000                    ***
1,41,100,115,1.017                   ***
/
MM
MU
21,1,21,29,0
/
/
SB                        IND MED
29
1,1,100,115,1.000                    ***
1,41,100,115,1.15                    ***
/
MM
MU
24,1,24,29,0
/
/
SB                        IND HGH
29
```

```
1,1,100,115,1.000                    ***
1,41,100,115,1.15                    ***
/
MM
MU
25,1,25,29,0
/
/
SB            SET BLOCK TO A VALUE TO RATIO PREF IN SOUTH - IND LOW
29                     MAP 29
1,1,100,115,1.000                    ***
1,41,100,115,1.005                   ***
/
MM                   MAP MATH
MU                   MULTIPLY
23,1,23,29,0
/             ******* REDUCE LAND AVAILABLE, AND ALLOCATE GROWTH *******
AS                                 ******* START COMMERCIAL MEDIUM ******* 5
7,.038,7,0,9,0    *** REDUCE AVAILABLE LAND        ***
/
SA                   ALLOCATE LAND USE GROWTH
42.9                   *** AMOUNT                   ***
6,7,21                 STORE GROWTH , ADJUSTED AVAIL LAND , PREF MAP
CM
7,65
/
AS
7,1,7,-1,6,0           REMOVE GROWTH FROM AVAIL LAND
12,1,12,1,6,0          ADD GROWTH TO CLASS LAND USE
/
CM
65,7
/
AS                                 ******* START DOMESTIC HIGH  ******* 3
7,.056,7,0,9,0         *** REDUCE AVAILABLE LAND  ***
/
SA                   ALLOCATE LAND USE GROWTH
232.8                  *** AMOUNT                   ***
6,7,19                 STORE GROWTH , ADJUSTED AVAIL LAND , PREF MAP
CM
7,65
/
AS
7,1,7,-1,6,0           REMOVE GROWTH FROM AVAIL LAND
10,1,10,1,6,0          ADD GROWTH TO CLASS LAND USE
/
CM
```

```
65,7
/
AS                                  ******* START INDUSTRIAL HIGH ******* 9
7,.6,7,0,9,0          *** REDUCE AVAILABLE LAND  ***
/
SA                  ALLOCATE LAND USE GROWTH
63.3                  *** AMOUNT                    ***
6,7,25                STORE GROWTH , ADJUSTED AVAIL LAND , PREF MAP
CM
7,65
/
AS
7,1,7,-1,6,0          REMOVE GROWTH FROM AVAIL LAND
16,1,16,1,6,0         ADD GROWTH TO CLASS LAND USE
/
CM
65,7
/
AS                                  ******* START INDUSTRIAL MEDIUM ****** 8
7,.022,7,0,9,0        *** REDUCE AVAILABLE LAND  ***
/
SA                  ALLOCATE LAND USE GROWTH
12.9                  *** AMOUNT                    ***
6,7,24                STORE GROWTH , ADJUSTED AVAIL LAND , PREF MAP
CM
7,65
/
AS
7,1,7,-1,6,0          REMOVE GROWTH FROM AVAIL LAND
15,1,15,1,6,0         ADD GROWTH TO CLASS LAND USE
/
CM
65,7
/
AS                                  ******* START DOMESTIC MEDIUM ******* 2
7,.078,7,0,9,0        *** REDUCE AVAILABLE LAND  ***
/
SA                  ALLOCATE LAND USE GROWTH
458.9                 *** AMOUNT                    ***
6,7,18                STORE GROWTH , ADJUSTED AVAIL LAND , PREF MAP
CM
7,65
/
AS
7,1,7,-1,6,0          REMOVE GROWTH FROM AVAIL LAND
9,1,9,1,6,0           ADD GROWTH TO CLASS LAND USE
/
```

```
CM
65,7
/
AS                                  ******* START COMMERCIAL LOW ******* 4
7,.048,7,0,9,0          *** REDUCE AVAILABLE LAND  ***
/
SA                     ALLOCATE LAND USE GROWTH
124.0                   *** AMOUNT                  ***
6,7,20                  STORE GROWTH , ADJUSTED AVAIL LAND , PREF MAP
CM
7,65
/
AS
7,1,7,-1,6,0            REMOVE GROWTH FROM AVAIL LAND
11,1,11,1,6,0           ADD GROWTH TO CLASS LAND USE
/
CM
65,7
/
AS                                  ******* START INDUSTRIAL LOW ******* 7
7,.006,7,0,9,0          *** REDUCE AVAILABLE LAND  ***
/
SA                     ALLOCATE LAND USE GROWTH
15.5                    *** AMOUNT                  ***
6,7,23                  STORE GROWTH , ADJUSTED AVAIL LAND , PREF MAP
CM
7,65
/
AS
7,1,7,-1,6,0            REMOVE GROWTH FROM AVAIL LAND
14,1,14,1,6,0           ADD GROWTH TO CLASS LAND USE
/
CM
65,7
/
AS                                  ******* START DOMESTIC LOW ******* 1
7,.14,7,0,9,0           *** REDUCE AVAILABLE LAND  ***
/
SA                     ALLOCATE LAND USE GROWTH
787.2                   *** AMOUNT                  ***
6,7,17                  STORE GROWTH , ADJUSTED AVAIL LAND , PREF MAP
CM
7,65
/
AS
7,1,7,-1,6,0            REMOVE GROWTH FROM AVAIL LAND
8,1,8,1,6,0             ADD GROWTH TO CLASS LAND USE
/
```

```
CM
65,7
/
AS                                        ******* START TUBEWELLS ******* 6
7,1.0,7,0,9,0          *** REDUCE AVAILABLE LAND  ***
/
SA                   ALLOCATE LAND USE GROWTH
1406.2                 *** AMOUNT                    ***
6,7,22                 STORE GROWTH , ADJUSTED AVAIL LAND , PREF MAP
CM
7,65
/
AS
7,1,7,-1,6,0           REMOVE GROWTH FROM AVAIL LAND
13,1,13,1,6,0          ADD GROWTH TO CLASS LAND USE
/
SD
MB
MBLU94                 ***   SAVE 1994 MODIFIED LAND USE MAPS   ***
7,16
/
/
MB
MBRP94                 ***   SAVE REVISED 1994 PREF MAPS        ***
17,25
/
/
/                    RETURN TO MAP MATH
/                    RETURN TO MAP EDIT
/                    RETURN TO SPATIAL MODEL
/                    RETURN TO PRIMARY MENU
LM                   LOAD MODEL
SD                   SPATIAL DISTRIBUTION
N
8,9,10,11,12,13,14,15,16
1994                   *** YEAR                      ***
21                         HOUR
2                      *** LOAD MAP NO.              ***
/                      RETURN TO PRIMARY MENU
ON                   TURN MENUS ON
TR                   TRANSFER CONTROL TO KEYBOARD
```

TP297

This transfer file is the same as TP294 except for a different year. Similar files should be created for each of the forecast iteration years (eg. TP202, TP207, TP212).

Before this transfer file is run, the following must be set up:

The same items as in TP294, with the appropriate names, years, maps, etc.

This transfer file produces the following:

The same items as for TP294, except for a different year.

```
OF      **********  TP297  **********  MODIFY PREF MAPS - PART 2
OF
SM                SPATIAL MODEL
ME                MAP EDIT
CI                CARD IMAGE
MBLU94              LAND USE 1994                    ***
CI                CARD IMAGE
P17X                LOAD PREF MAP -- DOM LOW         ***
CI                CARD IMAGE
P18X                LOAD PREF MAP -- DOM MED         ***
CI                CARD IMAGE
P19X                LOAD PREF MAP -- DOM HGH         ***
CI                CARD IMAGE
P20X                LOAD PREF MAP -- COM LOW         ***
CI                CARD IMAGE
P21X                LOAD PREF MAP -- COM MED         ***
CI                CARD IMAGE
P22X                LOAD PREF MAP -- TUBEWELLS       ***
CI                CARD IMAGE
P23X                LOAD PREF MAP -- IND LOW         ***
CI                CARD IMAGE
P24X                LOAD PREF MAP -- IND MED         ***
CI                CARD IMAGE
P25X                LOAD PREF MAP -- IND HGH         ***
MM                MAP MATH
CM                COPY LAND USE MAPS TO WORKSPACE MAPS FOR COMPARING
55,7                WITH GROWN LAND USE MAPS AFTER THIS TRANSFER FILE
56,8
57,9
58,10
59,11
60,12
61,13
62,14
63,15
64,16
65,7                MAP 65 = TEMP STORAGE OF AVAIL LAND
/
AS                ADD/SUBTRACT --CHANGE RANKS TO PREFERENCE VALUES
17,-1,17,0,17,5127  DOM LOW -- LAST NUMBER = MAX RANK + 1 FROM WRR
18,-1,18,0,18,5032  DOM MED                    ***
19,-1,19,0,19,4741  DOM HGH                    ***
20,-1,20,0,20,4883  COM LOW                    ***
21,-1,21,0,21,5331  COM MED                    ***
22,-1,22,0,22, 509  TUBEWELL                   ***
23,-1,23,0,23,4056  IND LOW                    ***
24,-1,24,0,24,4965  IND MED                    ***
25,-1,25,0,25,4711  IND HGH                    ***
/
```

```
TH                  THRESHOLD -- SET 0 PREF CELLS TO 0
17,0,0,0,5126         DOM LOW -- LAST NUMBER = MAX RANK FROM WRR
18,0,0,0,5031         DOM MED                          ***
19,0,0,0,4740         DOM HGH                          ***
20,0,0,0,4882         COM LOW                          ***
21,0,0,0,5330         COM MED                          ***
22,0,0,0, 508         TUBEWELL                         ***
23,0,0,0,4055         IND LOW                          ***
24,0,0,0,4964         IND MED                          ***
25,0,0,0,4710         IND HGH                          ***
/
MU                  MULTIPLY -- RESTRICT PREFERENCES TO SERVICE AREA ONLY
17,1,17,51,0          DOM LOW
18,1,18,51,0          DOM MED
19,1,19,51,0          DOM HGH
20,1,20,51,0          COM LOW
21,1,21,51,0          COM MED
22,1,22,51,0          TUBEWELLS
23,1,23,51,0          IND LOW
24,1,24,51,0          IND MED
25,1,25,51,0          IND HGH
/
SC                  SCALE PREF MAPS FROM 0 100
17,0,100              SCALE PREF MAP  -  DOM LOW
18,0,100              SCALE PREF MAP  -  DOM MED
19,0,100              SCALE PREF MAP  -  DOM HGH
20,0,100              SCALE PREF MAP  -  COM LOW
21,0,100              SCALE PREF MAP  -  COM MED
22,0,100              SCALE PREF MAP  -  TUBEWELLS
23,0,100              SCALE PREF MAP  -  IND LOW
24,0,100              SCALE PREF MAP  -  IND MED
25,0,100              SCALE PREF MAP  -  IND HGH
/                           ******* RATIO SELECTED AREAS UP OR DOWN *******
/                       RETURN TO MAP EDIT
SB                  SET BLOCK TO A VALUE TO RATIO PREF IN SOUTH - DOM LOW
29                    MAP 29
1,1,100,115,1.000                    ***
1,41,100,115,.9907                   ***
/
MM                  MAP MATH
MU                  MULTIPLY
17,1,17,29,0
/
/                     RETURN TO MAP EDIT
SB                  SET BLOCK TO A VALUE TO RATIO PREF IN SOUTH - DOM MED
29                    MAP 29
1,1,100,115,1.00                     ***
```

```
1,41,100,115,.963                    ***
/
MM                  MAP MATH
MU                    MULTIPLY
18,1,18,29,0
/
/                   RETURN TO MAP EDIT
SB                  SET BLOCK TO A VALUE TO RATIO PREF IN SOUTH - COM LOW
29                    MAP 29
1,1,100,115,1.000                    ***
1,41,100,115,1.01                    ***
/
MM                  MAP MATH
MU                  MULTIPLY
20,1,20,29,0
/
/                     RETURN TO MAP EDIT
SB                        DOM HGH
29
1,1,100,115,1.000                    ***
1,41,100,115,.984                    ***
/
MM
MU
19,1,19,29,0
/
/
SB                        COM MED
29
1,1,100,115,1.000                    ***
1,41,100,115,1.017                   ***
/
MM
MU
21,1,21,29,0
/
/
SB                        IND MED
29
1,1,100,115,1.000                    ***
1,41,100,115,1.15                    ***
/
MM
MU
24,1,24,29,0
/
/
SB                        IND HGH
29
1,1,100,115,1.000                    ***
```

```
1,41,100,115,1.15                    ***
/
MM
MU
25,1,25,29,0
/
/
SB                 SET BLOCK TO A VALUE TO RATIO PREF IN SOUTH - IND LOW
29                   MAP 29
1,1,100,115,1.000                    ***
1,41,100,115,1.005                   ***
/
MM                 MAP MATH
MU                   MULTIPLY
23,1,23,29,0
/              ******* REDUCE AVAILABLE LAND, AND ALLOCATE GROWTH *******
AS                                  ******* START COMMERCIAL MEDIUM ******* 5
7,.057,7,0,9,0       *** REDUCE AVAILABLE LAND       ***
/
SA                 ALLOCATE LAND USE GROWTH
72.7                 *** AMOUNT                      ***
6,7,21               STORE GROWTH , ADJUSTED AVAIL LAND , PREF MAP
CM
7,65
/
AS
7,1,7,-1,6,0         REMOVE GROWTH FROM AVAIL LAND
12,1,12,1,6,0        ADD GROWTH TO CLASS LAND USE
/
CM
65,7
/
AS                                  ******* START DOMESTIC HIGH ******* 3
7,.084,7,0,9,0       *** REDUCE AVAILABLE LAND       ***
/
SA                 ALLOCATE LAND USE GROWTH
423.7                *** AMOUNT                      ***
6,7,19               STORE GROWTH , ADJUSTED AVAIL LAND , PREF MAP
CM
7,65
/
AS
7,1,7,-1,6,0         REMOVE GROWTH FROM AVAIL LAND
10,1,10,1,6,0        ADD GROWTH TO CLASS LAND USE
/
CM
65,7
```

```
/
AS                                  ******* START INDUSTRIAL HIGH ******* 9
7,.6,7,0,9,0        *** REDUCE AVAILABLE LAND       ***
/
SA                ALLOCATE LAND USE GROWTH
120.9               *** AMOUNT                      ***
6,7,25              STORE GROWTH , ADJUSTED AVAIL LAND , PREF MAP
CM
7,65
/
AS
7,1,7,-1,6,0        REMOVE GROWTH FROM AVAIL LAND
16,1,16,1,6,0       ADD GROWTH TO CLASS LAND USE
/
CM
65,7
/
AS                                  ******* START INDUSTRIAL MEDIUM ****** 8
7,.033,7,0,9,0      *** REDUCE AVAILABLE LAND       ***
/
SA                ALLOCATE LAND USE GROWTH
24.8                *** AMOUNT                      ***
6,7,24              STORE GROWTH , ADJUSTED AVAIL LAND , PREF MAP
CM
7,65
/
AS
7,1,7,-1,6,0        REMOVE GROWTH FROM AVAIL LAND
15,1,15,1,6,0       ADD GROWTH TO CLASS LAND USE
/
CM
65,7
/
AS                                  ******* START DOMESTIC MEDIUM ******* 2
7,.117,7,0,9,0      *** REDUCE AVAILABLE LAND       ***
/
SA                ALLOCATE LAND USE GROWTH
835.5               *** AMOUNT                      ***
6,7,18              STORE GROWTH , ADJUSTED AVAIL LAND , PREF MAP
CM
7,65
/
AS
7,1,7,-1,6,0        REMOVE GROWTH FROM AVAIL LAND
9,1,9,1,6,0         ADD GROWTH TO CLASS LAND USE
/
CM
65,7
```

```
/
AS                                        ******* START COMMERCIAL LOW ******* 4
7,.072,7,0,9,0      *** REDUCE AVAILABLE LAND        ***
/
SA                 ALLOCATE LAND USE GROWTH
210.2                *** AMOUNT                        ***
6,7,20               STORE GROWTH , ADJUSTED AVAIL LAND , PREF MAP
CM
7,65
/
AS
7,1,7,-1,6,0         REMOVE GROWTH FROM AVAIL LAND
11,1,11,1,6,0        ADD GROWTH TO CLASS LAND USE
/
CM
65,7
/
AS                                        ******* START INDUSTRIAL LOW ******* 7
7,.009,7,0,9,0       *** REDUCE AVAILABLE LAND        ***
/
SA                 ALLOCATE LAND USE GROWTH
25.8                 *** AMOUNT                        ***
6,7,23               STORE GROWTH , ADJUSTED AVAIL LAND , PREF MAP
CM
7,65
/
AS
7,1,7,-1,6,0         REMOVE GROWTH FROM AVAIL LAND
14,1,14,1,6,0        ADD GROWTH TO CLASS LAND USE
/
CM
65,7
/
AS                                        ******* START DOMESTIC LOW ******* 1
7,.21,7,0,9,0        *** REDUCE AVAILABLE LAND        ***
/
SA                 ALLOCATE LAND USE GROWTH
1433.1               *** AMOUNT                        ***
6,7,17               STORE GROWTH , ADJUSTED AVAIL LAND , PREF MAP
CM
7,65
/
AS
7,1,7,-1,6,0         REMOVE GROWTH FROM AVAIL LAND
8,1,8,1,6,0          ADD GROWTH TO CLASS LAND USE
/
CM
65,7
```

```
/
AS                                        ******* START TUBEWELLS ******* 6
7,1.0,7,0,9,0        *** REDUCE AVAILABLE LAND        ***
/
SA                 ALLOCATE LAND USE GROWTH
2189.3               *** AMOUNT                        ***
6,7,22               STORE GROWTH , ADJUSTED AVAIL LAND , PREF MAP
CM
7,65
/
AS
7,1,7,-1,6,0         REMOVE GROWTH FROM AVAIL LAND
13,1,13,1,6,0        ADD GROWTH TO CLASS LAND USE
/
SD
MB
MBLU97               ***  SAVE 1994 MODIFIED LAND USE MAPS  ***
7,16
/
/
MB
MBRP97               *** SAVE REVISED 1994 PREF MAPS  ***
17,25
/
/
/                  RETURN TO MAP MATH
/                  RETURN TO MAP EDIT
/                  RETURN TO SPATIAL MODEL
/                  RETURN TO PRIMARY MENU
LM                 LOAD MODEL
SD                 SPATIAL DISTRIBUTION
N
8,9,10,11,12,13,14,15,16
1997                 *** YEAR                  ***
21                       HOUR
3                    *** LOAD MAP NO.          ***
/                  RETURN TO PRIMARY MENU
ON                 TURN MENUS ON
TR                 TRANSFER CONTROL TO KEYBOARD
```

TR123

This transfer file is used in DLF to create a map for visually comparing the location of customers in LOADSITE with the location of FEEDERSITE buses. It can easily be modified for SLF by simply changing the land-use map numbers. This is a valuable check on the geographical locations of data.

Before this transfer file is run, the following must be set up:

- o Land-use map numbers
- o Map 22 containing FEEDERSITE bus locations. This is created by running NODESIM.

This transfer file produces the following:

Map 34; containing 1's in cells with customers, 2's in cells with buses, and 3's in cells with both. Display this map with the Color Option.

```
ON          TR123 -- CREATE MAP WITH VALUE 1, 2, OR 3
ON MENUS ****** TR123 ****** TR123 ****** TR123 ******
ON     TRANSFER FILE TO CREATE A MAP SHOWING LOCATION
ON     OF CUSTOMERS WITH RELATION TO THE FDRSITE BUSES
ON     1-CUSTS ONLY, 2-BUSES ONLY, 3-CUSTS AND BUSES
OF MENUS ****** TR123 ****** TR123 ****** TR123 ******
SM                          GO TO SPATIAL MODEL
ME                          GO TO MAP EDIT
CN                          CHANGE MAP NAMES
32                            MAP 32
BASE YR CUST CELLS=1          NAME OF MAP 32
33                            ETC.
FDRSITE BUS CELLS=2
34
1-CUST,2=BUS,3-BOTH
/
MM                            END MAP NAME CHANGES
AS                          GO TO MAP MATHEMATICS
32,1,1,1,2,0                ADD/SUBTRACT
32,1,32,1,3,0                 ADD 1-10 INTO 32
32,1,32,1,4,0
32,1,32,1,5,0
32,1,32,1,6,0
32,1,32,1,7,0
32,1,32,1,8,0
32,1,32,1,9,0
32,1,32,1,10,0
/
CM                            END ADD/SUBTRACT
33,22                       COPY MAPS
/                             TO 33 FROM 22
TH                            END COPY MAPS
32,0,0,1,0                  THRESHOLD
33,2,0,2,0                    1=CUSTOMERS
/                             2=BUS
AS                            END THRESHOLD
34,1,33,1,32,0              ADD/SUBTRACT
/                             1=CUSTOMERS, 2=BUS, 3=BOTH
/                             END ADD/SUBTRACT
SD                          RETURN TO SPATIAL MODEL
MB                          GO TO SPATIAL DISPLAY
MB123                       MAP BACKUP
34,34                         FILE NAME
/                             MAP 34
/                             ACCEPT DEFAULT WINDOW
/                             END OF MAPS
/                           RETURN TO MAP MATHEMATICS
/                           RETURN TO SPATIAL MODEL
ON MENUS                    RETURN TO PRIMARY MENU
TR
                            RETURN CONTROL TO KEYBOARD
```

TRBLOC

This transfer file is used in DLF or SLF to convert a NODESIM bus location map into a map with only bus numbers, stripping off the phasing and multiple-buses-in-a-cell information. This can be useful in reviewing or verifying the file from FEEDERSITE. It can also be used to identify bus numbers of buses where abnormally high loads have been brought in on FEEDERSITE buses. It works only if all buses are three-phase buses.

Before this transfer file is run, the following must be set up:

- A NODESIM bus locations map in Map 22

This transfer file produces the following:

- A bus numbers map.
- A Map Backup file of the bus numbers map. This can be converted, by running PRMB5, to a geographically correct printout for review. Also a listing of all the bus locations can be created by running PRNZ.

```
ON        TRBLOC -- CREATE MAP WITH BUS LOC BUS NUMBERS
ON MENUS ***** TRBLOC ***** TRBLOC ***** TRBLOC ***** TRBLOC ******
ON     TRANSFER FILE TO COVERT NODESIM BUS LOCATION MAP INTO A
ON     MAP WITH ONLY BUS NUMBERS, IN A FORMAT THAT CAN BE SENT TO
ON     A MAP BACKUP FILE. HANDLES 4 DIGIT BUS NUMBERS.
OF MENUS ***** TRBLOC ***** TRBLOC ***** TRBLOC ***** TRBLOC ******
SM                              GO TO SPATIAL MODEL
ME                              GO TO MAP EDIT
CN                              CHANGE MAP NAMES
30                                MAP 30
MAP OF + BUS LOCS                 NAME OF MAP 30
31                                ETC.
MAP OF - BUS LOCS
35
BUS LOC BUS NO'S
/                                 END MAP NAME CHANGES
MM                              GO TO MAP MATHEMATICS
CM                              COPY MAPS
30,22
31,22
/                                 END COPY MAPS
TH                              THRESHOLD
30,0,0,9999999,9999999            MAKE MAP OF POSITIVE VALUES
31,-9999999,-9999999,0,0          MAKE MAP OF NEGATIVE VALUES
/                                 END THRESHOLD
AS                              ADD SUBTRACT
30,0,30,1,30,-7                 REMOVE PHASE CODE -- FOR 3-PH ONLY
31,0,31,1,31,7
/                                 END ADD/SUBTRACT
TH                              THRESHOLD
30,0,0,9999999,9999999            REMOVE NEGATIVES
31,-9999999,-9999999,0,0          REMOVE POSITIVES
/                                 END THRESHOLD
AS                              ADD/SUBTRACT
30,0,30,.001,30,0                 DIVIDE BY 1000 FOR LARGE NUMBERS
31,0,31,.001,31,0                 2 LEAST SIGNIF DIGITS AFTER DECIMAL
35,1,30,1,31,0                    COMBINE NEGATIVES AND POSITIVES
/                                 END ADD/SUBTRACT
SD                              GO TO SPATIAL DISPLAY
MB                              SEND MAP TO MAP BACKUP FILE
M35BA
35,35
/                                 ACCEPT DEFAULT WINDOW
/                                 END OF MAPS
/                               RETURN TO MAP EDIT
/                               RETURN TO SPATIAL MODEL
/                               RETURN TO PRIMARY MENU
ON MENUS
TR                              RETURN CONTROL TO KEYBOARD
```

TRBORD

This transfer file is used in DLF or SLF to create a map containing the border of the service area, from a file defining the service area. It allows the service area to be touching the map edges. It is set up for a 120 x 120 map size but can easily be changed to any map size.

Before this transfer file is run, the following must be set up:

- A Card Image file SAR51.DAT, defining the service area with 1's inside the service area and 0's outside. It should use Map 51 as the target map.

  If there is already a service area map, copy it to Map 51 and, before running the transfer file, remove the steps that initialize Map 51 and those that read in the SAR51 Card Image file.

This transfer file produces the following:

- A service area map, Map 51.
- A border map, Map 50.

```
ON          TRBORD -- BOUNDARY MAP
ON MENU ****** TRBORD ***** TRBORD ***** TRBORD ***** TRBORD ******
ON        TRANSFER FILE TO CREATE A BORDER MAP IN MAP 50, USING
ON       THE SERVICE AREA DEFINED IN THE CARD IMAGE FILE SAR51.DAT
OF MENU ****** TRBORD ***** TRBORD ***** TRBORD ***** TRBORD ******
SM                      GO TO SPATIAL MODE
ME                      GO TO MAP EDIT
IM                      INITIALIZE MAP
51                        MAP 51
0                         TO ZERO
Y                         YES, THAT'S CORRECT
52                        MAP 52
0                         TO ZERO
Y                         YES, THAT'S CORRECT
/                         END INITIALIZE
CI                      CARD IMAGE
SAR51                     CARD IMAGE FILE DEFINING SERVICE AREA
SL                      SET LINE TO A VALUE
52                        MAP 52
1,1,120,1,1               TOP BORDER
1,1,1,120,1               LEFT   "
120,1,120,120,1           RIGHT  "
1,120,120,120,1           BOTTOM "
/                         END LINE INPUT
/                       RETURN TO SPATIAL MODEL
MM                      GO TO MAP MATHEMATICS
PR                      PROXIMITY FUNCTION
51,2,50                   ON MAP 51, DISTANCE = 2, RESULTS IN MAP 50
TH                      THRESHOLD
50,0,1,0,1                MAP 50, ZERO ALL BUT 1'S
/                         END THRESHOLD
MU                      MULTIPLY
52,1,52,51,0              MAP 52 = MAP 52 * MAP 51
/                         END MULTIPLY
AS                      ADD/SUBTRACT
50,1,50,1,52,0            MAP 50 = MAP 50 + MAP 52
/                         END ADD/SUBTRACT
ON                      TURN ON MENUS
TR                      TRANSFER CONTROL TO KEYBOARD
```

TRCBB

This transfer file is used during the DLF and SLF load forecast procedures to check for out-of-bounds customers in the base year. See Sections V.B.2 and VI.B.2.

Before this transfer file is run, the following must be set up:

- Maps 31-40 and Maps 51-65 available for use.
- A Card Image file SAR64.DAT defining the service area with 1's inside the service area and 0's outside. The transfer file can be easily changed to use an already existing Service Area map. The target map must be Map 64.
- Base year customer maps, Maps 1-9 or 10 for DLF, or Maps 8-16 for SLF.

This transfer file produces the following:

- A map, Map 62, defining which classes of customers are in each out-of-bounds cell.
- A Map Backup file of that map, to be processed by the utility program PROOB.
- A Map Backup file of the individual class maps containing the out-of-bounds customers information. The information in this file can be displayed by the utility program PRNZ.

```
ON            TRCBB -- CHECK BOUNDARIES - BASE YEAR
ON MENUS ****** TRCBB ****** TRCBB ****** TRCBB ****** TRCBB ******
ON         TRANSFER FILE TO CHECK IF ALL OF THE BASE YEAR CUSTOMERS
ON         ARE IN THE BOUNDARIES OF  THE SERVICE AREA (DIVISION)
OF MENUS ****** TRCBB ****** TRCBB ****** TRCBB ****** TRCBB ******
SM                        GO TO SPATIAL MODEL
ME                        GO TO MAP EDIT
CN                        CHANGE NAMES OF MAPS
64                          MAP 64
SERVICE AREA MASK           NEW MAP NAME
65                          ETC.
BASE YR CUST CELLS=1
63
1=CUS OUT,2=VAC,3=IN
62
CLASSES IN OOB CELLS
61
OOB CELLS MASK
31
OOB CUSTS DOM-LOW
32
OOB CUSTS DOM-MED
33
OOB CUSTS DOM-HGH
34
OOB CUSTS COM-LOW
35
OOB CUSTS COM-MED
36
OOB CUSTS TUBWELL
37
OOB CUSTS IND-LOW
38
OOB CUSTS IND-MED
39
OOB CUSTS IND-HGH
51
1'S IF DOM-LOW CUSTS
52
1'S IF DOM-MED CUSTS
53
1'S IF DOM-HGH CUSTS
54
1'S IF COM-LOW CUSTS
55
1'S IF COM-LOW CUSTS
56
1'S IF TUBWELL CUSTS
57
```

```
1'S IF IND-LOW CUSTS
58
1'S IF IND-MED CUSTS
59
1'S IF IND-HGH CUSTS
/                    END OF NAME CHANGES
IM                 INITIALIZE MAP
64                    MAP 64
0                     TO ZERO
Y                     YES
/                     END OF INITIALIZE
CI                 CARD IMAGE
SAR64               NAME OF CARD IMAGE FILE WITH SERVICE AREA DEFINITION
/                    RETURN TO SPATIAL MODEL
MM                 GO TO MAP MATH
AS                 ADD/SUBTRACT
65,1,1,1,2,0         ADD ALL BASE YEAR CUSTOMERS INTO MAP 65    ***
65,1,65,1,3,0                                                   ***
65,1,65,1,4,0                                                   ***
65,1,65,1,5,0          FOR DLF, USE MAPS 1-9 OR 10.             ***
65,1,65,1,6,0          FOR SLF, USE MAPS 8-16.                  ***
65,1,65,1,7,0                                                   ***
65,1,65,1,8,0                                                   ***
65,1,65,1,9,0                                                   ***
/                    END OF ADD/SUBTRACT
TH                 THRESHOLD
65,0,0,1,0           SET NON-ZERO CELLS TO 1 (WHERE THERE ARE CUSTOMERS)
/                    END OF THRESHOLD
AS                 ADD/SUBTRACT
63,1,65,2,64,0       1=CUST OUT OF BOUND, 2=VAC IN BOUND, 3=CUST IN BOUND
/                    END OF ADD/SUBTRACT
CM                 COPY MAPS
61,63                FOR OUT-OF-BOUND CELLS MASK
51,1                 CLASS 1 CUSTOMERS                          ***
52,2                 CLASS 2 CUSTOMERS                          ***
53,3                 CLASS 3 CUSTOMERS   FOR DLF, USE CUST      ***
54,4                 CLASS 4 CUSTOMERS     MAPS 1-9 OR 10       ***
55,5                 CLASS 5 CUSTOMERS   FOR SLF, USE CUST      ***
56,6                 CLASS 6 CUSTOMERS     MAPS 8-16            ***
57,7                 CLASS 7 CUSTOMERS                          ***
58,8                 CLASS 8 CUSTOMERS                          ***
59,9                 CLASS 9 CUSTOMERS                          ***
/                    END OF COPY
TH                 THRESHOLD
61,0,1,0,1           ELIMINATE ALL BUT OUT-OF-BOUND CELLS (=1'S)
51,0,0,1,0           1'S FOR CLASS 1 CELLS
52,0,0,1,0           1'S FOR CLASS 2 CELLS
53,0,0,1,0           1'S FOR CLASS 3 CELLS
```

```
54,0,0,1,0          1'S FOR CLASS 4 CELLS
55,0,0,1,0          1'S FOR CLASS 5 CELLS
56,0,0,1,0          1'S FOR CLASS 6 CELLS
57,0,0,1,0          1'S FOR CLASS 7 CELLS
58,0,0,1,0          1'S FOR CLASS 8 CELLS
59,0,0,1,0          1'S FOR CLASS 9 CELLS
/                   END OF THRESHOLD
AS                ADD/SUBTRACT
62,1,51,2,52,0      COMBINE CLASSES 1 AND 2 COMPONENTS
62,1,62,4,53,0      ADD CLASS 3 COMPONENT
62,1,62,8,54,0      ADD CLASS 4 COMPONENT
62,1,62,16,55,0     ADD CLASS 5 COMPONENT
62,1,62,32,56,0     ADD CLASS 6 COMPONENT
62,1,62,64,57,0     ADD CLASS 7 COMPONENT
62,1,62,128,58,0    ADD CLASS 8 COMPONENT
62,1,62,256,59,0    ADD CLASS 9 COMPONENT
/                   END OF ADD/SUBTRACT
MU                MULTIPLY
62,1,62,61,0        TIMES MASK OF OUT-OF-BOUND CELLS
31,1,1,61,0         SAME
32,1,2,61,0         ETC.                                          ***
33,1,3,61,0                                                       ***
34,1,4,61,0                                                       ***
35,1,5,61,0               FOR DLF, USE CUST MAPS 1-9 OR 10        ***
36,1,6,61,0               FOR SLF, USE CUST MAPS 8-16             ***
37,1,7,61,0                                                       ***
38,1,8,61,0                                                       ***
39,1,9,61,0                                                       ***
/                                                                 ***
                    END OF MULTIPLY
SD                GO TO SPATIAL DISPLAY
MB                MAP BACKUP
OUTBAS              NAME OF MAP BACKUP FILE
62,62               MAP 62
/                   ACCEPT MAXIMUM X, Y LIMITS
/                   NO MORE MAPS
MB                MAP BACKUP
MB3139              NAME OF MAP BACKUP FILE
31,39               MAPS 31 TO 39
/                   ACCEPT MAXIMUM X, Y LIMITS
/                   NO MORE MAPS
ON                TURN ON MENUS
TR                RETURN CONTROL TO KEYBOURD
```

TRCBH

This transfer file is used during the DLF load forecast procedure to check for out-of-bounds customers in the horizon year. See Section V.E.1.

Before this transfer file is run, the following must be set up:

- Maps 31-40 and Maps 51-65 available for use.
- A Card Image file SAR64.DAT defining the service area with 1's inside the service area and 0's outside. The transfer file can easily be changed to use an already existing service area map. The target map must be Map 64.

This transfer file produces the following:

- A map, Map 62, defining which classes of customers are in each out-of-bounds cell.
- A Map Backup file of that map, to be processed by the utility program PROOB.
- A Map Backup file of the individual class maps containing the out-of-bounds customers information. The information in this file can be displayed by the utility program PRNZ.

```
ON          TRCBH -- CHECK BOUNDARIES - HORIZON YEAR
ON MENUS ****** TRCBH ****** TRCBH ****** TRCBH ****** TRCBH ******
ON        TRANSFER FILE TO CHECK IF ALL OF THE HORIZON YEAR CUSTOMERS
ON        ARE IN THE BOUNDARIES OF  THE SERVICE AREA (DIVISION)
OF MENUS ****** TRCBH ****** TRCBH ****** TRCBH ****** TRCBH ******
SM                      GO TO SPATIAL MODEL
ME                      GO TO MAP EDIT
CN                      CHANGE NAMES OF MAPS
64                        MAP 64
SERVICE AREA MASK         NEW MAP NAME
65                        ETC.
BASE YR CUST CELLS=1
63
1=CUS OUT,2=VAC,3=IN
62
CLASSES IN OOB CELLS
61
OOB CELLS MASK
31
OOB CUSTS DOM-LOW
32
OOB CUSTS DOM-MED
33
OOB CUSTS DOM-HGH
34
OOB CUSTS COM-LOW
35
OOB CUSTS COM-MED
36
OOB CUSTS TUB-PRI
37
OOB CUSTS TUB-FR
38
OOB CUSTS IND-LOW
39
OOB CUSTS IND-MED
40
OOB CUSTS IND-HGH
51
1'S IF DOM-LOW CUSTS
52
1'S IF DOM-MED CUSTS
53
1'S IF DOM-HGH CUSTS
54
1'S IF COM-LOW CUSTS
55
1'S IF COM-LOW CUSTS
56
```

```
1'S IF TUB-PRI CUSTS
57
1'S IF TUB-FR  CUSTS
58
1'S IF IND-LOW CUSTS
59
1'S IF IND-MED CUSTS
60
1'S IF IND-HGH CUSTS
/                          END OF NAME CHANGES
IM                       INITIALIZE MAP
64                          MAP 64
0                           TO ZERO
Y                           YES
/                           END OF INITIALIZE
CI                       CARD IMAGE
SAR64                     NAME OF CARD IMAGE FILE WITH SERVICE AREA DEFINITION
/                          RETURN TO SPATIAL MODEL
MM                       GO TO MAP MATH
AS                       ADD/SUBTRACT
65,1,11,1,12,0              ADD ALL HORIZON YEAR CUSTOMERS INTO MAP 65
65,1,65,1,13,0
65,1,65,1,14,0
65,1,65,1,15,0
65,1,65,1,16,0
65,1,65,1,17,0
65,1,65,1,18,0
65,1,65,1,19,0
65,1,65,1,20,0
/                          END OF ADD/SUBTRACT
TH                       THRESHOLD
65,0,0,1,0                 SET NON-ZERO CELLS TO 1 (WHERE THERE ARE CUSTOMERS)
/                          END OF THRESHOLD
AS                       ADD/SUBTRACT
63,1,65,2,64,0             1=CUST OUT OF BOUND, 2=VAC IN BOUND, 3=CUST IN BOUND
/                          END OF ADD/SUBTRACT
CM                       COPY MAPS
61,63                      FOR OUT-OF-BOUND CELLS MASK
51,11                       CLASS 1 CUSTOMERS
52,12                       CLASS 2 CUSTOMERS
53,13                       CLASS 3 CUSTOMERS
54,14                       CLASS 4 CUSTOMERS
55,15                       CLASS 5 CUSTOMERS
56,16                       CLASS 6 CUSTOMERS
57,17                       CLASS 7 CUSTOMERS
58,18                       CLASS 8 CUSTOMERS
59,19                       CLASS 9 CUSTOMERS
60,20                       CLASS 10 CUSTOMERS
/                         END OF COPY
```

```
TH                      THRESHOLD
61,0,1,0,1                ELIMINATE ALL BUT OUT-OF-BOUND CELLS (=1'S)
51,0,0,1,0                1'S FOR CLASS 1 CELLS
52,0,0,1,0                1'S FOR CLASS 2 CELLS
53,0,0,1,0                1'S FOR CLASS 3 CELLS
54,0,0,1,0                1'S FOR CLASS 4 CELLS
55,0,0,1,0                1'S FOR CLASS 5 CELLS
56,0,0,1,0                1'S FOR CLASS 6 CELLS
57,0,0,1,0                1'S FOR CLASS 7 CELLS
58,0,0,1,0                1'S FOR CLASS 8 CELLS
59,0,0,1,0                1'S FOR CLASS 9 CELLS
60,0,0,1,0                1'S FOR CLASS 10 CELLS
/                         END OF THRESHOLD
AS                      ADD/SUBTRACT
62,1,51,2,52,0            COMBINE CLASSES 1 AND 2 COMPONENTS
62,1,62,4,53,0            ADD CLASS 3 COMPONENT
62,1,62,8,54,0            ADD CLASS 4 COMPONENT
62,1,62,16,55,0           ADD CLASS 5 COMPONENT
62,1,62,32,56,0           ADD CLASS 6 COMPONENT
62,1,62,64,57,0           ADD CLASS 7 COMPONENT
62,1,62,128,58,0          ADD CLASS 8 COMPONENT
62,1,62,256,59,0          ADD CLASS 9 COMPONENT
62,1,62,512,60,0          ADD CLASS 10 COMPONENT
/                         END OF ADD/SUBTRACT
MU                      MULTIPLY
62,1,62,61,0              TIMES MASK OF OUT-OF-BOUND CELLS
31,1,11,61,0               SAME
32,1,12,61,0               ETC.
33,1,13,61,0
34,1,14,61,0
35,1,15,61,0
36,1,16,61,0
37,1,17,61,0
38,1,18,61,0
39,1,19,61,0
40,1,20,61,0
/                         END OF MULTIPLY
SD                      GO TO SPATIAL DISPLAY
MB                      MAP BACKUP
OUTHOR                    NAME OF MAP BACKUP FILE
62,62                     MAP 62
/                         ACCEPT MAXIMUM X, Y LIMITS
/                         NO MORE MAPS
MB                      MAP BACKUP
MB3140                    NAME OF MAP BACKUP FILE
31,40                     MAPS 31 TO 40
/                         ACCEPT MAXIMUM X, Y LIMITS
/                         NO MORE MAPS
ON                      TURN ON MENUS
TR                      RETURN CONTROL TO KEYBOURD
```

TRDNG

This transfer file is used in DLF after the forecast is run, to eliminate any negative load growth that might occur in some of the cells with no load in the base year. This is done by reducing the amount of load in the earlier year to the amount of load in the later year. The user must then ratio up the entire load map to maintain the correct total load. Several iterations are needed.

Before this transfer file is run, the following must be set up:

- All the load maps, Maps 23-29.

This transfer file produces the following:

- Load maps with no negative growth between forecast years.

Do not use this if there is legitimate negative growth in any class, such as reduction in the number of Tubewells in future years.

```
ON          TRDNG -- DELETE NEGATIVE GROWTH - START FROM HORIZON YEAR
ON MENUS ****** TRDNG ****** TRDNG ****** TRDNG ****** TRDNG ******
ON         TRANSFER FILE TO ADJUST LOAD MAPS SO THERE ARE NO CELLS WITH
ON        NEGATIVE GROWTH. MAPS MUST BE RATIOD AFTER THEY ARE ADJUSTED.
OF MENUS ****** TRDNG ****** TRDNG ****** TRDNG ****** TRDNG ******
SM                        GO TO SPATIAL MODEL
ME                        GO TO MAP EDIT
CN                        CHANGE NAMES OF MAPS
60                          MAP 60
LOAD DIFF MP24-MP23         NEW MAP NAME
61                          MAP 60
LOAD DIFF MP25-MP24         NEW MAP NAME
62                          MAP 60
LOAD DIFF MP26-MP25         NEW MAP NAME
63                          MAP 60
LOAD DIFF MP27-MP26         NEW MAP NAME
64                          MAP 60
LOAD DIFF MP28-MP27         NEW MAP NAME
65                          MAP 60
LOAD DIFF MP29-MP28         NEW MAP NAME
/                           END OF MAP NAME CHANGES
/                         RETURN TO SPATIAL MODEL
MM                        GO TO MAP MATH
AS                        ADD/SUBTRACT
65,1,29,-1,28,0             GET DIFF BETWEEN THE HORIZON AND 6TH LOAD MAPS
/                           END OF ADD/SUBTRACT
TH                        THRESHOLD
65,-999,-999,0,0            DELETE POSITIVE VALUES
/                           END OF THRESHOLD
AS                        ADD/SUBTRACT
28,1,28,1,65,0              SUBTRACT NEG VALUES FROM (=ADD TO) 2ND YEAR MAP
65,1,28,-1,27,0         REPEAT ABOVE 7 LINES FOR SIXTH AND FIFTH LOAD MAPS
/
TH
65,-999,-999,0,0
/
AS
27,1,27,1,65,0
65,1,27,-1,26,0         REPEAT ABOVE 7 LINES FOR FIFTH AND FOURTH LOAD MAPS
/
TH
65,-999,-999,0,0
/
AS
26,1,26,1,65,0
65,1,26,-1,25,0         REPEAT ABOVE 7 LINES FOR FOURTH AND THIRD LOAD MAPS
/
```

```
TH
65,-999,-999,0,0
/
AS
25,1,25,1,65,0
65,1,25,-1,24,0        REPEAT ABOVE 7 LINES FOR THIRD AND SECOND LOAD MAPS
/
TH
65,-999,-999,0,0
/
AS
24,1,24,1,65,0
65,1,24,-1,23,0        REPEAT ABOVE 7 LINES FOR SECOND AND BASE LOAD MAPS
/
TH
65,-999,-999,0,0
/
AS
23,1,23,1,65,0
60,1,24,-1,23,0          SAVE DIFF BETWEEN BASE AND SECOND LOAD MAPS
61,1,25,-1,24,0          ETC.
62,1,26,-1,25,0
63,1,27,-1,26,0
64,1,28,-1,27,0
65,1,29,-1,28,0
/                      END OF ADD SUBTRACT
ON MENUS
TR                     TRANSFER CONTROL TO KEYBOARD
```

TRFCMP

This transfer file is used to create a Feeder Cost Map, in DLF, in Map 45, according to the SUBSITE Users Manual procedure, and accounting for the maximum number of customers per cell. It can be modified to work with SLF by changing the map numbers of the customer maps.

Before this transfer file is run, the following must be set up:

- Base year customer maps 1-9. (The file can be modified to handle 10 classes.)
- A multiplier for each class which is a combination of the multiplier from the SUBSITE User's Manual and the maximum number of customers in a cell. The manual multipliers assume the maps contain the fraction of a cell filled with the class, so they have to be divided by the maximum number of customers per cell to adjust for the fact that the maps contain the actual number of customers.
- The annualized cost of building a typical feeder across one cell in an undeveloped area.

This transfer file produces the following:

- A map, Map 47, containing the cost of building a feeder across each cell.

```
ON        TRFCMP -- MAKE FEEDER COST MAP - MAP 45
ON MENUS ***** TRFCMP ***** TRFCMP ***** TRFCMP ***** TRFCMP *****
ON      TRANSFER FILE TO CREATE A FEEDER EFFORT MAP, USING THE
ON      BASE YEAR CUSTOMER DATA WITH THE USERS MANUAL PROCEDURE
OF MENUS ***** TRFCMP ***** TRFCMP ***** TRFCMP ***** TRFCMP *****
SM                    GO TO SPATIAL MODEL
ME                    GO TO MAP EDIT
CN                    CHANGE MAP NAME
45                      MAP 45
FEEDER EFFORT MAP       MAP NAME
/                       END MAP NAME CHANGES
IM                    INITIALIZE MAP
47                      MAP 47
1                       TO 1
Y                       THAT'S CORRECT
/                       END INITIALIZE MAPS
MM                    GO TO MAP MATHEMATICS
AS                    ADD/SUBTRACT
47,1,47,.001,1,0        DOM-LOW CONST =  .1/100 CUSTOMERS
47,1,47,.005,2,0        DOM-MED CONST =  .2/40  "
47,1,47,.02,3,0         DOM HGH CONST =  .4/20  "
47,1,47,.005,4,0        COM-LOW CONST =  .2/40  "   SKP
47,1,47,.08667,5,0      COM-MED CONST = 1.3/15  "   15 MAR 93
47,1,47,0.0,6,0         TUBWELL CONST =  .0/5   "
47,1,47,.0125,7,0       IND-LOW CONST =  .1/8   "
47,1,47,.1,8,0          IND-MED CONST =  .4/4   "
47,1,47,1.0,9,0         IND-HGH CONST = 2.0/2   "
47,12.0,47,0,9,0        TIMES THE ANNUALIZED COST PER CELL
/
ON MENUS
TR                    RETURN CONTROL TO KEYBOARD
```

TRGSB

This transfer file is used in DLF or SLF to create the Grid Station service area boundaries map, Map 65. The map is used for calibrating LOADSITE loads to the Grid Station metered loads.

Before this transfer file is run, the following must be set up:

- Lines of data in the transfer file representing the Grid Station service area boundaries.

This transfer file produces the following:

- A Grid Station service areas boundary map, Map 65, containing 1000's at the boundaries and 1's elsewhere.

```
ON        ****** TRGSB ***** MAKE GRID STATION BOUNDARIES MAP *****
OF                    TURN OFF MENUS
SM                    GO TO SPATIAL MODEL
ME                    GO TO MAP EDIT
IM                    INITIALIZE MAP
65                      MAP 65
0                       TO ZERO
Y                       THAT'S RIGHT
/                       END INITIALIZE MAP
SL                    SET LINE TO A VALUE
65                      MAP 65
31,1,31,25,1            X1,Y1,X2,Y2,VALUE
31,25,...               MORE LINES OF DATA
...                     REPLACE THESE LINES WITH YOUR DATA
/                       END SET LINE TO A VALUE
/                     GO TO SPATIAL MODEL
MM                    GO TO MAP MATHEMATICS
SC                    SCALE MAP
65,0,999                MAP 65 FROM 0 TO 999
/                       END SCALE MAP
AS                    ADD/SUBTRACT
65,1,65,0,65,1          ADD 1 TO MAP 65
/                       END ADD/SUBTRACT
ON                    TURN ON MENUS
TR                    RETURN CONTROL TO KEYBOARD
```

TROB

This transfer file is used to open the database files upon entry into LOADSITE, either DLF or SLF.

Before this transfer file is run, the following must be set up:

- Global and Spatial databases.
- Correct database names and map dimensions in the transfer file.

This transfer file produces the following:

- Opened Global and Spatial databases.
- Leaves the user in the Primary Menu of LOADSITE.

```
ON          TROB -- OPEN BOTH DLF DATABASES - STARTS FROM SETUP MENU
OF MENUS **** TROB ***** TROB ***** TROB ***** TROB ***** TROB ****
OB           OPEN BOTH
S-G           NAME OF GLOBAL DATABASE
N                NO - DON'T CHANGE HEADER 1
N                NO - DON'T CHANGE HEADER 2
1                1 READING PER HOUR
S-S           NAME OF SPATIAL DATABASE
120              MAP X-DIMENSION
120              MAP Y-DIMENSION
N                NO - DON'T CHANGE HEADER
/            RETURN TO PRIMARY MENU
ON           TURN ON MENUS
TR           RETURN CONTROL TO KEYBOARD
```

TRPIC

This transfer file is used in DLF to create, and dump to a Map Backup file, a map showing how many customer classes are in each cell. The PRMB2 utility program can print out the Map Backup file in a geographically correct format. This is useful in reviewing the base year customer data. Display the map in the program using the color scale option. This transfer file can be modified for use in SLF by changing the customer map numbers.

Before this transfer file is run, the following must be set up:

- A Map Backup file, SAR64, containing the service area definition; 1's inside the service area, 0's outside. The target map must be Map 64.
- Case year customer maps 1-10.
- Maps 31-41 and Maps 64-65 must be available.

This transfer file produces the following:

- A map, Map 65, containing the number of classes in each small area in the service area, and 88 in each cell outside the area. Run PRMB2 outside the program to get a file for printing out in a geographically correct format.

```
ON          TRPIC -- PICTURE OF SERVICE AREA AND CUSTOMERS
ON MENUS ****** TRPIC ****** TRPIC ****** TRPIC ****** TRPIC ******
ON       TRANSFER FILE TO CREATE AND DUMP A MAP SHOWING HOW MANY
ON       CUSTOMERS CLASSES ARE IN EACH CELL. 88=OUT-OF BOUNDS.
OF MENUS ****** TRPIC ****** TRPIC ****** TRPIC ****** TRPIC ******
SM                      GO TO SPATIAL MODEL
ME                      GO TO MAP EDIT
IM                      INITIALIZE MAP
64                        MAP 64
0                         TO ZERO
Y                         THAT'S CORRECT
/                         END INITIALIZE MAPS
CI                      READ IN CARD IMAGE FILE
SAR64                     FILE NAME
/                       RETURN TO SPATIAL MODEL
MM                      GO TO MAP MATHEMATICS
CM                      COPY MAPS
31,1                      TO 31 FROM 1
32,2                      ETC.
33,3
34,4
35,5
36,6
37,7
38,8
39,9
40,10
41,64
/                         END COPY MAPS
TH                      THRESHOLD
31,0,0,1,0                SET MAP 31 TO 1 IF POSITIVE
32,0,0,1,0                ETC.
33,0,0,1,0
34,0,0,1,0
35,0,0,1,0
36,0,0,1,0
37,0,0,1,0
38,0,0,1,0
39,0,0,1,0
40,0,0,1,0
41,88,.5,0,.5
/                         END THRESHOLD
AS                      ADD/SUBTRACT
65,1,31,1,32,0            ADD ALL INTO MAP 65
65,1,65,1,33,0              SO MAP 65 HAS THE NUMBER
65,1,65,1,34,0              OF CLASSES IN EACH CELL
65,1,65,1,35,0
65,1,65,1,36,0
65,1,65,1,37,0
```

```
65,1,65,1,38,0
65,1,65,1,39,0
65,1,65,1,40,0
65,1,65,1,41,0
/                          END ADD/SUBTRACT
SD                       GO TO SPATIAL DISPLAY
MB                       MAP BACKUP
MB65PC                     MAP NAME
65,65                      MAP 65
/                          ACCEPT DEFAULT WINDOW
/                          END MAPS
ON   MENUS
TR                       RETURN CONTROL TO KEYBOARD
```

TRPR35

This transfer file is used in DLF or SLF to send a 120 x 120 map to the output file for printing. It can easily be modified for other sizes of maps. The program command that should do this does not work.

Before the transfer file is run, the following must be set up:

- The desired map in Map 35.

This transfer file produces the following:

- The map values in display format, in the output file, which can be sent to the printer.

```
ON        TRPR35 --  PRINT MAP35 WITH HEADER FORMATTED OUTPUT FORM
ON MENUS ***** TRPR35 ***** TRPR35 ***** TRPR35 ***** TRPR35 *****
ON   THIS TRANSFER FILE IS USED BECAUSE OF A LOADSITE PROGRAM BUG
ON   WHICH PREVENTS THE DISPLAY OF A COMPLETE WINDOW. THE PROGRAM
ON   STOPS AT THE END OF THE DISPLAY OF THE FIRST COLUMN.
OF MENUS ***** TRPR35 ***** TRPR35 ***** TRPR35 ***** TRPR35 *****
SM                    GO TO SPATIAL MODEL
SD                    GO TO SPATIAL DISPLAY
TD                    GO TO TABULAR DISPLAY
MT                    MAP TABULATION
35,1,1,120,120          MAP 35 & WINDOW
PR                      TO PRINTER
35,6/                   NEXT 5 COLUMNS
PR                      ET
35,11/
PR
35,16/
PR
35,21/
PR
35,26/
PR
35,31/
PR
35,36/
PR
35,41/
PR
35,46/
PR
35,51/
PR
35,56/
PR
35,61/
PR
35,66/
PR
35,71/
PR
35,76/
PR
35,81/
PR
35,86/
PR
35,91/
PR
35,96/
```

```
PR
35,101/
PR
35,106/
PR
35,111/
PR
35,116/
PR
/                 END DISPLAY
/                 RETURN TO SPATIAL DISPLAY
/                 RETURN TO SPATIAL MODEL
/                 RETURN TO PRIMARY MENU
ON MENUS
TR                RETURN CONTROL TO KEYBOARD
```

TRSA

This transfer file is used in DLF or SLF to set up a service area map, Map 64, with 1's inside the service area and 0's outside. The data can be entered for any area.

Before this transfer file is run, the following must be set up:

- Lines of data in the transfer file defining the service area.

This transfer file produces the following:

- Map 64, containing the service area map.

```
ON        TRSA -- SET UP SERVICE AREA MAP
ON MENUS ***** TRSA ***** TRSA ***** TRSA ***** TRSA *****
ON      TRANSFER FILE TO CREATE SERVICE AREA MAP
OF MENUS ***** TRSA ***** TRSA ***** TRSA ***** TRSA *****
SM                      GO TO SPATIAL MODEL
ME                      GO TO MAP EDIT
CN                      CHANGE MAP NAMES
64                        MAP 64
SERVICE AREA MAP          MAP NAME
/                         END MAP NAME CHANGES
IM                      INITIALIZE MAP
64                        MAP 64
0                         TO ZERO
Y                         THAT'S CORRECT
/                         END INITIALIZE MAPS
SB                      SET BLOCK TO A VALUE
64                        MAP 64
2,41,2,54,1               X1,Y1,X2,Y2,VALUE
3,37,3,54,1               ETC.
4,26,4,54,1
5,25,5,55,1
6,25,6,56,1
7,24,10,56,1
11,24,11,57,1
12,23,13,57,1
.
.
.
111,46,111,57,1
112,48,112,57,1
113,51,113,57,1
114,53,114,57,1
/                   END SET BLOCK TO VALUE
ON MENUS
TR                  RETURN CONTROL TO KEYBOARD
```

TRSR

This transfer file is used in SUBSITE to store SUBSITE results in geographical maps. It thresholds some of the maps for more clear displays.

Before this transfer file is run, the following must be set up:

- SUBSITE results must be available from running that program. If the user goes to Graphical Display or up out of the SUBSITE Primary Menu, the results are no longer available.
- Maps 41-48 must be available.
- Map numbers, in the transfer file, for storing Substation Service Areas.

This transfer file produces the following:

- Maps containing the results of a SUBSITE run.

  Map 41 - Substation Locations, Thresholded to 1.
  Map 42 - Substation Assignments.
  Map 43 - Substation Boundaries, Thresholded to 1.
  Map 44 - Substation Service Areas.
  Map 45 - Voltage Drops.
  Map 46 - Low Voltages.
  Map 47 - Unserved Loads, Thresholded to 1.
  Map 48 - Assigned Substation Loadings.

```
OF      ***** TRSR ***** TRSR ***** TRSR ***** TRSR ***** TRSR *****
OF      **** TRANSFER FILE TO STORE SUBSITE RESULTS IN MAPS *****
OF                TURN OFF MENUS
SR                STORE RESULTS OF SUBSITE INTO MAPS 41-48
SL                SUBSTATION LOCATIONS
41                  MAP 41
SA                SUBSTATION ASSIGNMENTS
42                  MAP 42
SB                SUBSTATION BOUNDARIES
43                  MAP-43
SS                SUBSTATION SERVICE AREAS
1/                  LIST OF SUBSTATION ID'S, MAX 5 SUBS
44                  MAP 44
VD                VOLTAGE DROP
45                  MAP 45
LV                LOW VOLTAGE
Y                   ALL LOW VOLTAGES -- YES
46                  MAP-46
UL                UNSERVED LOADS
47                  MAP-47
AS                ASSIGNED SUBSTATION LOADING
48                  MAP 48
/                 RETURN TO SUBSITE MENU
ME                GO TO MAP EDIT MENU
MM                GO TO MAP MATHEMATICS MENU
TH                THRESHOLD
41,0,0,1,0          SET SUBSTATION LOCATIONS ALL TO 1
43,0,0,1,0          SET SUBSTATION BOUNDARIES TO 1
47,0,0,1,0          SET ALL UNSERVED LOAD CELLS TO 1
/                   END THRESHOLD
MU                MULTIPLY
43,1,43,51,0        SUBSTATION BOUNDARIES * SERVICE AREA
/                   END MULTIPLY
PO                POWER
45,45,.3            VOLTAGE DROP
/                   END POWER
/                 RETURN TO MAP EDIT MENU
/                 RETURN TO SUBSITE MENU
ON                TURN ON MENUS
TR                RETURN CONTROL TO KEYBOARD
```

TRX1

This transfer file is used in the DLF Load Forecast Procedure, see Sections V.D.1 and 2. It separates the Primary Peaks (Customers above the limit) from the Base.

Before this transfer file is run, the following must be set up:

- Customer maps for the base year, Maps 1-10.
- Customer limits in the transfer file, in two sections.

This transfer file produces the following:

- Printout of the Global Model data
- Printout of Map Statistics of Base Year customers
- Printout of Map Statistics of Primary Peaks and Primary Base

```
ON          TRX1 -- 1ST TRANSFER FILE OF PROCEDURE
ON MENUS ******* TRX1 ****** TRX1 ****** TRX1 ****** TRX1 *******
ON   TRANSFER FILE TO SEPARATE THE BASE YEAR BASE FROM THE PRIMARY
ON   PEAK CUSTOMERS. -- PART 1 OF CREATE HORIZ YEAR CUSTOMER MAPS.
OF MENUS ******* TRX1 ****** TRX1 ****** TRX1 ****** TRX1 *******
GM                    GO TO GLOBAL MODEL
ED                    GO TO EDIT/DISPLAY
DA                    DISPLAY ALL
PR                      TO PRINTER
/                     RETURN TO GLOBAL MODEL
/                     RETURN TO PRIMARY MENU
SM                    GO TO SPATIAL MODEL
ME                    GO TO MAP EDIT
CN                    CHANGE NAMES OF MAPS
1                       MAP 1
DOM-LOW (BASE YEAR)
2                       MAP 2
DOM-MED (BASE YEAR)
3                       MAP 3
DOM-HGH (BASE YEAR)
4                       MAP 4
COM-LOW (BASE YEAR)
5                       MAP 5
COM-MED (BASE YEAR)
6                       MAP 6
TUB-PRI (BASE YEAR)
7                       MAP 7
TUB-FR  (BASE YEAR)
8                       MAP 8
IND-LOW (BASE YEAR)
9                       MAP 9
IND-MED (BASE YEAR)
10                      MAP 10
IND-HGH (BASE YEAR)
11                      MAP 11
DOM-LOW (HORIZ YEAR)
12                      MAP 12
DOM-MED (HORIZ YEAR)
13                      MAP 13
DOM-HGH (HORIZ YEAR)
14                      MAP 14
COM-LOW (HORIZ YEAR)
15                      MAP 15
COM-MED (HORIZ YEAR)
16                      MAP 16
TUB-PRI (HORIZ YEAR)
17                      MAP 17
TUB-FR  (HORIZ YEAR)
```

```
18                          MAP 18
IND-LOW (HORIZ YEAR)
19                          MAP 19
IND-MED (HORIZ YEAR)
20                          MAP 20
IND-HGH (HORIZ YEAR)
31                          MAP 31
PRIMARY BASE DOM-LOW
32                          MAP 32
PRIMARY BASE DOM-MED
33                          MAP 33
PRIMARY BASE DOM-HGH
34                          MAP 34
PRIMARY BASE COM-LOW
35                          MAP 35
PRIMARY BASE COM-MED
36                          MAP 36
PRIMARY BASE TUB-PRI
37                          MAP 37
PRIMARY BASE TUB-FR
38                          MAP 38
PRIMARY BASE IND-LOW
39                          MAP 39
PRIMARY BASE IND-MED
40                          MAP 40
PRIMARY BASE IND-HGH
41                          MAP 41
PRMARY PEAKS DOM-LOW
42                          MAP 42
PRMARY PEAKS DOM-MED
43                          MAP 43
PRMARY PEAKS DOM-HGH
44                          MAP 44
PRMARY PEAKS COM-LOW
45                          MAP 45
PRMARY PEAKS COM-MED
46                          MAP 46
PRMARY PEAKS TUB-PRI
47                          MAP 47
PRMARY PEAKS TUB-FR
48                          MAP 48
PRMARY PEAKS IND LOW
49                          MAP 49
PRMARY PEAKS IND-MED
50                          MAP 50
PRMARY PEAKS IND-HGH
/                             END OF MAP NAME CHANGES
/                           RETURN TO SPATIAL MODEL
MM                          GO TO MAP MATH
MS                          MAP STATISTICS
1,10                          MAPS 1 TO 10
```

```
PR                          TO PRINTER
/                           NO MORE MAPS
CM                        COPY MAPS
31,1                        TO MAP 31 FROM MAP 1
32,2                        ETC.
33,3
34,4
35,5
36,6
37,7
38,8
39,9
40,10
41,1
42.2
43,3
44,4
45,5
46,6
47,7
48,8
49,9
50,10
/                           END OF COPYS
TH                        THRESHOLD
31,0,0,450,450              ** CUT OFF PRIMARY PEAKS ABOVE 450 IN MAP 31
32,0,0,100,100              ETC.
33,0,0,11,11
34,0,0,200,200
35,0,0,10,10
36,0,0,3,3
37,0,0,3,3
38,0,0,40,40
39,0,0,4,4
40,0,0,2,2
/                           END OF THRESHOLD
AS                        ADD/SUBTRACT
41,0,41,1,41,-450           ** LOWER PRIMARY PEAKS BY SUB 450 FROM MAP 41
42,0,42,1,42,-100           ETC.
43,0,43,1,43,-11
44,0,44,1,44,-200
45,0,45,1,45,-10
46,0,46,1,46,-3
47,0,47,1,47,-3
48,0,48,1,48,-40
49,0,49,1,49,-4
50,0,50,1,50,-2
/                           END OF ADD/SUBTRACT
```

```
TH                          THRESHOLD
41,0,0,0,99999                REMOVE NEGATIVE VALUES FROM MAP 41
42,0,0,0,99999                ETC.
43,0,0,0,99999
44,0,0,0,99999
45,0,0,0,99999
46,0,0,0,99999
47,0,0,0,99999
48,0,0,0,99999
49,0,0,0,99999
50,0,0,0,99999
/                             END OF THRESHOLD
MS                          MAP STATISTICS
41,50                         MAPS 41 TO 50
PR                            TO PRINTER
31,40                         MAPS 31 TO 40
PR                            TO PRINTER
/                             END OF MAPS
/                           RETURN TO SPATIAL MODEL
/                           RETURN TO PRIMARY MENU
ON                          TURN ON MENUS
TR                          TRANSFER BACK TO KEYBOARD
```

OUTPUT FROM TRANSFER FILE TRX1

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****** WAPDA CADPAD OUTPUT ******

Customer Class Name	Annual Growth Rate %	1991/ 0 Base	1994/ 1	1997/ 2	2000/ 3	2004/ 4	2007/ 5
			2011/ 6				
DOM-LOW	0.0	39962.0	48068.4	55825.1	63705.8	72745.6	79491.1
			89467.9				
DOM-MED	0.0	5070.0	6098.5	7150.5	8277.6	9636.4	10684.1
			12260.3				
DOM-HGH	0.0	376.0	452.0	529.9	613.5	714.1	791.8
			908.6				
COM-LOW	0.0	4870.0	5540.0	6181.9	6832.1	7582.5	8099.5
			8729.5				
COM-MED	0.0	151.0	172.6	195.4	220.2	250.3	270.9
			293.2				
T-WELL	0.0	2649.0	2776.6	2877.1	2964.3	3039.0	3078.7
			3115.8				
F-TWELL	0.0	561.0	605.5	640.0	669.2	699.8	717.4
			731.8				
IND-LOW	0.0	1221.0	1455.9	1736.0	2069.9	2543.8	2920.1
			3421.4				
IND-MED	0.0	37.0	43.2	50.3	58.7	71.1	80.9
			93.8				
IND-HGH	0.0	6.0	7.2	8.7	10.5	13.1	15.6
			18.2				

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****** WAPDA CADPAD OUTPUT **********

Statistics for map 1 - DOM-LOW (BASE YEAR)

Minimum=	0.0000	Maximum=	543.0000
Total =	39962.0000	Average=	107.1367
-Sigma =	12.6423	+Sigma =	201.6311
Non-Zero Cells =	373.	Negative Cells =	0.
X Coord= 107 ---- LOAD CENTER ---- Y Coord=			61

Statistics for map 2 - DOM-MED (BASE YEAR)

Minimum=	0.0000	Maximum=	197.0000
Total =	5070.0000	Average=	13.9286
-Sigma =	-7.0694	+Sigma =	34.9265
Non-Zero Cells =	364.	Negative Cells =	0.
X Coord= 106 ---- LOAD CENTER ---- Y Coord=			61

Statistics for map 3 - DOM-HGH (BASE YEAR)

Minimum=	0.0000	Maximum=	14.0000
Total =	376.0000	Average=	2.3797
-Sigma =	0.0208	+Sigma =	4.7387
Non-Zero Cells =	158.	Negative Cells =	0.
X Coord= 109 ---- LOAD CENTER ---- Y Coord=			61

Statistics for map 4 - COM-LOW (BASE YEAR)

Minimum=	0.0000	Maximum=	276.0000
Total =	4870.0000	Average=	18.1041
-Sigma =	-17.1849	+Sigma =	53.3931
Non-Zero Cells =	269.	Negative Cells =	0.
X Coord= 104 ---- LOAD CENTER ---- Y Coord=			60

Statistics for map 5 - COM-MED (BASE YEAR)

Minimum=	0.0000	Maximum=	12.0000
Total =	151.0000	Average=	2.4355
-Sigma =	-0.0181	+Sigma =	4.8891
Non-Zero Cells =	62.	Negative Cells =	0.
X Coord= 115 ---- LOAD CENTER ---- Y Coord=			62

Statistics for map 6 - TUB-PRI (BASE YEAR)

Minimum=	0.0000	Maximum=	17.0000
Total =	2649.0000	Average=	1.5268
-Sigma =	0.4260	+Sigma =	2.6276
Non-Zero Cells =	1735.	Negative Cells =	0.
X Coord= 102 ---- LOAD CENTER ---- Y Coord=			57

Statistics for map 7 - TUB-FR (BASE YEAR)

Minimum=	0.0000	Maximum=	3.0000
Total =	561.0000	Average=	1.0768
-Sigma =	0.7965	+Sigma =	1.3571
Non-Zero Cells =	521.	Negative Cells =	0.
X Coord= 103 ---- LOAD CENTER ---- Y Coord=			58

Statistics for map 8 - IND-LOW (BASE YEAR)

Minimum=	0.0000	Maximum=	80.0000
Total =	1221.0000	Average=	5.9561
-Sigma =	-4.0874	+Sigma =	15.9996
Non-Zero Cells =	205.	Negative Cells =	0.
X Coord= 109 ---- LOAD CENTER ---- Y Coord=			57

Statistics for map 9 - IND-MED (BASE YEAR)

Minimum=	0.0000	Maximum=	6.0000
Total =	37.0000	Average=	1.6087
-Sigma =	0.4388	+Sigma =	2.7786
Non-Zero Cells =	23.	Negative Cells =	0.
X Coord= 125 ---- LOAD CENTER ---- Y Coord=			64

Statistics for map 10 - IND-HGH (BASE YEAR)

Minimum=	0.0000	Maximum=	1.0000
Total =	6.0000	Average=	1.0000
-Sigma =	1.0000	+Sigma =	1.0000
Non-Zero Cells =	6.	Negative Cells =	0.
X Coord= 113 ---- LOAD CENTER ---- Y Coord=			59

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****** WAPDA CADPAD OUTPUT **********

Statistics for map 41 - PRMARY PEAKS DOM-LOW

Minimum=	0.0000	Maximum=	93.0000
Total =	333.0000	Average=	66.6000
-Sigma =	36.4563	+Sigma =	96.7437
Non-Zero Cells =	5.	Negative Cells =	0.

X Coord= 79 ---- LOAD CENTER ---- Y Coord= 60

Statistics for map 42 - PRMARY PEAKS DOM-MED

Minimum=	0.0000	Maximum=	97.0000
Total =	201.0000	Average=	50.2500
-Sigma =	15.5991	+Sigma =	84.9009
Non-Zero Cells =	4.	Negative Cells =	0.

X Coord= 68 ---- LOAD CENTER ---- Y Coord= 52

Statistics for map 43 - PRMARY PEAKS DOM-HGH

Minimum=	0.0000	Maximum=	3.0000
Total =	4.0000	Average=	2.0000
-Sigma =	1.0000	+Sigma =	3.0000
Non-Zero Cells =	2.	Negative Cells =	0.

X Coord= 68 ---- LOAD CENTER ---- Y Coord= 52

Statistics for map 44 - PRMARY PEAKS COM-LOW

Minimum=	0.0000	Maximum=	76.0000
Total =	76.0000	Average=	76.0000
-Sigma =	76.0000	+Sigma =	76.0000
Non-Zero Cells =	1.	Negative Cells =	0.

X Coord= 67 ---- LOAD CENTER ---- Y Coord= 52

Statistics for map 45 - PRMARY PEAKS COM-MED

Minimum=	0.0000	Maximum=	2.0000
Total =	2.0000	Average=	2.0000
-Sigma =	2.0000	+Sigma =	2.0000
Non-Zero Cells =	1.	Negative Cells =	0.

X Coord= 127 ---- LOAD CENTER ---- Y Coord= 65

Statistics for map 46 - PRMARY PEAKS TUB-PRI

Minimum=	0.0000	Maximum=	14.0000
Total =	139.0000	Average=	2.4386
-Sigma =	-0.6847	+Sigma =	5.5619
Non-Zero Cells =	57.	Negative Cells =	0.

X Coord= 113 ---- LOAD CENTER ---- Y Coord= 64

Statistics for map 47 - PRMARY PEAKS TUB-FR

Minimum=	0.0000	Maximum=	0.0000
Total =	0.0000	Average=	0.0000
-Sigma =	0.0000	+Sigma =	0.0000
Non-Zero Cells =	0.	Negative Cells =	0.

X Coord= 0 ---- LOAD CENTER ---- Y Coord= 0

Statistics for map 48 - PRMARY PEAKS IND-LOW

Minimum=	0.0000	Maximum=	40.0000
Total =	81.0000	Average=	16.2000
-Sigma =	2.8075	+Sigma =	29.5925
Non-Zero Cells =	5.	Negative Cells =	0.

X Coord= 123 ---- LOAD CENTER ---- Y Coord= 59

Statistics for map 49 - PRMARY PEAKS IND MED

Minimum=	0.0000	Maximum=	2.0000
Total =	2.0000	Average=	2.0000
-Sigma =	2.0000	+Sigma =	2.0000
Non-Zero Cells =	1.	Negative Cells =	0.

X Coord= 122 ---- LOAD CENTER ---- Y Coord= 57

Statistics for map 50 - PRMARY PEAKS IND-HGH

Minimum=	0.0000	Maximum=	0.0000
Total =	0.0000	Average=	0.0000
-Sigma =	0.0000	+Sigma =	0.0000
Non-Zero Cells =	0.	Negative Cells =	0.

X Coord= 0 ---- LOAD CENTER ---- Y Coord= 0

Statistics for map 31 - PRIMARY BASE DOM-LOW

Minimum=	0.0000	Maximum=	450.0000
Total =	39629.0000	Average=	106.2440
-Sigma =	15.4444	+Sigma =	197.0436
Non-Zero Cells =	373.	Negative Cells =	0.
X Coord= 108 ---- LOAD CENTER ---- Y Coord=			61

Statistics for map 32 - PRIMARY BASE DOM-MED

Minimum=	0.0000	Maximum=	100.0000
Total =	4869.0000	Average=	13.3764
-Sigma =	-4.0767	+Sigma =	30.8294
Non-Zero Cells =	364.	Negative Cells =	0.
X Coord= 107 ---- LOAD CENTER ---- Y Coord=			61

Statistics for map 33 - PRIMARY BASE DOM-HGH

Minimum=	0.0000	Maximum=	11.0000
Total =	372.0000	Average=	2.3544
-Sigma =	0.1040	+Sigma =	4.6048
Non-Zero Cells =	158.	Negative Cells =	0.
X Coord= 109 ---- LOAD CENTER ---- Y Coord=			61

Statistics for map 34 - PRIMARY BASE COM-LOW

Minimum=	0.0000	Maximum=	200.0000
Total =	4794.0000	Average=	17.8216
-Sigma =	-15.6595	+Sigma =	51.3026
Non-Zero Cells =	269.	Negative Cells =	0.
X Coord= 104 ---- LOAD CENTER ---- Y Coord=			60

Statistics for map 35 - PRIMARY BASE COM-MED

Minimum=	0.0000	Maximum=	10.0000
Total =	149.0000	Average=	2.4032
-Sigma =	0.0652	+Sigma =	4.7413
Non-Zero Cells =	62.	Negative Cells =	0.
X Coord= 114 ---- LOAD CENTER ---- Y Coord=			62

Statistics for map 36 - PRIMARY BASE TUB-PRI

Minimum=	0.0000	Maximum=	3.0000
Total =	2510.0000	Average=	1.4467
-Sigma =	0.7733	+Sigma =	2.1201
Non-Zero Cells =	1735.	Negative Cells =	0.
X Coord= 102 ---- LOAD CENTER ---- Y Coord=			57

Statistics for map 37 - PRIMARY BASE TUB-FR

Minimum=	0.0000	Maximum=	3.0000
Total =	561.0000	Average=	1.0768
-Sigma =	0.7965	+Sigma =	1.3571
Non-Zero Cells =	521.	Negative Cells =	0.
X Coord= 103 ---- LOAD CENTER ---- Y Coord=			58

Statistics for map 38 - PRIMARY BASE IND-LOW

Minimum=	0.0000	Maximum=	40.0000
Total =	1140.0000	Average=	5.5610
-Sigma =	-2.3786	+Sigma =	13.5005
Non-Zero Cells =	205.	Negative Cells =	0.
X Coord= 108 ---- LOAD CENTER ---- Y Coord=			57

Statistics for map 39 - PRIMARY BASE IND-MED

Minimum=	0.0000	Maximum=	4.0000
Total =	35.0000	Average=	1.5217
-Sigma =	0.6435	+Sigma =	2.4000
Non-Zero Cells =	23.	Negative Cells =	0.
X Coord= 125 ---- LOAD CENTER ---- Y Coord=			65

Statistics for map 40 - PRIMARY BASE IND-HGH

Minimum=	0.0000	Maximum=	1.0000
Total =	6.0000	Average=	1.0000
-Sigma =	1.0000	+Sigma =	1.0000
Non-Zero Cells =	6.	Negative Cells =	0.
X Coord= 113 ---- LOAD CENTER ---- Y Coord=			59

TRX2

This transfer file is used in the DLF Load Forecast Procedure, see Sections V.D.4 and 5. It grows the Primary Base and separates the Secondary Peaks from the Secondary Base, and then restores the Primary Peaks to the Secondary Base.

Before this transfer file is run, the following must be set up:

- Maps as left by TRX1.
- Multipliers, from the spreadsheet, in the transfer file, for growing the Primary Base.
- Customer limits, in three sections.

This transfer file produces the following:

- Printout of Map Statistics for Secondary Peaks.
- Printout of Map Statistics for Secondary Base.
- Map Backup files of Base Year Customers and of Secondary Base and Primary Peaks Customers.
- A Map Backup file, for each class, of the Secondary Base and Primary Peak maps.
- Printout of Map Statistics for the Secondary Base and Primary Peak maps.

```
ON          TRX2 -- 2ND TRANSFER FILE OF PROCEDURE
ON MENUS ******* TRX2 ****** TRX2 ****** TRX2 ****** TRX2 *******
ON   TRANSFER FILE TO GROW THE BASE CUSTS, SEPARATE THE SECONDARY
ON   BASE AND SECONDARY PEAK CUSTS, AND RESTORE THE PRIMARY PEAK
ON   CUSTS TO THE BASE MAPS. -- PART 2 OF CREATE HORIZON YEAR MAPS.
OF MENUS ******* TRX2 ****** TRX2 ****** TRX2 ****** TRX2 *******
SM                          GO TO SPATIAL MODEL
ME                          GO TO MAP EDIT
CN                          CHANGE NAMES OF MAPS
31                            MAP 31
SECONDY BASE DOM-LOW
32                            MAP 32
SECONDY BASE DOM-MED
33                            MAP 33
SECONDY BASE DOM-HGH
34                            MAP 34
SECONDY BASE COM-LOW
35                            MAP 35
SECONDY BASE COM-MED
36                            MAP 36
SECONDY BASE TUB-PRI
37                            MAP 37
SECONDY BASE TUB-FR
38                            MAP 38
SECONDY BASE IND-LOW
39                            MAP 39
SECONDY BASE IND-MED
40                            MAP 40
SECNDY BASE IND-HGH
51                            MAP 51
SECNDY PEAKS DOM-LOW
52                            MAP 52
SECNDY PEAKS DOM-MED
53                            MAP 53
SECNDY PEAKS DOM-HGH
54                            MAP 54
SECNDY PEAKS COM-LOW
55                            MAP 55
SECNDY PEAKS COM-MED
56                            MAP 56
SECNDY PEAKS TUB-PRI
57                            MAP 57
SECNDY PEAKS TUB-FR
58                            MAP 58
SECNDY PEAKS IND-LOW
59                            MAP 59
SECNDY PEAKS IND-MED
60
SECNDY PEAKS IND-HGH
```

```
/                                END OF MAP NAME CHANGES
/                                RETURN TO SPATIAL MODEL
MM                               GO TO MAP MATHEMATICS
AS                               ADD/SUBTRACT
31,2.12431,31,0,1,0                ** GROW BASE MAP 31 BY THE CLASS FACTOR
32,2.32902,32,0,1,0                 ETC.
33,2.28952,33,0,1,0
34,1.72447,34,0,1,0
35,1.85772,35,0,1,0
36,1.16745,36,0,1,0
37,1.27433,37,0,1,0
38,2.73684,38,0,1,0
39,2.46571,39,0,1,0
40,2.80000,40,0,1,0
/                                END OF ADD/SUBTRACT
CM                               COPY MAPS
51,31                              COPY TO MAP 51 FROM MAP 31
52,32                              ETC.
53,33
54,34
55,35
56,36
57,37
58,38
59,39
60,40
/                              END OF COPYS
TH                             THRESHOLD
31,0,0,450,450                   ** CUT OFF SEC PEAKS ABOVE 450 FROM MAP 31
32,0,0,100,100                    ETC.
33,0,0,11,11
34,0,0,200,200
35,0,0,10,10
36,0,0,3,3
37.0,0,3,3
38,0,0,40,40
39,0,0,4,4
40,0,0,2,2
51,0,450,0,99999               ** CUT OFF SEC BASE BELOW 450 IN MAP 51
52,0,100,0,99999               ETC.
53,0,11,0,99999
54,0,200,0,99999
55,0,10,0,99999
56,0,3,0,99999
57,0,3,0,99999
58,0,40,0,99999
59,0,4,0,99999
60,0,2,0,99999
```

```
/                          END OF THRESHOLDS
AS                         ADD/SUBTRACT
51,0,41,1,51,-450           ** LOWER SEC PEAKS BY SUBTR 450 FROM MAP 51
52,0,42,1,52,-100            ETC.
53,0,43,1,53,-11
54,0,44,1,54,-200
55,0,45,1,55,-10
56,0,46,1,56,-3
57,0,47,1,57,-3
58,0,48,1,58,-40
59,0,49,1,59,-4
60,0,50,1,60,-2
/                          END OF ADD/SUBTRACT
TH                         THRESHOLD
51,0,0,0,99999               REMOVE NEGATIVE VALUES FROM MAP 51
52,0,0,0,99999               ETC.
53,0,0,0,99999
54,0,0,0,99999
55,0,0,0,99999
56,0,0,0,99999
57,0,0,0,99999
58,0,0,0,99999
59,0,0,0,99999
60,0,0,0,99999
/                          END OF THRESHOLD
MS                         MAP STATISTICS
51,60                        MAPS 51 TO 60
PR                           TO PRINTER
31,40                        MAPS 31 TO 40
PR                           TO PRINTER
/                          END OF MAPS
AS                         ADD/SUBTRACT
31,1,31,1,41,0              ** ADD PRI PEAKS TO BASE MAP 31 FROM MAP 41
32,1,32,1,42,0               ETC.
33,1,33,1,43,0
34,1,34,1,44,0
35,1,35,1,45,0
36,1,36,1,46,0
37,1,37,1,47,0
38,1,38,1,48,0
39,1,39,1,49,0
40,1,40,1,50,0
/                          END OF ADD/SUBTRACT
/                          RETURN TO SPATIAL MODEL
ME                         GO TO MAP EDIT
CN                         CHANGE NAMES OF MAPS
31                           MAP 31
SEC BAS + PR PKS D-L
```

```
32                          MAP 32
SEC BAS + PR PKS D-M
33                          MAP 33
SEC BAS + PR PKS D-H
34                          MAP 34
SEC BAS + PR PKS C-L
35                          MAP 35
SEC BAS + PR PKS C-M
36                          MAP 36
SEC BAS + PR PKS T-P
37                          MAP 37
SEC BAS + PR PKS T-F
38                          MAP 38
SEC BAS + PR PKS I-L
39                          MAP 39
SEC BAS + PR PKS I-M
40                          MAP 40
SEC BAS + PR PKS I-H
/                         END OF MAP NAME CHANGES
SD                        GO TO SPATIAL DISPLAY
MB                        MAP BACKUP
MB0110                      MAP BACKUP FILE NAME
1,10                        MAPS 1 TO 10
/                           ACCEPT DEFAULT MAP WINDOW
/                           NO MORE MAPS
MB                        ETC.
MB1120
11,20
/
/
MB
MB31
31,31
/
/
MB
MB32
32,32
/
/
MB
MB33
33,33
/
/
MB
MB34
34,34
/
/
```

```
MB
MB35
35,35
/
/
MB
MB36
36,36
/
/
MB
MB37
37,37
/
/
MB
MB38
38,38
/
/
MB
MB39
39,39
/
/
MB
MB40
40,40
/
/
/
MM                    RETURN TO MAP EDIT
MS                    GO TO MAP MATHEMATICS
31,40                 MAP STATISTICS
PR                      MAPS 31 TO 40
/                       TO PRINTER
ON                    END OF MAPS
TR                    TURN ON MENUS
                      TRANSFER CONTROL BACK TO THE KEYBOARD
```

OUTPUT_FROM_TRANSFER_FILE_TRX2

```
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     Statistics for map 51 - SECNDY PEAKS DOM-LOW
     ---------------------------------------------

   Minimum=          0.0000     Maximum=        505.9395
   Total  =       9097.6992     Average=        227.4425
   -Sigma =         58.0990     +Sigma =        396.7859
   Non-Zero Cells =     40.     Negative Cells =      0.
   X Coord=  100 ---- LOAD CENTER ---- Y Coord=     62

     Statistics for map 52 - SECNDY PEAKS DOM-MED
     ---------------------------------------------

   Minimum=          0.0000     Maximum=        132.9020
   Total  =       1358.8909     Average=         59.0822
   -Sigma =         19.0627     +Sigma =         99.1017
   Non-Zero Cells =     23.     Negative Cells =      0.
   X Coord=   99 ---- LOAD CENTER ---- Y Coord=     58

     Statistics for map 53 - SECNDY PEAKS DOM-HGH
     ---------------------------------------------

   Minimum=          0.0000     Maximum=         14.1846
   Total  =        114.2684     Average=          5.7134
   -Sigma =         -0.0378     +Sigma =         11.4646
   Non-Zero Cells =     20.     Negative Cells =      0.
   X Coord=  102 ---- LOAD CENTER ---- Y Coord=     58

     Statistics for map 54 - SECNDY PEAKS COM-LOW
     ---------------------------------------------

   Minimum=          0.0000     Maximum=        144.8920
   Total  =        726.3714     Average=         72.6371
   -Sigma =         29.5708     +Sigma =        115.7034
   Non-Zero Cells =     10.     Negative Cells =      0.
   X Coord=   79 ---- LOAD CENTER ---- Y Coord=     56

     Statistics for map 55 - SECNDY PEAKS COM-MED
     ---------------------------------------------

   Minimum=          0.0000     Maximum=          8.5771
   Total  =         37.7472     Average=          5.3925
   -Sigma =          2.8194     +Sigma =          7.9655
   Non-Zero Cells =      7.     Negative Cells =      0.
   X Coord=  123 ---- LOAD CENTER ---- Y Coord=     62
```

Statistics for map 56 - SECNDY PEAKS TUB-PRI

Minimum=	0.0000	Maximum=	0.5023
Total =	89.9206	Average=	0.5023
-Sigma =	0.5023	+Sigma =	0.5023
Non-Zero Cells =	179.	Negative Cells =	0.

X Coord= 107 ---- LOAD CENTER ---- Y Coord= 56

Statistics for map 57 - SECNDY PEAKS TUB-FR

Minimum=	0.0000	Maximum=	0.8230
Total =	1.6460	Average=	0.8230
-Sigma =	0.8230	+Sigma =	0.8230
Non-Zero Cells =	2.	Negative Cells =	0.

X Coord= 129 ---- LOAD CENTER ---- Y Coord= 70

Statistics for map 58 - SECNDY PEAKS IND-LOW

Minimum=	0.0000	Maximum=	69.4736
Total =	617.6833	Average=	30.8842
-Sigma =	5.1972	+Sigma =	56.5711
Non-Zero Cells =	20.	Negative Cells =	0.

X Coord= 117 ---- LOAD CENTER ---- Y Coord= 57

Statistics for map 59 - SECNDY PEAKS IND-MED

Minimum=	0.0000	Maximum=	5.8628
Total =	17.3142	Average=	2.1643
-Sigma =	0.0289	+Sigma =	4.2996
Non-Zero Cells =	8.	Negative Cells =	0.

X Coord= 123 ---- LOAD CENTER ---- Y Coord= 57

Statistics for map 60 - SECNDY PEAKS IND-HGH

Minimum=	0.0000	Maximum=	0.8000
Total =	4.8000	Average=	0.8000
-Sigma =	0.8000	+Sigma =	0.8000
Non-Zero Cells =	6.	Negative Cells =	0.

X Coord= 113 ---- LOAD CENTER ---- Y Coord= 59

Statistics for map 31 - SECONDY BASE DOM-LOW

Minimum=	0.0000	Maximum=	450.0000
Total =	75086.6016	Average=	201.3046
-Sigma =	70.7455	+Sigma =	331.8637
Non-Zero Cells =	373.	Negative Cells =	0.
X Coord= 108 ---- LOAD CENTER ---- Y Coord=			61

Statistics for map 32 - SECONDY BASE DOM-MED

Minimum=	0.0000	Maximum=	100.0000
Total =	9981.1025	Average=	27.4206
-Sigma =	-0.9089	+Sigma =	55.7501
Non-Zero Cells =	364.	Negative Cells =	0.
X Coord= 109 ---- LOAD CENTER ---- Y Coord=			62

Statistics for map 33 - SECONDY BASE DOM-HGH

Minimum=	0.0000	Maximum=	11.0000
Total =	737.4290	Average=	4.6673
-Sigma =	1.5704	+Sigma =	7.7641
Non-Zero Cells =	158.	Negative Cells =	0.
X Coord= 110 ---- LOAD CENTER ---- Y Coord=			61

Statistics for map 34 - SECONDY BASE COM-LOW

Minimum=	0.0000	Maximum=	200.0000
Total =	7540.6895	Average=	28.0323
-Sigma =	-18.3036	+Sigma =	74.3682
Non-Zero Cells =	269.	Negative Cells =	0.
X Coord= 107 ---- LOAD CENTER ---- Y Coord=			60

Statistics for map 35 - SECONDY BASE COM-MED

Minimum=	0.0000	Maximum=	10.0000
Total =	239.0517	Average=	3.8557
-Sigma =	1.0765	+Sigma =	6.6348
Non-Zero Cells =	62.	Negative Cells =	0.
X Coord= 113 ---- LOAD CENTER ---- Y Coord=			62

Statistics for map 36 - SECONDY BASE TUB-PRI

Minimum=	0.0000	Maximum=	3.0000
Total =	2840.4248	Average=	1.6371
-Sigma =	0.9637	+Sigma =	2.3105
Non-Zero Cells =	1735.	Negative Cells =	0.

X Coord= 102 ---- LOAD CENTER ---- Y Coord- 57

Statistics for map 37 - SECONDY BASE TUB-FR

Minimum=	0.0000	Maximum=	3.0000
Total =	713.2538	Average=	1.3690
-Sigma =	1.0304	+Sigma =	1.7076
Non-Zero Cells =	521.	Negative Cells =	0.

X Coord= 103 ---- LOAD CENTER ---- Y Coord- 58

Statistics for map 38 - SECONDY BASE IND-LOW

Minimum=	0.0000	Maximum=	40.0000
Total =	2502.3127	Average=	12.2064
-Sigma =	-0.2965	+Sigma =	24.7093
Non-Zero Cells =	205.	Negative Cells =	0.

X Coord- 106 ---- LOAD CENTER ---- Y Coord= 57

Statistics for map 39 - SECONDY BASE IND-MED

Minimum-	0.0000	Maximum=	4.0000
Total =	68.9857	Average=	2.9994
-Sigma =	2.2686	+Sigma =	3.7301
Non-Zero Cells =	23.	Negative Cells =	0.

X Coord= 126 ---- LOAD CENTER ---- Y Coord- 67

Statistics for map 40 - SECONDY BASE IND-HGH

Minimum=	0.0000	Maximum=	4.0000
Total =	12.0000	Average=	2.0000
-Sigma =	2.0000	+Sigma =	2.0000
Non-Zero Cells =	6.	Negative Cells =	0.

X Coord= 113 ---- LOAD CENTER ---- Y Coord= 59

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Statistics for map 31 - SEC BAS + PR PKS D-L

Minimum=	0.0000	Maximum=	543.0000
Total =	75419.6016	Average=	202.1973
-Sigma =	69.6810	+Sigma =	334.7136
Non-Zero Cells =	373.	Negative Cells =	0.

X Coord= 108 ---- LOAD CENTER ---- Y Coord= 61

Statistics for map 32 - SEC BAS + PR PKS D-M

Minimum=	0.0000	Maximum=	197.0000
Total =	10182.1025	Average=	27.9728
-Sigma =	-2.4140	+Sigma =	58.3596
Non-Zero Cells =	364.	Negative Cells =	0.

X Coord= 108 ---- LOAD CENTER ---- Y Coord= 61

Statistics for map 33 - SEC BAS + PR PKS D-H

Minimum=	0.0000	Maximum=	14.0000
Total =	741.4291	Average=	4.6926
-Sigma =	1.5345	+Sigma =	7.8507
Non-Zero Cells =	158.	Negative Cells =	0.

X Coord= 110 ---- LOAD CENTER ---- Y Coord= 61

Statistics for map 34 - SEC BAS + PR PKS C-L

Minimum=	0.0000	Maximum=	276.0000
Total =	7616.6895	Average=	28.3148
-Sigma =	-19.2832	+Sigma =	75.9129
Non-Zero Cells =	269.	Negative Cells =	0.

X Coord= 106 ---- LOAD CENTER ---- Y Coord= 60

Statistics for map 35 - SEC BAS + PR PKS C-M

Minimum=	0.0000	Maximum=	12.0000
Total =	241.0517	Average=	3.8879
-Sigma =	1.0272	+Sigma =	6.7486
Non-Zero Cells =	62.	Negative Cells =	0.

X Coord= 113 ---- LOAD CENTER ---- Y Coord= 62

Statistics for map 36 - SEC BAS + PR PKS T-P

Minimum=	0.0000	Maximum=	17.0000
Total =	2979.4253	Average=	1.7172
-Sigma =	0.6304	+Sigma =	2.8041
Non-Zero Cells =	1735.	Negative Cells =	0.
X Coord= 102 ---- LOAD CENTER ----		Y Coord=	57

Statistics for map 37 - SEC BAS + PR PKS T-F

Minimum=	0.0000	Maximum=	3.0000
Total =	713.2538	Average=	1.3690
-Sigma =	1.0304	+Sigma =	1.7076
Non-Zero Cells =	521.	Negative Cells =	0.
X Coord= 103 ---- LOAD CENTER ----		Y Coord=	58

Statistics for map 38 - SEC BAS + PR PKS I-L

Minimum=	0.0000	Maximum=	80.0000
Total =	2583.3125	Average=	12.6015
-Sigma =	-1.1428	+Sigma =	26.3458
Non-Zero Cells =	205.	Negative Cells =	0.
X Coord= 107 ---- LOAD CENTER ----		Y Coord=	57

Statistics for map 39 - SEC BAS + PR PKS I-M

Minimum=	0.0000	Maximum=	6.0000
Total =	70.9857	Average=	3.0863
-Sigma =	2.1513	+Sigma =	4.0214
Non-Zero Cells =	23.	Negative Cells =	0.
X Coord= 126 ---- LOAD CENTER ----		Y Coord=	66

Statistics for map 40 - SEC BAS + PR PKS I-H

Minimum=	0.0000	Maximum=	2.0000
Total =	12.0000	Average=	2.0000
-Sigma =	2.0000	+Sigma =	2.0000
Non-Zero Cells =	6.	Negative Cells =	0.
X Coord= 113 ---- LOAD CENTER ----		Y Coord=	59

TRX3

This transfer file is used in the DLF Load Forecast Procedure. See Section V.D.11. It adds manual customers, from Card Image files, to the horizon year customer maps.

Before this transfer file is run, the following must be set up:

- The maps as left by TRX2.

This transfer file produces the following:

- Horizon Year customer maps, Maps 11-20.
- Maps of base year customer cells (value = 1) for each class, Maps 41-50.
- Maps of horizon year customer cells (value = 1) for each class, Maps 51-60. This is for graphically displaying new customer cells by displaying horizon year customer cells for a class and then base year customer cells with another color. The new cells retain the horizon year color, the existing cells do not.

```
ON          TRX3 -- 3RD TRANSFER FILE OF PROCEDURE
ON MENUS ******* TRX3 ****** TRX3 ******* TRX3 ****** TRX3 *******
ON    TRANSFER FILE TO ADD MANUAL CUSTS FROM CARD IMAGE FILES INTO
ON    HORIZON YR CUST MAPS. -- PART 3 OF CREATE HORIZON YEAR MAPS.
ON    PREPARE MAPS TO SHOW BASE AND HORIZON YEAR AREAS, EACH CLASS.
OF MENUS ******* TRX3 ****** TRX3 ******* TRX3 ****** TRX3 *******
SM                GO TO SPATIAL MODEL
MM                GO TO MAP MATH
CM                COPY MAPS
11,31               TO MAP 11 FROM MAP 31
12,32               ETC
13,33
14,34
15,35
16,36
17,37
18,38
19,39
20,40
/                   END OF COPYS
/                 RETURN TO SPATIAL MODEL
ME                GO TO MAP EDIT
IM                INITIALIZE MAPS
41                  MAP 41
0                   TO ZERO
Y                   YES IT'S CORRECT
42                  ETC.
0
Y
43
0
Y
44
0
Y
45
0
Y
46
0
Y
47
0
Y
48
0
Y
49
0
Y
```

```
50
0
Y
/                    END OF INITIALIZE
CI                 CARD IMAGE INPUT
CUST1                CLASS 1 MANUALLY ADDED CUSTOMERS
CI
CUST2                CLASS 2 MANUALLY ADDED CUSTOMERS
CI
CUST3                ETC.
CI
CUST4
CI
CUST5
CI
CUST6
CI
CUST7
CI
CUST8
CI
CUST9
CI
CUST10
/                  RETURN TO SPATIAL MODEL
MM                 GO TO MAP MATH
AS                 ADD/SUBTRACT
11,1,11,1,41,0       ADD MANUAL CUSTS OF MAP 41 TO HORIZON YR MAP 11
12,1,12,1,42,0       ETC.
13,1,13,1,43,0
14,1,14,1,44,0
15,1,15,1,45,0
16,1,16,1,46,0
17,1,17,1,47,0
18,1,18,1,48,0
19,1,19,1,49,0
20,1,20,1,50,0
/                    END OF ADD/SUBTRACT
SD                 GO TO SPATIAL DISPLAY
TD                 GO TO TABULAR DISPLAY
MS                 MAP STATISTICS
11,20                MAPS 11 TO 20
PR                   TO PRINTER
/                    NO MORE MAPS
/                  RETURN TO SPATIAL DISPLAY
/                  RETURN TO MAP MATHEMATICS
CM                 COPY MAPS
41,1                 TO MAP 41 FROM MAP 1
42,2                 ETC.
```

```
43,3
44,4
45,5
46,6
47,7
48,8
49,9
50,10
51,11
52,12
53,13
54,14
55,15
56,16
57,17
58,18
59,19
60,20
/                    END OF COPYS
TH                 THRESHOLD
41,0,0,1,0           SET NON-ZERO CELLS TO 1 IN MAP 41
42,0,0,1,0           ETC.
43,0,0,1,0
44,0,0,1,0
45,0,0,1,0
46,0,0,1,0
47,0,0,1,0
48,0,0,1,0
49,0,0,1,0
50,0,0,1,0
51,0,0,1,0
52,0,0,1,0
53,0,0,1,0
54,0,0,1,0
55,0,0,1,0
56,0,0,1,0
57,0,0,1,0
58,0,0,1,0
59,0,0,1,0
60,0,0,1,0
/                    END OF THRESHOLDS
/                  RETURN TO SPATIAL MODEL
ME                 GO TO MAP EDIT
CN                 CHANGE NAMES OF MAPS
41                       MAP 41
BAS YR CUST =1   D-L
42                       MAP 42
BAS YR CUST =1   D-M
43                       MAP 43
```

```
BAS YR CUST =1   D-H
44                          MAP 44
BAS YR CUST =1   C-L
45                          MAP 45
BAS YR CUST =1   C-M
46                          MAP 46
BAS YR CUST =1   T-P
47                          MAP 47
BAS YR CUST =1   T-F
48                          MAP 48
BAS YR CUST =1   I-L
49                          MAP 49
BAS YR CUST =1   I-M
50                          MAP 50
BAS YR CUST =1   I-H
51                          MAP 51
HOR YR CUST =1   D-L
52                          MAP 52
HOR YR CUST =1   D-M
53                          MAP 53
HOR YR CUST =1   D-H
54                          MAP 54
HOR YR CUST =1   C-L
55                          MAP 55
HOR YR CUST =1   C-M
56                          MAP 56
HOR YR CUST =1   T-P
57                          MAP 57
HOR YR CUST =1   T-F
58                          MAP 58
HOR YR CUST =1   I-L
59                          MAP 59
HOR YR CUST =1   I-M
60                          MAP 60
HOR YR CUST =1   I-H
/                           END OF MAP NAME CHANGES
ON                   TURN ON MENUS
TR                   TRANSFER CONTROL TO KEYBOARD
```

OUTPUT FROM TRANSFER FILE TRX3

```
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     Statistics for map 11 - DOM-LOW (HORIZ YEAR)
     ---------------------------------------------

   Minimum=          0.0000    Maximum=        615.9800
   Total  =      89468.7891    Average=        195.7742
   -Sigma =         65.0383    +Sigma =        326.5100
   Non-Zero Cells =    457.    Negative Cells =      0.
   X Coord=  108 ---- LOAD CENTER ---- Y Coord=     60

     Statistics for map 12 - DOM-MED (HORIZ YEAR)
     ---------------------------------------------

   Minimum=          0.0000    Maximum=        197.0000
   Total  =      12259.9268    Average=         27.3659
   -Sigma =         -1.8616    +Sigma =         56.5934
   Non-Zero Cells =    448.    Negative Cells =      0.
   X Coord=  107 ---- LOAD CENTER ---- Y Coord=     61

     Statistics for map 13 - DOM-HGH (HORIZ YEAR)
     ---------------------------------------------

   Minimum=          0.0000    Maximum=         14.2385
   Total  =        908.5585    Average=          4.0926
   -Sigma =          0.8867    +Sigma =          7.2985
   Non-Zero Cells =    222.    Negative Cells =      0.
   X Coord=  110 ---- LOAD CENTER ---- Y Coord=     61

     Statistics for map 14 - COM-LOW (HORIZ YEAR)
     ---------------------------------------------

   Minimum=          0.0000    Maximum=        276.0000
   Total  =       8728.7813    Average=         24.6576
   -Sigma =        -17.9733    +Sigma =         67.2884
   Non-Zero Cells =    354.    Negative Cells =      0.
   X Coord=  107 ---- LOAD CENTER ---- Y Coord=     60

     Statistics for map 15 - COM-MED (HORIZ YEAR)
     ---------------------------------------------

   Minimum=          0.0000    Maximum=         14.4308
   Total  =        293.0516    Average=          2.8178
   -Sigma =         -0.0014    +Sigma =          5.6370
   Non-Zero Cells =    104.    Negative Cells =      0.
   X Coord=  114 ---- LOAD CENTER ---- Y Coord=     62
```

Statistics for map 16 - TUB-PRI (HORIZ YEAR)

Minimum=	0.0000	Maximum=	17.0000
Total =	3116.3848	Average=	1.7284
-Sigma =	0.6221	+Sigma =	2.8348
Non-Zero Cells =	1803.	Negative Cells =	0.
X Coord= 102 ---- LOAD CENTER ---- Y Coord=			57

Statistics for map 17 - TUB-FR (HORIZ YEAR)

Minimum=	0.0000	Maximum=	3.2743
Total =	732.2540	Average=	1.3687
-Sigma =	1.0173	+Sigma =	1.7201
Non-Zero Cells =	535.	Negative Cells =	0.
X Coord= 103 ---- LOAD CENTER ---- Y Coord=			58

Statistics for map 18 - IND-LOW (HORIZ YEAR)

Minimum=	0.0000	Maximum=	80.0000
Total =	3421.4224	Average=	12.0898
-Sigma =	-0.3402	+Sigma =	24.5199
Non-Zero Cells =	283.	Negative Cells =	0.
X Coord= 106 ---- LOAD CENTER ---- Y Coord=			57

Statistics for map 19 - IND-MED (HORIZ YEAR)

Minimum=	0.0000	Maximum=	6.0000
Total =	94.0257	Average=	2.5412
-Sigma =	1.4177	+Sigma =	3.6647
Non-Zero Cells =	37.	Negative Cells =	0.
X Coord= 126 ---- LOAD CENTER ---- Y Coord=			67

Statistics for map 20 - IND-HGH (HORIZ YEAR)

Minimum=	0.0000	Maximum=	2.0000
Total =	18.0000	Average=	1.8000
-Sigma =	1.4000	+Sigma =	2.2000
Non-Zero Cells =	10.	Negative Cells =	0.
X Coord= 116 ---- LOAD CENTER ---- Y Coord=			59

TRX4

This transfer file is used in the DLF Load Forecast Procedure. See Section V.F.1 and V.G.1. It identifies new customer cells and dumps a Map Backup file of the new customer cells map, for use in assigning Start Years by the manual method.

Before this transfer file is run, the following must be set up:

- Maps as left by TRX3.

This transfer file produces the following:

- Printout of Map Statistics of Maps 63, 64, 65 (new cells, base year cells, horizon year cells).
- Map Backup file of Map 63, new cells. This will be printed after converting the format with PRMB5.

```
ON          TRX4 -- 4TH TRANSFER FILE OF PROCEDURE
ON MENUS ******* TRX4 ****** TRX4 ******* TRX4 ****** TRX4 *******
ON    TRANSFER FILE TO IDENTIFY NEW CELLS USED AFTER THE BASE YEAR.
ON     RESULTS ARE DUMPED TO MB63 TO HELP CREATE START YEAR MAP.
OF MENUS ******* TRX4 ****** TRX4 ******* TRX4 ****** TRX4 *******
SM                        GO TO SPATIAL MODEL
ME                        GO TO MAP EDIT
CN                        CHANGE NAMES OF MAPS
64                          MAP 61
BASE YR CUST CELLS =1       NEW MAP NAME
65                          ETC.
HORZ YR CUST CELLS =1
63
NEW CELLS=1(ALL CLS)
/                           END OF MAP NAMES
/                         RETURN TO SPATIAL MODEL
MM                        GO TO MAP MATH
AS                        ADD SUBTRACT
64,1,1,1,2,0                ADD BASE YEAR MAPS TOGETHER IN MAP 64
64,1,64,1,3,0               ETC.
64,1,64,1,4,0
64,1,64,1,5,0
64,1,64,1,6,0
64,1,64,1,7,0
64,1,64,1,8,0
64,1,64,1,9,0
64,1,64,1,10,0
65,1,11,1,12,0              ADD HORIZON YEAR MAPS TOGETHER IN MAP 65
65,1,65,1,13,0              ETC.
65,1,65,1,14,0
65,1,65,1,15,0
65,1,65,1,16,0
65,1,65,1,17,0
65,1,65,1,18,0
65,1,65,1,19,0
65,1,65,1,20,0
/                           END OF ADD/SUBTRACT
CM                        COPY MAP
62,65                       TO MAP 62 FROM MAP 65 FOR FUTURE USE
/                           END OF COPYS
TH                        THRESHOLD
64,0,0,1,0                  SET NON-ZERO CELLS TO 1
65,0,0,1,0                  SAME
/                           END OF THRESHOLDS
AS                        ADD/SUBTRACT
63,1,65,-1,64,0             SUBTRACT BASE YR CELLS FROM HORIZ YR CELLS
/                           END OF ADD/SUBTRACT
MS                        MAP STATISTICS
63,65                       MAPS 63 TO 65
```

PR	TO PRINTER
/	NO MORE MAPS
SD	GO TO SPATIAL DISPLAY
MB	MAP BACKUP
MB63	BACKUP FILE NAME
63,63	MAP 63
/	NO COORDINATE CHANGES - DUMP COMPLETE MAP
/	NO MORE MAPS
ON	TURN ON MENUS
TR	RETURN CONTROL TO KEYBOARD

OUTPUT FROM TRANSFER FILE TRX4

```
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    Statistics for map 63 - NEW CELLS=1(ALL CLS)
    --------------------------------------------

  Minimum=          0.0000    Maximum=          1.0000
  Total  =         20.0000    Average=          1.0000
  -Sigma =          1.0000    +Sigma =          1.0000
  Non-Zero Cells =     20.    Negative Cells =     0.
  X Coord=  100 ---- LOAD CENTER ---- Y Coord=    58

    Statistics for map 64 - BASE YR CUST CELLS =
    --------------------------------------------

  Minimum=          0.0000    Maximum=          1.0000
  Total  =       2188.0000    Average=          1.0000
  -Sigma =          1.0000    +Sigma =          1.0000
  Non-Zero Cells =   2188.    Negative Cells =     0.
  X Coord=  109 ---- LOAD CENTER ---- Y Coord=    61

    Statistics for map 65 - HORZ YR CUST CELLS =
    --------------------------------------------

  Minimum=          0.0000    Maximum=          1.0000
  Total  =       2208.0000    Average=          1.0000
  -Sigma =          1.0000    +Sigma =          1.0000
  Non-Zero Cells =   2208.    Negative Cells =     0.
  X Coord=  108 ---- LOAD CENTER ---- Y Coord=    60
```

TRX5

This transfer file is used in the Automated Method for creating the Start Year map in the DLF Load Forecast Procedure. See Section V.G.5. It creates a map of values indicating general nearness to other customers, and dumps the map to a Map Backup file for processing with the WRR utility program.

Before this transfer file is run, the following must be set up:

- Map 62 as left by TRX4.

This transfer file produces the following:

- Map 62 with values indicating general nearness to customers.
- Map Backup file of Map 62.

```
ON          TRX5 -- 5TH TRANSFER FILE OF PROCEDURE
ON MENUS ******* TRX5 ****** TRX5 ****** TRX5 ****** TRX5 *******
ON   TRANSFER FILE FOR STEP 1 OF OPTION 2 FOR CREATE START YR MAP,
ON   BASED ON NEARNESS TO HORIZON YEAR CUSTS. RESULTS GO TO MB62.
OF MENUS ******* TRX5 ****** TRX5 ****** TRX5 ****** TRX5 *******
SM                          GO TO SPATIAL MODEL
ME                          GO TO MAP EDIT
CN                          CHANGE NAME OF MAP FILE
62                          MAP 62
MAP FOR START YR WRR        NEW MAP NAME
/                           END OF MAP NAME CHANGES
/                           RETURN TO SPATIAL MODEL
MM                          GO TO MAP MATH
CV                          CONVOLUTE WEIGHT CELLS NEAR EXISTING CELLS
62                          SOURCE MAP 62
62                          TARGET MAP 62
4                           OPERATOR WIDTH OF 4
.4,3,2,1                    OPERATOR VALUES
AS                          ADD/SUBTRACT
62,1,62,0,62,1              ADD 1'S FOR IF CONV MISSED ANY NEW CELLS
/                           END ADD/SUBTRACT
MU                          MULTIPLY
62,1,62,63,0                MASK OUT ALL BUT NEW CELLS
/                           END MULTIPLY
SC                          SCALE
62,0,21                     SCALE MAP 62 TO 21 SO IT CAN BE CUBED
/                           END SCALE
TH                          THRESHOLD
62,99,.00001,999,999        TEMPORARILY SET ZEROS TO 99
62,.22,.22,999,999          SET VALUESS <.22 TO .22 SO CUBE WON'T KILL
62,0,0,0,98                 RESET ORIGINAL ZEROS TO ZERO
/                           END THRESHOLD
PO                          POWER
62,62,3.0                   CUBE MAP TO WEIGHT NEARNESS TO OLD CELLS
/                           END POWER
SD                          GO TO SPATIAL DISPLAY
MB                          MAP BACKUP
MB62                        FILE NAME
62,62                       MAP 62
/                           ACCEPT COMPLETE MAP COORDINATES
/                           NO MORE MAPS
ON                          TURN ON MENUS
TR                          RETURN CONTROL TO KEYBOARD
```

TRX6

This transfer file is used in the Automated Method for creating the Start Year map in the DLF Forecast Procedure. See Section V.G.6 and 7. It reads in the Start Year rankings from a Map Backup file created by the WRR utility program, and converts the map to Start Years.

Before this transfer file is run, the following must be set up:

- o A Map Backup file from WRR with Start Year rankings.
- o Values in the transfer file for the correct years.

This transfer file produces the following:

- o The Start Year Map.

```
ON          TRX6 -- 6TH TRANSFER FILE OF PROCEDURE
ON MENUS ******* TRX6 ****** TRX6 ****** TRX6 ****** TRX6 *******
ON  TRANSFER FILE FOR STEP 2 OF OPTION 2 FOR  CREATE START YR MAP,
ON  CONVERTING START YR RANKINGS INTO START YRS FOR ALL NEW CELLS.
OF MENUS ******* TRX6 ****** TRX6 ****** TRX6 ****** TRX6 *******
SM                          GO TO SPATIAL MODEL
ME                          GO TO MAP EDIT
CI                          CARD IMAGE
MB21W                         FILE NAME - FILE OF START YEAR RANKS
CN                          CHANGE NAME OF MAP FILE
21                            MAP 21
START YEAR MAP                NEW MAP NAME
/                             END OF MAP NAME CHANGES
MM                          GO TO MAP MATH
SC                          SCALE
21,0,19                       SCALE MAP 21 FROM 0 TO 19
/                             END SCALE
AS                          ADD/SUBTRACT
21,1,21,0,21,1990             ADD BASE YEAR TO MAP 21
/                             END ADD/SUBTRACT
TH                          THRESHOLD
21,0,1990.001,99999,99999     REMOVE 1991'S FROM PREV ZERO CELLS
/                             END THRESHOLD
ON                          TURN ON MENUS
TR                          RETURN CONTROL TO KEYBOARD
```

TRXF1

This transfer file is used in FEEDERSITE to send bus data to LOADSITE in four quadrants. It splits the area into four quadrants and sends each to LOADSITE in a separate Card Image file. The option to not assign loads to non-loaded buses in NODESIM is used, but the user can change that if he wants.

Before this transfer file is run, the following must be set up:

- An FEEDERSITE database.
- A valid study year.
- Coordinates defining the four quadrant windows.

This transfer file produces the following:

- Four Card Image bus data files for sending the bus data from the four quadrants to LOADSITE. They will be used by NODESIM to assign LOADSITE loads to the buses and send them back to FEEDERSITE.

```
ON          TRXF1 -- SENT FOUR QUADRANTS OF BUS DATA TO LOADSITE
ON MENUS ****** TRXF1 ****** TRXF1 ****** TRXF1 ****** TRXF1 ******
ON     TRANSFER FILE TO SEND BUS DATA FROM FEEDERSITE TO LOADSITE
ON    IN FOUR QUADRANTS. THIS CAN BE USED TO GET AROUND THE PROBLEM
ON    OF TOO TOO MANY CELLS WITH MULTIPLE BUSES. USE WITH TRANSFER
ON     FILES TRXF2-7.
OF MENUS ****** TRXF1 ****** TRXF1 ****** TRXF1 ****** TRXF1 ******
CC              CC
GE              GET EXISTING DATABASE
DATA2           DATABASE NAME
Y                 YES THAT'T THE ONE
1990            STUDY YEAR
ED              EXCLUDE DATA
ED                ENTIRE DATABASE
Y                 YES THAT'S RIGHT
ID              INCLUDE DATA
CW                BY COORDINATE WINDOW --  UPPER LEFT QUADRANT
354600            UPPER LEFT X
3508200           UPPER LEFT Y
390600            LOWER RIGHT X
3544200           LOWER RIGHT Y
/                 NO MORE WINDOWS
/               RETURN TO PREVIOUS MENU
PS              PROCESS STUDY SYSTEM
SD              SEND DATA TO OTHER CADPAD PROGRAM
LO              TO LOADSITE
2LDSUL            NAME OF FILE
354600            UPPER LEFT X
3508200           UPPER LEFT Y
390600            LOWER RIGHT X
3544200           LOWER RIGHT Y
N               IN NODESIM, DON'T ASSIGN LOADS TO NON-LOADED BUSES
/               RETURN
/               RETURN
ED              EXCLUDE DATA
ED                ENTIRE DATABASE
Y                 YES THAT'S RIGHT
ID              INCLUDE DATA
CW                BY COORDINATE WINDOW -- LOWER LEFT QUADRANT
354600            UPPER LEFT X
3472200           UPPER LEFT Y
390600            LOWER RIGHT X
3508200           LOWER RIGHT Y
/                 NO MORE WINDOWS
/                 RETURN TO PREVIOUS MENU
PS              PROCESS STUDY SYSTEM
SD              SEND DATA TO OTHER CADPAD PROGRAM
LO                TO LOADSITE
2LDSLL            NAME OF FILE
354600            UPPER LEFT X
3472200           UPPER LEFT Y
```

```
390600          LOWER RIGHT X
3508200         LOWER RIGHT Y
N              IN NODESIM, DON'T ASSIGN LOADS TO NON-LOADED BUSES
/             RETURN
/             RETURN
ED            EXCLUDE DATA
ED              ENTIRE DATABASE
Y               YES THAT'S RIGHT
ID            INCLUDE DATA
CW              BY COORDINATE WINDOW -- UPPER RIGHT QUADRANT
390600          UPPER LEFT X
3508200         UPPER LEFT Y
426600          LOWER RIGHT X
3544200         LOWER RIGHT Y
/               NO MORE WINDOWS
/             RETURN TO PREVIOUS MENU
PS              PROCESS STUDY SYSTEM
SD              SEND DATA TO OTHER CADPSD PROGRAM
LO              TO LOADSITE
2LDSUR          FILE NAME
390600          UPPER LEFT X
3508200         UPPER LEFT Y
426600          LOWER RIGHT X
3544200         LOWER RIGHT Y
N               NO MORE WINDOWS
/            RETURN
/            RETURN
ED           EXCLUDE DATA
ED             ENTIRE DATABASE
Y              YES THAT'S RIGHT
ID           INCLUDE DATA
CW             BY COORDINATE WINDOW -- LOWER RIGHT QUADRANT
390600         UPPER LEFT X
3472200        UPPER LEFT Y
426600         LOWER RIGHT X
3508200        LOWER RIGHT Y
/            RETURN
/            RETURN
PS           PROCESS STUDY SYSTEM
SD           SEND DATA TO OTHER CADPAD PROGRAM
LO             TO LOADSITE
2LDSLR         FILENAME
390600         UPPER LEFT X
3472200        UPPER LEFT Y
426600         LOWER RIGHT X
3508200        LOWER RIGHT Y
N              IN NODESIM, DON'T ASSIGN LOADS TO NON-LOADED BUSES
/            RETURN
/            RETURN
ON MENUS
TR           RETURN CONTROL TO KEYBOARD
```

TRXF2

This transfer file is used in SLF (even if the forecast was done with DLF), to split a load map into four quadrants and put them in four different maps. It then doubles the resolution of each map so that each quadrant fills its own map. These maps can then be used to assign loads to the FEEDERSITE buses with greater cell resolution.

Before this transfer file is run, the following must be set up:

- A LOADSITE load map.
- Maps 31-39 available.

This transfer file produces the following:

- Four load maps, one for each quadrant, at double cell resolution. In other words, one original cell's load is now divided equally among four cells.

```
ON        TRXF2 -- SPLIT LOAD MAP INTO FOUR QUADRANTS AT DOUBLE RES
ON MENUS ****** TRXF2 ****** TRXF2 ****** TRXF2 ****** TRXF2 ******
ON    THIS TRANSFER FILE SPLITS THE LOAD MAP INTO FOUR QUADRANTS SO
ON    THE BUS DATA FROM FEEDERSITE CAN BE PROCESSED AT HIGHER RES.
ON    USE WITH TRXF1 AND TRXF3-7.
OF MENUS ****** TRXF2 ****** TRXF2 ****** TRXF2 ****** TRXF2 ******
SM                        GO TO SPATIAL MODEL
ME                        GO TO MAP EDIT
CN                        CHANGE MAP NAMES
31                          MAP 31
UPPER LEFT LOADSITE LOADS     ETC.
32
LOWER LEFT DLOADSITE LOADS
33
UPPER RIGHT LOADSITE LOADS
34
LOWER RIGHT LOADSITE LOADS
35
TEMP LOAD MAP - ALL
36
UPPER LEFT FDS LOADS
37
LOWER LEFT FDS LOADS
38
UPPER RIGHT FDS LOADS
39
LOWER RIGHT FDS LOADS
/                           END MAP NAME CHANGES
MM                        GO TO MAP MATHEMATICS
CM                        COPY MAPS
31,24                       TO 31 FROM 24        USE THE          ***
32,24                       ETC.                 APPROPRIATE      ***
33,24                                            LOAD MAP         ***
34,24                                                             ***
/                           END COPY MAPS
MW                        MOVE WINDOW
DR                          DOUBLE RESOLUTION
31                          FROM MAP 31
1,1                           FROM X,Y = 1,1
60,60                         TO X,Y = 60,60
31                          TO MAP 31
1,1                           AT X,Y = 1,1
32                          FROM MAP 32
1,61                          ETC.
60,120
32
1,1
33
61,1
```

```
120,60
33
1,1
34
61,61
120,120
34
1,1
/                END MOVE WINDOW
/              RETURN TO MAP EDIT
/              RETURN TO SPATIAL MODEL
/              RETURN TO PRIMARY MENU
90             EXIT SLF
N              DON'T PRINT OUTPUT FILE
TR             RETURN CONTROL TO KEYBOARD
```

TRXF3

This transfer file is used in LOADSITE to process the upper left quadrant of the study area, assigning loads to the buses brought in from FEEDERSITE, and sending the loaded buses back to FEEDERSITE.

Before this transfer file is run, the following must be set up:

- o A Card Image file from FEEDERSITE, with the upper left quadrant bus data.
- o A load map, Map 31, with the LOADSITE loads for the upper left quadrant.

This transfer file produces the following:

- o A Card Image file dumped out to FEEDERSITE, containing the loaded bus data for the upper left quadrant.

```
ON          TRXF3 -- RUN NODESIM FOR UPPER LEFT QUADRANT
ON MENUS ****** TRXF3 ****** TRXF3 ****** TRXF3 ****** TRXF3 ******
ON     SAVES ORIGINAL LOAD MAP, BRINGS IN UPPER LEFT QUADRANT
ON     LOAD MAP AND RUNS NODESIM. USE WITH OTHER TRXFn FILES.
OF MENUS ****** TRXF3 ****** TRXF3 ****** TRXF3 ****** TRXF3 ******
SM                          GO TO SPATIAL MODEL
MM                          GO TO MAP MATHEMATICS
CM                          COPY MAPS
35,24                         TO 35 FROM 24 TO SAVE COMPLETE LOAD MAP
24,31                         TO 24 FROM 31 -- UPPER LEFT QUADRANT
/                             END COPY MAPS
/                           RETURN TO SPATIAL MODEL
/                           RETURN TO PRIMARY MENU
LM                          GO TO LOAD MODEL
NS                          RUN NODESIM MODULE
CI                            CARD IMAGE OPTION
2LFSUL                        INPUT FILE NAME
36                            STORE FEEDERSITE LOADS IN MAP 36
1992                          YEAR TO PROCESS
FS                            SEND RESULTS TO FEEDERSITE
A                             ADD TO FEEDERSITE DATABASE
2FDSUL                        OUTPUT FILE NAME
/                           RETURN TO LOAD MODEL
/                           RETURN TO PRIMARY MENU
90                          EXIT DLF
N                           DON'T PRINT OUTPUT FILE
TR                          RETURN CONTROL TO KEYBOARD
```

TRXF4

This transfer file is used in LOADSITE to process the lower left quadrant of the study area, assigning loads to the buses brought in from FEEDERSITE, and sending the loaded buses back to FEEDERSITE.

Before this transfer file is run, the following must be set up:

- o A Card Image file from FEEDERSITE, with the lower left quadrant bus data.
- o A load map, Map 31, with the LOADSITE loads for the lower left quadrant.

This transfer file produces the following:

- o A Card Image file dumped out to FEEDERSITE, containing the loaded bus data for the lower left quadrant.

```
ON          TRXF4 -- RUN NODESIM FOR LOWER LEFT QUADRANT
ON MENUS ****** TRXF4 ****** TRXF4 ****** TRXF4 ****** TRXF4 ******
ON     SAVES ORIGINAL LOAD MAP, BRINGS IN LOWER LEFT QUADRANT
ON     LOAD MAP AND RUNS NODESIM. USE WITH OTHER TRXFn FILES.
OF MENUS ****** TRXF4 ****** TRXF4 ****** TRXF4 ****** TRXF4 ******
SM             GO TO SPATIAL MODEL
MM             GO TO MAP MATHEMATICS
CM             COPY MAPS
24,32            TO MAP 24 FROM MAP 32 -- LOWER LEFT QUADRANT
/                END COPY MAPS
/              RETURN TO SPATIAL MODEL
/              RETURN TO PRIMARY MENU
LM             GO TO LOAD MODEL
NS             RUN NODESIM MODULE
CI               CARD IMAGE OPTION
2LDSLL           INPUT FILE NAME
37               FEEDERSITE LOADS TO MAP 37
1992             PROCESS YEAR 1992
FS               SEND RESULTS TO FEEDERSITE
M                MODIFY FEEDERSITE DATABADE
2FDSLL           OUTPUT FILE NAME
/              RETURN TO LOAD MODEL
/              RETURN TO PRIMARY MENU
90             EXIT DLF
N              DON'T PRINT OUTPUT FILE
TR             TRANSFER CONTROL TO KEYBOARD
```

TRXF5

This transfer file is used in LOADSITE to process the upper right quadrant of the study area, assigning loads to the buses brought in from FEEDERSITE, and sending the loaded buses back to FEEDERSITE.

Before this transfer file is run, the following must be set up:

- o A Card Image file from FEEDERSITE, with the upper right quadrant bus data.
- o A load map, Map 31, with the LOADSITE loads for the upper right quadrant.

This transfer file produces the following:

- o A Card Image file dumped out to FEEDERSITE, containing the loaded bus data for the upper right quadrant.

```
ON          TRXF5 -- RUN NODESIM FOR UPPER RIGHT QUADRANT
ON MENUS ****** TRXF5 ****** TRXF5 ****** TRXF5 ****** TRXF5 ******
ON     SAVES ORIGINAL LOAD MAP, BRINGS IN UPPER RIGHT QUADRANT
ON     LOAD MAP AND RUNS NODESIM. USE WITH OTHER TRXFn FILES.
OF MENUS ****** TRXF5 ****** TRXF5 ****** TRXF5 ****** TRXF5 ******
SM             GO TO SPATIAL MODEL
MM             GO TO MAP MATHEMATICS
CM             COPY MAPS
24,33            TO MAP 24 FROM MAP 33 -- UPPER RIGHT QUADRANT
/                END COPY MAPS
/              RETURN TO SPATIAL MODEL
/              RETURN TO PRIMARY MENU
LM             GO TO LOAD MODEL
NS             RUN NODESIM MODULE
CI               CARD IMAGE OPTION
2LDSUR           INPUT FILE NAME
38               FEEDERSITE LOADS TO MAP 37
1992             PROCESS YEAR 1992
FS               SEND RESULTS TO FEEDERSITE
M                MODIFY FEEDERSITE DATABADE
2FDSUR           OUTPUT FILE NAME
/              RETURN TO LOAD MODEL
/              RETURN TO PRIMARY MENU
90             EXIT DLF
N              DON'T PRINT OUTPUT FILE
TR             TRANSFER CONTROL TO KEYBOARD
```

TRXF6

This transfer file is used in LOADSITE to process the lower right quadrant of the study area, assigning loads to the buses brought in from FEEDERSITE, and sending the loaded buses back to FEEDERSITE.

Before this transfer file is run, the following must be set up:

- o A Card Image file from FEEDERSITE, with the lower right quadrant bus data.
- o A load map, Map 31, with the LOADSITE loads for the lower right quadrant.

This transfer file produces the following:

- o A Card Image file dumped out to FEEDERSITE, containing the loaded bus data for the lower right quadrant.

```
ON      TRXF6 -- RUN NODESIM FOR LOWER RIGHT QUADRANT
ON ****** TRXF6 ****** TRXF6 ****** TRXF6 ****** TRXF6 ******
ON     SAVES ORIGINAL LOAD MAP, BRINGS IN LOWER RIGHT QUADRANT
ON     LOAD MAP AND RUNS NODESIM. USE WITH OTHER TRXFn FILES.
ON     RESTORE ORIGINAL LOAD MAP AND SETS UP MAPS FOR DISPLAY
OF ****** TRXF6 ****** TRXF6 ****** TRXF6 ****** TRXF6 ******
SM                GO TO SPATIAL MODEL
MM                GO TO MAP MATHEMATICS
CM                COPY MAPS
24,34               TO MAP 24 FROM MAP 34 -- LOWER RIGHT QUADRANT
/                   END COPY MAPS
/                 RETURN TO SPATIAL MODEL
/                 RETURN TO PRIMARY MENU
LM                GO TO LOAD MODEL
NS                RUN NODESIM MODULE
CI                  CARD IMAGE OPTION
2LDSLR              INPUT FILE NAME
39                  FEEDERSITE LOADS TO MAP 39
1992                PROCESS YEAR 1992
FS                  SEND RESULTS TO FEEDERSITE
M                   MODIFY FEEDERSITE DATABASE
2FDSLR              OUTPUT FILE NAME
/                 RETURN TO LOAD MODEL
/                 RETURN TO PRIMARY MENU
SM                GO TO SPATIAL MODEL
MM                GO TO MAP MATHEMATICS
CM                COPY MAPS
24,35               TO MAP 24 FROM MAP 35 -- RESTORE ENTIRE LOAD MAP
41,31               TO MAP 41 FROM MAP 31
42,32               ETC.
43,33
44,34
45,35
46,36
47,37
48,38
49,39
/                   END COPY MAPS
PO                POWER FUNCTION
41,41,.1            MAP 41 TO .1 FOR DISPLAY OF LOADSITE UPPER LEFT
42,42,.1                 42                                LOWER LEFT
43,43,.1                 43                               UPPER RIGHT
44,44,.1                 44                               LOWER RIGHT
45,45,.1                 45                                TOTAL AREA
46,46,.1                 46                   FEEDERSITE UPPER LEFT
47,47,.1                 47                                LOWER LEFT
48,48,.1                 48                               UPPER RIGHT
49,49,.1                 49                               LOWER RIGHT
/                   END POWER FUNCTION
TR              RETURN CONTROL TO KEYBOARD FOR GRAPHICAL DISPLAYS
```

TRXF7

This transfer file is used in FEEDERSITE to read in the loaded buses from Card Image files from LOADSITE for the four quadrants of the study system.

Before this transfer file is run, the following must be set up:

- Valid database.
- Files from LOADSITE for the four quadrants.

This transfer produces the following:

- LOADSITE loads from the four quadrants of the study area, for the year specified, loaded into the FEEDERSITE databases.

```
ON          TRXF7 -- BRINGS BACK FOUR QUADRANTS OF LOAD DATA
ON MENUS ****** TRXF7 ****** TRXF7 ****** TRXF7 ****** TRXF7 ******
ON     THIS TRANSFER FILE READS IN THE LOAD DATA FROM LOADSITE
ON     FOR THE FOUR QUADRANTS SET UP IN THE OTHER TRXFn FILES.
OF MENUS ****** TRXF7 ****** TRXF7 ****** TRXF7 ****** TRXF7 ******
RD            RECEIVE DATA FROM OTHER PROGRAM -- UPPER LEFT
GE            GET EXISTING DATABASE
DATA2
Y               YES THAT'S RIGHT
2FDSUL
/             CONTINUE
RD            RECEIVE DATA FROM OTHER PROGRAM -- LOWER LEFT
2FDSLL
/             CONTINUE
RD            RECEIVE DATA FROM OTHER PROGRAM -- UPPER RIGHT
2FDSUR
/             CONTINUE
RD            RECEIVE DATA FROM OTHER PROGRAM -- LOWER RIGHT
2FDSLR
/             CONTINUE
ON            TURN ON MENUS
TR            RETURN CONTROL TO KEYBOARD
```

XTRDLF

This transfer file provides an alternate way of running the DLF forecast if the program forecast algorithm gives unacceptable load growth patterns in the individual small areas.

The spreadsheet XTRDLF.WK1 must be used to calculate the values to be entered in this transfer file. The transfer file has comments to tell you where to enter the values and where in the spreadsheet they come from.

Before this transfer file is run, the user must set up the data in the base year customer maps, Maps 1-10, and in the horizon year customer maps, Maps 11-20.

The transfer file uses Maps 31-40 as temporary work maps, and stores the loads in the usual load maps, Maps 23-29.

After running the transfer file, the resulting loads in Maps 23-29 should be checked against the total loads computed in the spreadsheet. Display them using Map Statistics.

```
OF *** XTRDLF *** TRANSFER FILE ALTERNATE TO DLF FORECAST ALGORITHM
OF ***  THE SPREADSHEET XTRDLF.WK1 MUST BE USED TO GET THE VALUES
OF ***  TO BE ENTERED IN THIS SPREADSHEET.  THIS TRANSFER FILE CAN
OF ***  ONLY WORK PROPERLY IF THE BASE YEAR AND HORIZON YEAR
OF ***  CUSTOMER MAPS HAVE BEEN COMPLETED.  THE TRANSFER FILE
OF ***  STORES THE LOADS IN THE PROPER LOAD MAPS, MAPS 23-29.
OF ***  MAPS 31-40 ARE USED AS TEMPORARY WORK MAPS.
SM
MM
AS              ***** ITERATION 0 (BASE YEAR) LOAD CALCULATION
31,.1016,1,0,1,0       COMPUTE CLASS 1 LOADS
32,.3015,2,0,1,0       COMPUTE CLASS 2 LOADS
33,.8278,3,0,1,0
34,.1134,4,0,1,0
35,.5655,5,0,1,0        THESE CONSTANTS COME FROM THE SPREADSHEET
36,.6800,6,0,1,0       XTRDLF.WK1 FROM THE SECTION LABELED "PROFILE
37,37.00,7,0,1,0        VALUES" FROM THE COLUMN OF ITERATION 0.
38,88.0,8,0,1,0
39,7.00,9,0,1,0
40,.510,10,0,1,0
23,1,31,1,32,0       ADD CLASS LOADS TOGETHER IN MAP 23
23,1,23,1,33,0       FOR ITERATION 0
23,1,23,1,34,0
23,1,23,1,35,0
23,1,23,1,36,0
23,1,23,1,37,0
23,1,23,1,38,0
23,1,23,1,39,0
23,1,23,1,40,0
/
AS              ***** ITERATION 1 LOAD CALCULATION
31,1,11,-1,1,0      COMPUTE CLASS 1 BASE TO HORIZ CUST GROWTH
32,1,12,-1,2,0      COMPUTE CLASS 2 BASE TO HORIZ CUST GROWTH
33,1,13,-1,3,0      ETC.
34,1,14,-1,4,0
35,1,15,-1,5,0
36,1,16,-1,6,0
37,1,17,-1,7,0
38,1,18,-1,8,0
39,1,19,-1,9,0
40,1,20,-1,10,0
31,.0956,31,1,1,0      COMPUTE CLASS 1 ITERATION 1 CUSTOMERS
32,.0951,32,1,2,0      COMPUTE CLASS 2 ITERATION 1 CUSTOMERS
33,.0939,33,1,3,0      ETC.
34,.1497,34,1,4,0
35,.1605,35,1,5,0       THESE CONSTANTS COME FROM THE SPREADSHEET
36,.3530,36,1,6,0       XTRDLF.WK1 FROM THE SECTION LABELLED
37,.2195,37,1,7,0       "MAP MULTIPLIERS" FROM THE COLUMN OF
38,.000,38,1,8,0       ITERATION 1.
39,.51,39,1,9,0
40,.000,40,1,10,0
```

```
31,.1118,31,0,1,0        COMPUTE CLASS 1 LOADS
32,.3321,32,0,1,0        COMPUTE CLASS 2 LOADS
33,.9187,33,0,1,0        ETC.
34,.1226,34,0,1,0
35,.6151,35,0,1,0         THESE CONSTANTS COME FROM THE SPREADSHEET
36,.7297,36,0,1,0             XTRDLF.WK1  FROM  THE  SECTION  LABELED
"PROFILE
37,40.9665,37,0,1,0       VALUES" FROM THE COLUMN OF ITERATION 1.
38,88.0,38,0,1,0
39,7.0,39,0,1,0
40,.5483,40,0,1,0
24,1,31,1,32,0        ADD CLASS LOADS TOGETHER IN MAP 24
24,1,24,1,33,0        FOR ITERATION 1.
24,1,24,1,34,0
24,1,24,1,35,0
24,1,24,1,36,0
24,1,24,1,37,0
24,1,24,1,38,0
24,1,24,1,39,0
24,1,24,1,40,0
/
AS                 ***** ITERATION 2 LOAD CALCULATION
31,1,11,-1,1,0       COMPUTE CLASS 1 BASE TO HORIZ CUST GROWTH
32,1,12,-1,2,0       COMPUTE CLASS 2 BASE TO HORIZ CUST GROWTH
33,1,13,-1,3,0       ETC.
34,1,14,-1,4,0
35,1,15,-1,5,0
36,1,16,-1,6,0
37,1,17,-1,7,0
38,1,18,-1,8,0
39,1,19,-1,9,0
40,1,20,-1,10,0
31,.2190,31,1,1,0     COMPUTE CLASS 1 ITERATION 2 CUSTOMERS
32,.2186,32,1,2,0     COMPUTE CLASS 2 ITERATION 2 CUSTOMERS
33,.2176,33,1,3,0     ETC.
34,.2547,34,1,4,0
35,.2757,35,1,5,0      THESE CONSTANTS COME FROM THE SPREADSHEET
36,.4382,36,1,6,0      XTRDLF.WK1 FROM THE SECTION LABELLED
37,.3293,37,1,7,0      "MAP MULTIPLIERS" FROM THE COLUMN OF
38,.000 ,38,1,8,0      ITERATION 2.
39,.6763,39,1,9,0
40,.2668,40,1,10,0
31,.1221,31,0,1,0      COMPUTE CLASS 1 LOADS
32,.3628,32,0,1,0      COMPUTE CLASS 2 LOADS
33,1.0096,33,0,1,0      ETC.
34,.1319,34,0,1,0
35,.6647,35,0,1,0       THESE CONSTANTS COME FROM THE SPREADSHEET
36,.7794,36,0,1,0           XTRDLF.WK1  FROM  THE  SECTION  LABELED
"PROFILE
37,44.9330,37,0,1,0     VALUES" FROM THE COLUMN OF ITERATION 2.
```

```
38,88.0,38,0,1,0
39,7.0,39,0,1,0
40,.5865,40,0,1,0
25,1,31,1,32,0        ADD CLASS LOADS TOGETHER IN MAP 25
25,1,25,1,33,0        FOR ITERATION 2.
25,1,25,1,34,0
25,1,25,1,35,0
25,1,25,1,36,0
25,1,25,1,37,0
25,1,25,1,38,0
25,1,25,1,39,0
25,1,25,1,40,0
/
AS                 ***** ITERATION 3 LOAD CALCULATION
31,1,11,-1,1,0        COMPUTE CLASS 1 BASE TO HORIZ CUST GROWTH
32,1,12,-1,2,0        COMPUTE CLASS 2 BASE TO HORIZ CUST GROWTH
33,1,13,-1,3,0        ETC.
34,1,14,-1,4,0
35,1,15,-1,5,0
36,1,16,-1,6,0
37,1,17,-1,7,0
38,1,18,-1,8,0
39,1,19,-1,9,0
40,1,20,-1,10,0
31,.3992,31,1,1,0       COMPUTE CLASS 1 ITERATION 3 CUSTOMERS
32,.3989,32,1,2,0       COMPUTE CLASS 2 ITERATION 3 CUSTOMERS
33,.3981,33,1,3,0       ETC.
34,.4108,34,1,4,0
35,.4450,35,1,5,0        THESE CONSTANTS COME FROM THE SPREADSHEET
36,.5659,36,1,6,0        XTRDLF.WK1 FROM THE SECTION LABELLED
37,.4756,37,1,7,0        "MAP MULTIPLIERS" FROM THE COLUMN OF
38,.0000,38,1,8,0        ITERATION 3.
39,.8426,39,1,9,0
40,.5055,40,1,10,0
31,.1376,31,0,1,0        COMPUTE CLASS 1 LOADS
32,.4087,32,0,1,0        COMPUTE CLASS 2 LOADS
33,1.146,33,0,1,0        ETC.
34,.1457,34,0,1,0
35,.7390,35,0,1,0         THESE CONSTANTS COME FROM THE SPREADSHEET
36,.8539,36,0,1,0             XTRDLF.WK1  FROM  THE  SECTION  LABELED
"PROFILE
37,50.8828,37,0,1,0       VALUES" FROM THE COLUMN OF ITERATION 3.
38,88.0,38,0,1,0
39,7.0,39,0,1,0
40,.6439,40,0,1,0
26,1,31,1,32,0        ADD CLASS LOADS TOGETHER IN MAP 26
26,1,26,1,33,0        FOR ITERATION 3.
26,1,26,1,34,0
26,1,26,1,35,0
26,1,26,1,36,0
26,1,26,1,37,0
```

```
26,1,26,1,38,0
26,1,26,1,39,0
26,1,26,1,40,0
/
AS                  ***** ITERATION 4 LOAD CALCULATION
31,1,11,-1,1,0          COMPUTE CLASS 1 BASE TO HORIZ CUST GROWTH
32,1,12,-1,2,0          COMPUTE CLASS 2 BASE TO HORIZ CUST GROWTH
33,1,13,-1,3,0          ETC.
34,1,14,-1,4,0
35,1,15,-1,5,0
36,1,16,-1,6,0
37,1,17,-1,7,0
38,1,18,-1,8,0
39,1,19,-1,9,0
40,1,20,-1,10,0
31,.5712,31,1,1,0          COMPUTE CLASS 1 ITERATION 4 CUSTOMERS
32,.5710,32,1,2,0          COMPUTE CLASS 2 ITERATION 4 CUSTOMERS
33,.5704,33,1,3,0          ETC.
34,.5660,34,1,4,0
35,.6156,35,1,5,0           THESE CONSTANTS COME FROM THE SPREADSHEET
36,.6910,36,1,6,0           XTRDLF.WK1 FROM THE SECTION LABELLED
37,.6098,37,1,7,0           "MAP MULTIPLIERS" FROM THE COLUMN OF
38,.0000,38,1,8,0           ITERATION 4.
39,1.00,39,1,9,0
40,.6608,40,1,10,0
31,.1530,31,0,1,0          COMPUTE CLASS 1 LOADS
32,.4547,32,0,1,0          COMPUTE CLASS 2 LOADS
33,1.2824,33,0,1,0          ETC.
34,.1595,34,0,1,0
35,.8134,35,0,1,0           THESE CONSTANTS COME FROM THE SPREADSHEET
36,.9284,36,0,1,0               XTRDLF.WK1  FROM  THE  SECTION  LABELED
"PROFILE
37,56.8326,37,0,1,0         VALUES" FROM THE COLUMN OF ITERATION 4.
38,88.0,38,0,1,0
39,7.0,39,0,1,0
40,.7013,40,0,1,0
27,1,31,1,32,0          ADD CLASS LOADS TOGETHER IN MAP 27
27,1,27,1,33,0          FOR ITERATION 4.
27,1,27,1,34,0
27,1,27,1,35,0
27,1,27,1,36,0
27,1,27,1,37,0
27,1,27,1,38,0
27,1,27,1,39,0
27,1,27,1,40,0
/
AS                  ***** ITERATION 5 LOAD CALCULATION
31,1,11,-1,1,0          COMPUTE CLASS 1 BASE TO HORIZ CUST GROWTH
32,1,12,-1,2,0          COMPUTE CLASS 2 BASE TO HORIZ CUST GROWTH
33,1,13,-1,3,0          ETC.
34,1,14,-1,4,0
```

```
35,1,15,-1,5,0
36,1,16,-1,6,0
37,1,17,-1,7,0
38,1,18,-1,8,0
39,1,19,-1,9,0
40,1,20,-1,10,0
31,.8012,31,1,1,0      COMPUTE CLASS 1 ITERATION 5 CUSTOMERS
32,.8011,32,1,2,0      COMPUTE CLASS 2 ITERATION 5 CUSTOMERS
33,.8008,33,1,3,0      ETC.
34,.8162,34,1,4,0
35,.8437,35,1,5,0       THESE CONSTANTS COME FROM THE SPREADSHEET
36,.8734,36,1,6,0       XTRDLF.WK1 FROM THE SECTION LABELLED
37,.8293,37,1,7,0       "MAP MULTIPLIERS" FROM THE COLUMN OF
38,.0000,38,1,8,0       ITERATION 5.
39,1.00,39,1,9,0
40,.8367,40,1,10,0
31,.1787,31,0,1,0       COMPUTE CLASS 1 LOADS
32,.5313,32,0,1,0       COMPUTE CLASS 2 LOADS
33,1.5097,33,0,1,0       ETC.
34,.1826,34,0,1,0
35,.9373,35,0,1,0        THESE CONSTANTS COME FROM THE SPREADSHEET
36,1.0526,36,0,1,0           XTRDLF.WK1  FROM  THE  SECTION  LABELED
"PROFILE
37,66.7489,37,0,1,0      VALUES" FROM THE COLUMN OF ITERATION 5.
38,88.0,38,0,1,0
39,7.0,39,0,1,0
40,.797,40,0,1,0
28,1,31,1,32,0       ADD CLASS LOADS TOGETHER IN MAP 28
28,1,28,1,33,0       FOR ITERATION 5.
28,1,28,1,34,0
28,1,28,1,35,0
28,1,28,1,36,0
28,1,28,1,37,0
28,1,28,1,38,0
28,1,28,1,39,0
28,1,28,1,40,0
/
AS              ***** ITERATION 6 (HORIZON YEAR) LOAD CALCULATION
31,.2045,11,0,1,0      COMPUTE CLASS 1 LOADS
32,.6079,12,0,1,0      COMPUTE CLASS 2 LOADS
33,1.7370,13,0,1,0     ETC.
34,.2056,14,0,1,0
35,1.0612,15,0,1,0      THESE CONSTANTS COME FROM THE SPREADSHEET
36,1.1768,16,0,1,0          XTRDLF.WK1  FROM  THE  SECTION  LABELED
"PROFILE
37,76.6652,17,0,1,0     VALUES" FROM THE COLUMN OF ITERATION 6.
38,88.0,18,0,1,0
39,7.0,19,0,1,0
40,.8926,20,0,1,0
29,1,31,1,32,0       ADD CLASS LOADS TOGETHER IN MAP 29
29,1,29,1,33,0       FOR ITERATION 6.
```

```
29,1,29,1,34,0
29,1,29,1,35,0
29,1,29,1,36,0
29,1,29,1,37,0
29,1,29,1,38,0
29,1,29,1,39,0
29,1,29,1,40,0
/
ON                    TURN ON MENUS
TR                    TRANSFER CONTROL BACK TO KEYBOARD
```

APPENDIX - B

SPREADSHEETS

SPREADSHEETS

The usefulness of spreadsheets is well known. They are easy to set up, easy to modify, and provide a convenient way to perform, and save the results of, many kinds of calculations.

This Appendix contains spreadsheets that were set up to aid data processing, analyzing, summarizing, etc. during the course of applying CADPAD to the different study areas during the past year.

For each spreadsheet, a short description is given and a printed example of the spreadsheet is included. Copies of the spreadsheets are being provided to WAPDA on a floppy diskette so that they may be used as-is or modified for use in future study work. The details of the computations can be gotten by looking at the formulae in the cells.

All the spreadsheets were created using the Lotus 123 spreadsheet package, which is available on the PC's at WAPDA. They are:

- o AUTO123 - Looks empty. Used to load VILLDAT.
- o BPURXYZ - Coordinates for map marking.
- o GRW3GRTH - Used with transfer files for DLF forecast.
- o GRWSUM - Summarizes SUBSITE study results.
- o KLAREAS - Used to determine customer sizes, etc. for converting customers to land-use.
- o KLCUS2LU - For converting customers to land-use and computing loads from the land-use data.
- o KLCUSTS - Summarizes sources of all customers.
- o KLLOADS - Part 1 computes class and system loads and load growth for 20 years. Part 2 computes class and system load profiles for the base year and compares system profile to metered profile, if available.
- o PWECON - Computes present worth of the costs of a study expansion alternative.
- o VILLDAT - Computes customer counts for cells of a batch.
- o XTRDLF - Computes values for DLF alternate forecast.

AUTO123.WK1

This spreadsheet looks like an empty spreadsheet, so there is no sample included here. It is installed on the PC at WAPDA in the directory D:\LOTUS\WK1, and is automatically loaded when Lotus 123 is invoked.

The reason for this spreadsheet is to make it very easy to load the VILLDAT spreadsheet. It contains a macro which is executed when the user enters the keyboard command ALT-L. The macro loads the VILLDAT spreadsheet from the D:\LOTUS\VIL directory.

BPURXYZ.WK1

This spreadsheet was created to assist with the conversion of map coordinates from degrees longitude and latitude, to Lambert coordinates. The PC program CONVERT was used to get Lambert equivalent coordinates for longitude and latitude at the four corners of the map. These Lambert coordinates were entered in the spreadsheet and the spreadsheet computed the distances of the small-area grid lines from the bottom latitude line and the left-most longitude of the map.

The user enters three values at the top of the spreadsheet: the cell width, the measured distance on the map between the left and right longitudes of the map, and the measured distance of the map between the top and bottom latitudes of the map. He also enters the longitude and latitude of the lower left corner and of the upper right corner of the map. Last, he enters the Lambert X and Y coordinates of the four corners of the map.

The spreadsheet computes the rest of the values, including:

1. Upper left and lower right corners longitude and latitude.

2. The first small area grid line coordinates in the X and Y directions from each corner of the map, and the distance, in cm, of each one from the corner of the map.

3. All small-area grid line coordinate, both X's and Y's; the distance from the left longitude for all the X grid coordinates along the top and bottom of the map; and the distance from the bottom latitude for all the Y grid coordinates along the left and right of the map.

The spreadsheet can be printed as a record and for use in marking the maps.

bpurxyz.wk1 SPREADSHEET FOR MARKING LAMBERT COORDINATES
2000 = CELL WIDTH IN METERS
96.7 = CM BETWEEN LEFT AND RIGHT LONGITUDES (X)
74.3 = CM BETWEEN TOP AND BOTTOM LATITUDES (Y)

COMPUTED VALUES = * BAHAWALPUR 2971-6

	LOWER LEFT	UPPER LEFT		UPPER RIGHT	LOWER RIGHT	
POINT NO.	12	7		8	13	
LONGTUDE (X)	71D 30M	71D 30M	*	72D 00M	72D 00M	*
LATITUDE (Y)	28D 40M	29D 00M	*	29D 00M	28D 40M	*
LAMBERT-X	3085613	3084399		3133121	3134508	
1ST GRID-X *	3086000	3086000		3132000	3134000	
CM TO 1ST-X *	1.48	0.44		3.89	2.04	
LAMBERT-Y	495266	532219		533934	496987	
1ST GRID-Y *	496000	532000		532000	498000	
CM TO 1ST-Y *	0.77	3.18		2.22	1.00	

	BOTTOM	TOP		LEFT	RIGHT
GRID WIDTH	3.96	3.97		4.02	4.02

X-GRID COORDS	CM FROM LEFT	CM FROM LEFT	Y-GRID COORDS	CM FROM BOTTOM	CM FROM BOTTOM
3084000	-3.19	-0.79	494000	-2.55	-6.01
3086000	0.77	3.18	496000	1.48	-1.98
3088000	4.72	7.15	498000	5.50	2.04
3090000	8.68	11.12	500000	9.52	6.06
3092000	12.63	15.09	502000	13.54	10.08
3094000	16.59	19.06	504000	17.56	14.10
3096000	20.54	23.02	506000	21.58	18.13
3098000	24.50	26.99	508000	25.60	22.15
3100000	28.45	30.96	510000	29.63	26.17
3102000	32.41	34.93	512000	33.65	30.19
3104000	36.36	38.90	514000	37.67	34.21
3106000	40.32	42.87	516000	41.69	38.23
3108000	44.27	46.84	518000	45.71	42.26
3110000	48.23	50.81	520000	49.73	46.28
3112000	52.19	54.78	522000	53.75	50.30
3114000	56.14	58.75	524000	57.77	54.32
3116000	60.10	62.72	526000	61.80	58.34
3118000	64.05	66.69	528000	65.82	62.37
3120000	68.01	70.66	530000	69.84	66.39
3122000	71.96	74.63	532000	73.86	70.41
3124000	75.92	78.60	534000	77.88	74.43
3126000	79.87	82.57			
3128000	83.83	86.54			
3130000	87.78	90.51			
3132000	91.74	94.48			
3134000	95.70	98.44			
3136000	99.65	102.41			

GRW3GRTH.WK1

This spreadsheet was created to assist in the DLF load forecast. It handles the calculations that are needed to determine the number of customers to be added manually to the horizon year customer maps. The spreadsheet is used in stages as follows:

1. Run the transfer file TRX1 and, from the output of the transfer file, enter the data for columns A,B,C, and E. The spreadsheet computes column D and columns F through J.

2. Transfer column J factors to the transfer file TRX2 and run it. From the output of the transfer file, enter data in column K of the spreadsheet. Check the computed values in columns M with the transfer file output. Column N contains the results. Column P gives the error, which should be zero.

Columns G and H are set up for 90% of the growth of each class to occur in existing cells, proportional to the amount of customers already in the cells, and 10% to be placed by the user, manually. This 90/10 ratio can be easily changed in the spreadsheet. In fact, if the user wants, each class can have a different ratio. If you change the percentages, also change the heading and footer.

See Section V.D for the full details of using this spreadsheet.

grw3grth.wk1 CUSTOMER GROWTH SPREADSHEET

GUJRANWALA GROWTH

A class	B base	C pr pks	D base-pp	E horiz	F growth	G 90%grth	H 10%grth	I grwn map
1	39962	333	39629	89468	49506	44555	4951	84184
2	5070	201	4869	12260	7190	6471	719	11340
3	376	4	372	909	533	480	53	852
4	4870	76	4794	8729	3859	3473	386	8267
5	151	2	149	293	142	128	14	277
6	2649	139	2510	3116	467	420	47	2930
7	561	0	561	732	171	154	17	715
8	1221	81	1140	3421	2200	1980	220	3120
9	37	2	35	94	57	51	6	86
10	6	0	6	18	12	11	1	17
n	TRX1 30+n	TRX1 40+n	=B-C 30+n	TRX1	=E-B	=.9*F	=.1*F	=D+G 30+n

class	J factor	K sec pks	L grwn-sp	M map3n	N sp+10%	O total	P diff chk	Q limit
1	2.12431	9098	75086	75419	14049	89468	0	450
2	2.32902	1359	9981	10182	2078	12260	0	100
3	2.28952	114	738	742	167	909	0	11
4	1.72447	726	7541	7617	1112	8729	0	200
5	1.85772	38	239	241	52	293	0	10
6	1.16745	90	2840	2979	137	3116	0	3
7	1.27433	2	713	713	19	732	0	3
8	2.73684	618	2502	2583	838	3421	0	40
9	2.46571	17	69	71	23	94	0	4
10	2.80000	5	12	12	6	18	0	2
	=I/D	TRX2 50+n	=I-K 30+n	=L+C 30+n	=K+H	=M+N	=O-E	INFO

GRWSUM.WK1

This spreadsheet was created to help summarize the results of the Gujranwala III Expansion Study. It is included here because the format might be helpful in summarizing other study results. Names and values can be changed, added, etc.

grwsum.wk1

GUJRANWALA III EXPANSION SUMMARY

Year	1991	1994	1997	2000	2004	2007	2011
Customers	54897	70626	87535	100415	115788	127121	142684
Gridstations	4	4	5	6	6	6	6
Gujranwala III Div							
GS Capacities							
Existing:							
Eminabad	18						
Therisansi	39						
College Road	41						
Qila Didar Singh	26						
Additions:							
Wapda Town			26				
Wandoo				13			
Tot GS Capacity (MVA)	124	124	150	163	163	163	163
Maximum Demand (MW)	40.5	52.2	66.3	79.9	96.4	109.4	128.4
Capacity Utiliz. % (1)	40.8	52.6	55.3	61.3	73.9	83.9	98.5
Overloaded GS's (2)	0	1	0	0	1	2	2
Unserved load	0	0	0	0	0	0	0
Max % Voltage Drop (3)	9.1	13.1	18.4	9.6	12.1	13.1	11.1
Power Losses KW	546	943	1434	1449	2037	2564	3143
Power Losses %	1.3	1.8	2.2	1.8	2.1	2.3	2.4
ANNUALIZED REVENUE REQUIREMENTS IN THOUSANDS OF RUPEES (4)							
Gridstations	18196	8196	23911	28071	28071	28071	28071
Feeders	82669	90528	82611	82104	91287	91942	95709
Subtotal:	100865	98724	106522	110175	119358	120013	123780
Cost of Losses	4368	7544	11472	11592	16296	20512	25144
Total Annualized Revenue Req'ments (1000's of Rupees)	105233	106268	117994	121767	135654	140525	148924

(1) Based on a power factor of 80%.
(2) Overloaded Gridstations were Q. D. Singh and Therisansi. Solution in all cases was to shift load to adjacent gridstations.
(3) Voltage Drop was worst at Therisansi in 1997. Relieved by Wandoo in 1998.
(4) In 1992 Pakistani Rupees.

KLAREAS.WK1

This spreadsheet was created to help in the conversion of customer data into land-use data for SLF.

The user enters the cell size of the spatial database grid. For each class he enters the class name, number of customers, load per customer from the load profile at the system peak hour, and the size of one customer (X-feet by Y-feet).

Note that the number of customers is entered in two cells. One is the actual number of customers and the other is the number of customers entered in the customer maps. If they are different, as they are if you enter the KVA of connected capacity instead of the actual number of customers, the spreadsheet can adjust for that. This is necessary because the load profile values are entered on a per-actual-customer basis.

The spreadsheet computes, for each class, the total load, area of one customer (in sq. ft and acres), maximum number of customers that will fit in a cell, total area for the class (in acres and small-areas or cells). It also computes the multipliers that must be applied to the customer maps and the load profiles to convert the customers to land-use.

The user should use this in a trial-and-error manner, entering customer sizes, comparing class sizes, maximum customers per cell, total area for the class, etc., checking that results are reasonable, and then re-adjusting customer sizes. Repeat until satisfied with results.

See Section VI.C for more detail.

klareas.wk1

KOT LAKHPAT CUSTOMER-TO-LAND-USE CONVERSION FACTORS

CELL SIZE : 500 METERS SQ = 250000 SQ MTRS = 2690966.8 SQ FT = 61.776 ACRES
ONE ACRE = 43560 SQ FT

CLASS		CUSTOMERS AND LOADS	CUSTOMER SIZES	LAND USE	CONVERT CUSTOMERS TO LAND USE: MAPS MULTIPLIER	END-USE PROFILE MULTIPLIER
1 D L	Act	50922.0	50.000 x-ft ea cust			
O O	Ent	50922.0	50.000 y-ft	1076 max custs		
M W	@Pk	0.250	2500.000 sqft ea	2923 acres this class	0.092903	10.7638674
	Ld	12730.5	0.0574 acres ea	47.31 small areas		
2 D M	Act	14844.0	50.000 x-ft ea cust			
O E	Ent	14844.0	100.000 y-ft	538 max custs		
M D	@Pk	0.800	5000.000 sqft ea	1704 acres this class	0.185807	5.3819337
	Ld	11875.2	0.1148 acres ea	27.58 small areas		
3 D H	Act	1493.0	140.000 x-ft ea cust			
O G	Ent	1493.0	180.000 y-ft	107 max custs		
M H	@Pk	1.700	25200.000 sqft ea	864 acres this class	0.936466	1.0678440
	Ld	2538.1	0.5785 acres ea	13.98 small areas		
4 C L	Act	9300.0	50.000 x-ft ea cust			
O O	Ent	9300.0	70.000 y-ft	769 max custs		
M W	@Pk	0.150	3500.000 sqft ea	747 acres this class	0.130065	7.6884767
	Ld	1395.0	0.0803 acres ea	12.10 small areas		
5 C M	Act	375.0	150.000 x-ft ea cust			
O E	Ent	375.0	200.000 y-ft	90 max custs		
M D	@Pk	2.000	30000.000 sqft ea	258 acres this class	1.114841	0.8969889
	Ld	750.0	0.6887 acres ea	4.18 small areas		
6 T A	Act	390.0	660.000 x-ft ea kva			
/ L	Ent	2874.0	660.000 y-ft	6 max custs		
W L	@Pk	3.750	435600.000 sqft ea	28740 acres this class	16.187490	0.0083830
	Ld	1462.5	10.0000 acres ea	465.23 small areas		
7 I L	Act	1464.0	50.000 x-ft ea cust			
N O	Ent	1464.0	70.000 y-ft	769 max custs		
D W	@Pk	1.500	3500.000 sqft ea	118 acres this class	0.130065	7.6884767
	Ld	2196.0	0.0803 acres ea	1.90 small areas		
8 I M	Act	69.0	20.000 x-ft ea 10 kva			
N E	Ent	1383.8	60.000 y-ft	2242 max custs		
D D	@Pk	30.000	1200.000 sqft ea	38 acres this class	0.044594	1.1181572
	Ld	2070.0	0.0275 acres ea	0.62 small areas		
9 I H	Act	24.0	150.000 x-ft ea 100 kva			
N G	Ent	420.7	200.000 y-ft	90 max custs		
D H	@PK	530.000	30000.000 sqft ea	290 acres this class	1.114841	0.0511749
	Ld	12720.0	0.6887 acres ea	4.69 small areas		

47737.3 Total Load

35681 Total Acres Used
577.59 Total Small Areas Used
3680 Total Available
15.70 % of Land Is Used

KLCUS2LU.WK1

This spreadsheet is related to KLAREAS. Both spreadsheets include the calculation of the multipliers for the maps and load profiles, for converting the customers data into land-use data. This spreadsheet takes the customer sizes determined in KLAREAS, calculates the multipliers and total land-uses, and then goes on to compute the loads resulting from the converted data. This can be used as a check on the results computed by the program after the multipliers are applied to the data and maps in the database.

klcus2lu.wkl KOT LAKHPAT CUSTOMER-TO-LAND-USE CONVERSION SUMMARY

A	B	C	D *	E	F=E/26910 *	G=D*F	H	I=C/D/F *	J=H*I	K=G*J
MAP NO.	CLASS	NO. OF CUSTS ACTUAL	NO. OF CUSTS ENTERED	SQ FT/ CUST ENTERED	CUST-TO-LAND-USE CONVERSN MULTIPLR	EQUIV LAND-USE TOTAL % CELL	END-USE PROFILE @ HR 21 KW/CUST	END-USE PROFILE MULTIPLR	CLASS PROFILE @ HR 21 KW/% CELL	CLASS LOAD @ HR 21 KW
8	D-L	50922	50922	2500	0.0929034	4730.83	0.25	10.7639	2.6910	12730.5
9	D-M	14844	14844	5000	0.1858068	2758.12	0.80	5.3819	4.3055	11875.2
10	D-H	1493	1493	25200	0.9364663	1398.14	1.70	1.0678	1.8153	2538.1
11	C-L	9300	9300	3500	0.1300647	1209.60	0.15	7.6885	1.1533	1395.0
12	C-M	375	375	30000	1.1148409	418.07	2.00	0.8970	1.7940	750.0
13	T-W	390	2874	435600	16.187490	46522.85	3.75	0.0084	0.0314	1462.5
14	I-L	1464	1464	3500	0.1300647	190.41	1.50	7.6885	11.5327	2196.0
15	I-M	69	1383.8	1200	0.0445936	61.71	30.00	1.1182	33.5447	2070.0
16	I-H	24	270.67	30000	1.1148409	301.75	530.00	0.0795	42.1535	12720.0
TOTALS		78881				57591.48				47737.3

* NOTES:

COLUMN D: FOR TUBEWELLS, 1 ENTERED CUSTOMER MEANS 1 KVA OF XFMR CAPACITY.
AN AVERAGE ACTUAL CUSTOMER IS ABOUT 7 KVA.
FOR B2, 1 ENTERED CUSTOMER MEANS 10 KVA OF XFMR CAPACITY.
AN AVERAGE ACTUAL CUSTOMER IS ABOUT 21 KVA.
FOR B3, 1 ENTERED CUSTOMER MEANS 100 KVA OF XFMR CAPACITY.
AN AVERAGE ACTUAL CUSTOMER IS ABOUT 18 KVA.

COLUMN F: THE NUMBER OF SQUARE FEET IN ONE PERCENT OF A SMALL AREA IS 26909.6684.

COLUMN I: BECAUSE THE CUSTOMER MAPS WERE CONVERTED TO LAND-USE MAP BY THE CUSTOMER-TO-LAND-USE FACTOR, THE END-USE PROFILE MULTIPLIER MUST BE THE INVERSE OF THE CUSTOMER-TO-LAND-USE FACTOR SO THAT THE PRODUCT OF THE TWO DOES NOT CHANGE. IN ADDITION, THE END-USE PROFILES MULTIPLIERS MUST REFLECT THE FACT THAT THE END-USE PROFILES WERE CREATED TO REPRESENT ONE AVERAGE ACTUAL CUSTOMER, BUT THREE OF THE CLASSES ARE ENTERED IN CUSTOMER COUNTS THAT REPRESENT THE SIZE OF THE CUSTOMERS. THE MULTIPLIERS FOR THESE 3 CLASSES MUST BE MULTIPLIED BY THE RATIO OF THE ACTUAL TO THE ENTERED NUMBER OF CUSTOMERS.

KLCUSTS.WK1

This spreadsheet was created to document and display, in a clear manner, the source of all the customers in the different classes, in the different customer maps, and by subdivisions. It shows how the "lighting", and "other", and "Batch 24" customers from batch data were converted to equivalent customers of the standard nine classes.

klcusts.wk1 SUMMARY OF CUSTOMERS IN KOT LAKHPAT DIVISION

CLASS	D-L	D-M	D-H	C-L	C-M	T-W*	I-L	I-M*	I-H*
MAP NO.	8	9	10	11	12	13	14	15	16
BATCHES BASE	50592	13661	1462	6571	366	2874	1464	1304	421
LIGHTG EQUIV									
AMER SADHU		76	3						
KHANA		240	9						
OTHER EQUIV									
FACT AREA	330	867	19						
KHANA				616					
RAIWIND				2113	9			80	
TOTAL CUSTS	50922	14844	1493	9300	375	2874	1464	1384	421

* EACH CUSTOMER IN MAPS = 1 KW FOR T-W, 10 KW FOR I-M, 100 KW FOR I-H

ALL BATCH CUSTOMERS BY SUBDIVISION

SUBDIVISION	D-L	D-M	D-H	C-L	C-M	T-W	I-L	I-M	I-H	OTHER
AMER SIDHU	6270	3455	376	1444	107	5	152	1	[illegible]	17
FACT AREA	7080	4065	406	1293	80	6	207	16	8	28
KHANA	15301	3039	329	1412	109	296	505	42	9	231
K R KISHAN*	14608	1995	204	1216	18	24	411	3	0	8
RAIWIND	7333	1107	147	1206	52	59	189	7	5	74
	50592	13661	1462	6571	366	390	1464	69	25	358

* INCLUDES RAJA JUNG SUBDIVISION AS WELL

BATCH 24 CUSTOMERS BY SUBDIVISION (INCLUDED IN ABOVE)

SUBDIVISION	D-L	D-M	D-H	C-L	C-M	T-W	I-L	I-M	I-H	OTHER
AMER SIDHU	0	0	0	1	0	0	1	1	3	7
FACT AREA	0	0	4	7	10	0	7	16	8	14
KHANA	1	0	0	13	26	0	18	42	9	28
K R KISHAN*	0	0	0	2	3	0	4	3	0	2
RAIWIND	0	0	0	0	8	0	5	7	5	6
	1	0	4	23	47	0	35	69	25	57

* INCLUDES RAJA JUNG SUBDIVISION AS WELL

KLLOADS.WK1

This spreadsheet computes base year 24-hour load profiles, and 20 years of loads, for the user to get a feel for the global customers and loads and to help the user to try out different class profiles and growth rates and immediately see the results.

Part 1 computes 20 future years of customers and loads for each class and for the system, and also computes the percentage growth of the total system load for each future year. The user enters base year customers for each class, the customer growth rate for each year for each class, and the base and horizon year load per customer at the peak hour for each class.

Part 2 computes the base year 24-hour load profile for each class and for the system. If the user enters a metered 24-hour system profile, the spreadsheet compares that to the computed system profile. The user enters the number of customers for each class, the 24-hour load profile per customer for each class, and the metered 24-hour system profile if it is available.

BEST AVAILABLE DOCUMENT

[illegible] - part 1

ICT LATERAL LOAD FORECAST AND LOAD PROFILES

CLASS/YEAR		1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
1 T L	%	9.00	9.00	9.00	9.00	9.00	4.50	4.50	4.50	4.50	3.50	3.50	3.50	3.50	3.50	3.00	3.00	3.00	3.00	3.00	3.00	
O O	#	47945	52251	56965	62091	67680	73771	77091	80560	84155	87873	91050	94235	97537	100951	104484	107819	110845	114172	117595	121125	124760
M W	Pk	0.152	0.152	0.155	0.155	0.161	0.162	0.165	0.168	0.172	0.173	0.175	0.179	0.180	0.183	0.185	0.189	0.190	0.193	0.195	0.198	0.200
	Lo	7192	7570	8530	9779	10325	11955	12721	13494	14311	15175	15934	16727	17557	18424	19330	20179	21061	21978	22930	23922	24952
2 D M	%	9.50	9.50	9.50	9.50	9.50	5.00	5.00	5.00	5.00	4.00	4.00	4.00	4.00	4.00	3.00	3.00	3.00	3.00	3.00	3.00	
O E	#	12970	14202	15551	17029	18645	20415	21439	22511	23638	24819	25811	26843	27917	29034	30195	31101	32034	32995	33985	35004	36054
M C	Pk	0.751	0.751	0.772	0.793	0.794	0.815	0.816	0.837	0.838	0.849	0.850	0.871	0.882	0.893	0.904	0.915	0.926	0.937	0.948	0.959	0.970
	Lo	9725	10503	12009	13830	14825	16438	17454	18616	19807	21071	22197	23381	24623	25927	27295	28447	29552	30915	32215	33595	34973
3 D E	%	10.00	10.00	10.00	10.00	10.00	5.50	5.50	5.50	5.50	4.50	4.50	4.50	4.50	4.50	3.00	3.00	3.00	3.00	3.00	3.00	
O G	#	1350	1492	1640	1810	1994	2194	2314	2441	2576	2717	2840	2967	3101	3241	3386	3485	3593	3709	3811	3926	4043
M E	Pk	0.132	0.139	0.176	0.217	0.255	0.292	0.334	0.378	0.412	0.451	0.490	0.529	0.568	0.607	0.646	0.685	0.724	0.763	0.802	0.841	0.880
	Lo	2660	3205	3599	4019	4499	5034	5401	5794	6213	6660	7071	7505	7963	8445	8960	9385	9756	10224	10679	11153	11645
4 C L	%	9.00	9.00	9.00	9.00	9.00	6.00	6.00	6.00	6.00	5.00	5.00	5.00	5.00	5.00	3.00	3.00	3.00	3.00	3.00	3.00	
O O	#	5605	6113	6663	7260	7916	8629	9146	9695	10277	10893	11435	12010	12610	13241	13903	14320	14750	15192	15645	16117	16601
M W	Pk	0.150	0.155	0.190	0.195	0.200	0.205	0.210	0.215	0.220	0.225	0.230	0.235	0.240	0.245	0.250	0.255	0.260	0.265	0.270	0.275	0.280
	Lo	1009	1131	1266	1415	1583	1765	1921	2084	2261	2451	2631	2822	3027	3244	3476	3652	3835	4026	4225	4432	4646
5 C M	%	10.00	10.00	10.00	10.00	10.00	7.00	7.00	7.00	7.00	5.50	5.50	5.50	5.50	5.50	4.00	4.00	4.00	4.00	4.00	4.00	
O E	#	279	307	338	371	409	449	491	514	559	589	621	656	692	730	770	801	833	866	901	937	974
M C	Pk	1.200	1.241	1.282	1.322	1.362	1.403	1.443	1.484	1.524	1.565	1.605	1.645	1.686	1.726	1.767	1.807	1.845	1.886	1.929	1.969	2.010
	Lo	335	351	421	491	552	630	634	763	839	921	997	1079	1166	1260	1360	1447	1539	1635	1737	1845	1955
6 T F	%	2.00	2.00	2.00	2.00	2.00	1.40	1.40	1.40	1.40	0.80	0.80	0.80	0.80	0.80	0.50	0.50	0.50	0.50	0.50	0.50	
U E	#	2574	2931	2999	3050	3111	3173	3215	3259	3309	3355	3381	3409	3436	3463	3491	3505	3528	3544	3561	3579	3597
E C	Pk	2.300	2.304	2.307	2.310	2.314	2.317	2.321	2.324	2.328	2.331	2.335	2.339	2.342	2.345	2.349	2.352	2.356	2.359	2.363	2.366	2.370
	Lo	6611	6750	6929	7047	7185	7324	7463	7584	7702	7821	7956	7971	8041	8120	8200	8253	8307	8361	8415	8470	8525
7 T F	%	4.00	4.00	4.00	4.00	4.00	2.50	2.50	2.50	2.50	1.20	1.20	1.20	1.20	1.20	1.00	1.00	1.00	1.00	1.00	1.00	
U E	#	1338	1369	1443	1503	1569	1628	1668	1709	1750	1794	1816	1839	1860	1882	1904	1924	1943	1962	1982	2002	2022
E	Pk	13.000	13.085	13.169	13.254	13.338	13.423	13.507	13.592	13.676	13.761	13.845	13.930	14.014	14.099	14.183	14.268	14.352	14.437	14.521	14.606	14.690
	Lo	17389	18180	19029	19919	20848	21819	22834	23911	24939	24989	25139	25598	26661	26831	27011	27444	27881	28327	28778	29234	29695
8 I L	%	10.00	10.00	10.00	10.00	10.00	5.00	5.00	5.00	5.00	4.00	4.00	4.00	4.00	4.00	3.00	3.00	3.00	3.00	3.00	3.00	
N G	#	1304	1462	1638	1832	2052	2298	2452	2620	2894	3126	3251	3381	3516	3657	3803	3917	4035	4156	4281	4409	4541
D W	Pk	2.000	2.092	2.184	2.276	2.368	2.460	2.540	2.630	2.720	2.810	2.900	2.990	3.080	3.170	3.260	3.350	3.440	3.530	3.620	3.710	3.800
	Lo	2605	3052	3565	4155	4842	5625	6353	7049	7870	8784	9425	10110	10831	11593	12399	13128	13880	14671	15499	16369	17257
9 I M	%	10.00	10.00	10.00	10.00	10.00	5.00	5.00	5.00	5.00	4.00	4.00	4.00	4.00	4.00	3.00	3.00	3.00	3.00	3.00	3.00	
N E	#	421	471	529	591	662	741	801	865	934	1009	1049	1091	1134	1180	1227	1264	1302	1341	1381	1423	1465
D C	Pk	55.000	60.654	66.308	69.962	71.616	73.270	74.924	76.578	78.232	79.886	81.540	83.194	84.848	86.502	88.156	89.810	91.464	93.118	94.772	96.426	98.080
	Lo	27345	31405	36045	41351	47405	54224	59994	66224	73097	80580	85539	90761	96272	102074	108187	113524	119093	124873	130904	137184	143724
10 I E	%	10.00	10.00	10.00	10.00	10.00	7.50	7.50	7.50	7.50	5.00	5.00	5.00	5.00	5.00	4.00	4.00	4.00	4.00	4.00	4.00	
N G	#	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
D E	Pk	420.000	426.600	433.200	439.800	446.400	453.000	459.600	466.200	472.800	479.400	486.000	492.600	499.200	505.800	512.400	519.000	525.600	532.200	538.800	545.400	552.000
	Lo	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL LOAD		75055	82895	91664	101513	112567	124990	134499	144516	155011	168153	176821	185954	195544	205624	216219	225444	235035	245012	255384	266169	277379
% LD GRWTH			9.45	9.56	9.70	9.82	9.95	7.05	7.13	7.17	7.22	4.91	4.91	4.91	4.91	4.90	4.09	4.09	4.07	4.09	4.09	4.04

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Kilcashel. - part 2

SUSTAINABLE ICE LOAD REDUCTION CONCEPTS - WORK FINAL VERSION

classification	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
1 ic	0.04	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.04	0.05	0.05	0.05
f	47945	47945	47945	47945	47945	47945	47945	47945	47945	47945	47945	47945	47945	47945	47945	47945	47945	47945	47945	47945	47945	47945	47945	47945
calc	4215	4215	4215	4215	4555	4795	4795	4555	3955	3955	3955	3955	4315	4507	4507	4555	4795	4795	5754	7192	5712	5754	4795	4215
2 ic	0.45	0.45	0.45	0.45	0.51	0.54	0.56	0.50	0.40	0.40	0.40	0.40	0.42	0.44	0.45	0.45	0.50	0.52	0.55	0.45	0.70	0.55	0.45	0.45
f	12970	12970	12970	12970	12970	12970	12970	12970	12970	12970	12970	12970	12970	12970	12970	12970	12970	12970	12970	12970	12970	12970	12970	12970
calc	5837	5837	5837	5837	6455	7004	7263	6455	5188	5188	5188	5188	5447	5707	5966	6225	6485	6744	7134	9725	9079	7523	5837	5837
3 ic	1.20	1.20	1.20	1.20	1.20	0.90	0.90	0.90	0.70	0.70	0.70	0.90	1.00	1.20	1.30	1.30	1.40	1.40	1.60	2.10	2.00	1.90	1.70	1.40
f	1362	1362	1362	1362	1362	1362	1362	1362	1362	1362	1362	1362	1362	1362	1362	1362	1362	1362	1362	1362	1362	1362	1362	1362
calc	1634	1634	1634	1634	1362	1225	1089	1089	1022	953	953	1158	1362	1634	1771	1771	1907	1907	2179	2860	2724	2588	2315	1907
4 ic	0.00	0.00	0.00	0.00	0.00	0.03	0.04	0.05	0.07	0.09	0.09	0.09	0.09	0.10	0.11	0.10	0.10	0.10	0.13	0.15	0.16	0.10	0.06	0.03
f	5605	5605	5605	5605	5605	5605	5605	5605	5605	5605	5605	5605	5605	5605	5605	5605	5605	5605	5605	5605	5605	5605	5605	5605
calc	0	0	0	0	112	168	224	280	393	449	449	449	505	533	589	561	561	561	729	1009	897	561	336	168
5 ic	0.20	0.20	0.20	0.20	0.20	0.20	0.30	0.60	0.80	0.80	0.85	0.85	0.90	0.90	0.90	0.85	0.70	0.75	0.90	1.20	1.10	0.90	0.50	0.20
f	279	279	279	279	279	279	279	279	279	279	279	279	279	279	279	279	279	279	279	279	279	279	279	279
calc	56	56	56	56	56	56	84	167	223	223	237	237	251	251	251	237	195	209	251	335	307	251	140	56
6 ic	0.00	0.00	0.00	0.50	0.80	1.00	1.20	1.50	1.80	2.20	2.20	2.20	2.10	2.00	2.00	2.00	2.00	2.00	2.00	2.30	1.80	1.00	0.00	0.00
f	2874	2874	2874	2874	2874	2874	2874	2874	2874	2874	2874	2874	2874	2874	2874	2874	2874	2874	2874	2874	2874	2874	2874	2874
calc	0	0	0	1437	2299	2874	3449	4311	5173	6323	6323	6323	6035	5748	5748	5748	5892	5892	5892	6610	5173	2874	0	0
7 ic	8.00	8.00	8.00	9.00	10.00	11.00	12.00	13.00	14.00	14.00	14.00	14.00	13.50	13.00	12.50	11.00	11.00	11.50	12.00	13.00	12.00	9.00	8.00	8.00
f	1355	1355	1355	1355	1355	1355	1355	1355	1355	1355	1355	1355	1355	1355	1355	1355	1355	1355	1355	1355	1355	1355	1355	1355
calc	10855	10855	10855	12214	13573	14932	16290	17649	18704	18704	18704	19764	18303	17573	16702	14932	14932	15664	16292	17649	16292	10855	10855	10855
8 ic	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.40	1.70	2.00	2.00	2.00	2.00	2.40	2.40	2.40	2.40	2.00	2.00	2.00	1.80	1.60	1.40	1.00
f	1304	1304	1304	1304	1304	1304	1304	1304	1304	1304	1304	1304	1304	1304	1304	1304	1304	1304	1304	1304	1304	1304	1304	1304
calc	1565	1565	1565	1565	1565	1565	1565	1825	2215	2608	2608	2608	2608	3129	3129	3129	3129	2608	2608	2608	2347	2086	1825	1565
9 ic	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	55.00	58.00	58.00	58.00	58.00	58.00	58.00	58.00	58.00	58.00	60.00	65.00	60.00	58.00	50.00	50.00
f	421	421	421	421	421	421	421	421	421	421	421	421	421	421	421	421	421	421	421	421	421	421	421	421
calc	21579	21579	21579	21579	21579	21579	21579	21579	23163	24421	24421	24421	24421	24421	24421	24421	24421	24421	25242	27368	25263	23579	21579	21579
10 ic	420.00	420.00	420.00	420.00	420.00	420.00	390.00	350.00	350.00	350.00	350.00	350.00	350.00	350.00	350.00	350.00	350.00	350.00	350.00	420.00	420.00	420.00	420.00	420.00
f	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
calc	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
weight	10000	12000	13000	15000	20000	22000	22000	23000	23000	23000	23000	23000	23000	23000	24000	22000	22000	22000	23000	25000	27000	22000	17000	16000
calcs	40134	40134	40134	42772	45185	47255	48114	51473	54705	57499	57773	57973	57773	57571	57151	55242	55575	55996	56947	65205	60276	45381	41575	40575
% off	301.34	234.45	208.73	185.14	125.92	114.87	100.05	123.82	137.63	149.99	151.15	152.06	151.19	150.02	138.38	151.12	152.61	154.53	156.29	161.02	123.24	115.82	145.92	153.59

BEST AVAILABLE DOCUMENT

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PWECON.WK1

This spreadsheet can be used to determine the present worth of expansion plans so that alternative plans can be compared on a common present worth basis. This is a common utility practice.

The spreadsheet allows for entry of four different rates which are: the escalation rates of the costs of Grid Stations and feeders, the escalation rate for the cost of losses which includes the escalation rate of energy costs, and the rate used by the utility for the cost of funds invested in the utility.

The user also enters the base year, the years of the study period, and the annualized costs of Grid Stations, Feeders, and Losses for each year of the study period. These costs are based on the results of either SUBSITE or FEEDERSITE study results.

The spreadsheet takes into account that different rates may apply to different costs and that the cost of money invested can also be at a different rate. It uses the three equipment and the losses cost escalation rates to determine the "cost at year" in future rupees, and then uses the investment funds rate to bring those future rupees costs back to a present worth in present rupees. The last column is the accumulation of the present worth up to and including that year.

The final total present worth cost of the expansion plan, including equipment and losses, is given at the upper right of the spreadsheet.

pweconi.wk1 PRESENT WORTH OF EXPANSION PLAN

NAME OF THIS
EXPANSION PLAN: ALTERNATIVE 1 PLAN TOTAL P.W. = 3147232

8 % = EQUIPMENT COST ESCALATION RATE FOR GRID STATIONS
8 % = EQUIPMENT COST ESCALATION RATE FOR FEEDERS
6 % = LOSSES COST ESCALATION RATE
10 % = INVESTMENT FUNDS RATE
1992 = BASE YEAR

		(COSTS = 1000'S OF RS - ANNUALIZED) <-COSTS IN BASE YEAR RS-->				PRESENT	PRESENT
	YEAR	STATION	FEEDER	LOSSES	COST AT YEAR	WORTH OF YEAR	WORTH TO YEAR
1	1993	14036	74389	35120	132726	120660	120660
2	1994	18973	81815	37912	160157	132361	253021
3	1995	18973	81815	37912	172118	129315	382336
4	1996	18973	81815	37912	184984	126347	508682
5	1997	28642	110229	48144	268475	166702	675384
6	1998	28642	110229	48144	288664	162943	838327
7	1999	28642	110229	48144	310391	159280	997607
8	2000	28642	110229	48144	333775	155708	1153316
9	2001	28642	110229	48144	358942	152226	1305542
10	2002	33580	89751	85064	418599	161388	1466930
11	2003	33580	89751	85064	449040	157386	1624316
12	2004	33580	89751	85064	481734	153495	1777811
13	2005	33580	89751	85064	516849	149713	1927524
14	2006	33580	89751	85064	554569	146035	2073559
15	2007	48963	117336	109448	789827	189078	2262638
16	2008	48963	117336	109448	847767	184499	2447136
17	2009	48963	117336	109448	910028	180044	2627181
18	2010	48963	117336	109448	976936	175710	2802891
19	2011	48963	117336	109448	1048843	171494	2974385
20	2012	54471	98349	140480	1162826	172847	3147232
TOTALS		681351	2004763	1502616			

VILLDAT.WK1

This spreadsheet was developed to assist in processing the batch data and village data into customer counts for the small-areas or cells of the LOADSITE customer maps. The user enters batch and village data and the spreadsheet produces ASCII Card Image files which are sent to the VAX for processing into the LOADSITE database customer maps.

The spreadsheet considers the batch data to be correct and ratios the village data up or down so that the totals of the small-area customers agree with the batch totals.

The customers are dispersed to the small-areas in proportion to the village counts of the villages in those small-areas. For example, if the batch total is 10% higher than the villages total for a class, the village totals will be increased by 10% when they are allocated to small-areas.

The details of the use of the spreadsheet are covered in Section IV of this manual.

REG/DIRC/DIV/SUBDIV/BATCH-LER/LERIII/ELP/EWD/B14

LER/LERIII/ELP.EWD/B14

* INDICATES COLUMNS WHERE DATA IS ENTERED BY THE USER
# INDICATES COLUMNS OF DATA THAT WILL BE SENT TO LOADSITE

	#		#		#		#
DOM-L_	420	COM-L	2	IND-L	6	TW-F	3
DOM-M_	21	COM-M	0	IND-M	0	TW-F	1
DOM-E_	11			IND-E	0		

BATCH TOTALS	452	DOMESTIC				2	COMMERCIAL			6	INDUSTRIAL	
CHECK TOTALS	452					2				6		
VILLAGE TOTALS	454	1.000	420	21	11	5	1.000	2	0	5	1.000	6

VILLDAT.WK1 IS THE BLANK SPREADSHEET FILE NAME.
COPY IT TO A FILE WITH A NAME AS DESCRIBED BELOW.
LOAD THAT FILE AND MAKE DATA ENTRIES THERE.

VDDSSSN.WK1 IS THE SPREADSHEET FILE NAMING CONVENTION. WHERE
V = "V" FOR VILLAGE DATA FILE
DD = TWO CHARACTER ABBREV FOR THE DIV NAME
SSS = THREE CHARACTER ABBREV FOR THE SUBDIV NAME
N = ONE OR TWO DIGIT BATCH NUMBER

CHECK OF BATCH TOTALS ASSIGNED TO CELLS

<------ DISTRIBUTION OF VILLAGE CUSTOMERS BY CLASS ------> <--SIX CLASSES OF CUSTS TO 1, 2, 3, OR 4 CELLS--->

NAME OF VILLAGE	<------ DOMESTIC ------>					<-- COMMERCIAL -->				<-INDUSTRIAL->			X	Y	Z	DOMESTIC LO	DOMESTIC MD	DOMESTIC HI	COMMERCL LO	COMMERCL MD	INDUSTRIAL LO	PRCNT SUM ERROR	CHECK OF BATCH TOTALS ASSIGNED TO CELLS 452.0 DOM	2.0 COM	6.0 IND
	TOT	PU	LOW	MED	HGH	TOT	PU	LOW	MED	TOT	PU	LOW													
WATNA	105	0.226	95	5	2	3	0.600	1	0	2	0.333	2	52	56	50	47.5	2.4	1.2	0.6	0.0	1.0	0	102.3	1.2	2.0
WATNA													52	57	50	47.5	2.4	1.2	0.6	0.0	1.0				
WATNA																0.0	0.0	0.0	0.0	0.0	0.0				
WATNA																0.0	0.0	0.0	0.0	0.0	0.0				
HYE ASLAM KHAN	25	0.054	23	1	1	0	0.000	0	0	0	0.000	0	46	62	100	22.8	1.1	0.6	0.0	0.0	0.0	0	24.4	0.0	0.0
HYE ASLAM KHAN																0.0	0.0	0.0	0.0	0.0	0.0				
HYE ASLAM KHAN																0.0	0.0	0.0	0.0	0.0	0.0				
HYE ASLAM KHAN																0.0	0.0	0.0	0.0	0.0	0.0				
QATAL GHARI	17	0.037	15	1	0	0	0.000	0	0	0	0.000	0	62	57	100	15.4	0.8	0.4	0.0	0.0	0.0	0	16.6	0.0	0.0
QATAL GHARI																0.0	0.0	0.0	0.0	0.0	0.0				
QATAL GHARI																0.0	0.0	0.0	0.0	0.0	0.0				
QATAL GHARI																0.0	0.0	0.0	0.0	0.0	0.0				
RAEN RAPOLEHE	3	0.006	3	0	0	1	0.200	0	0	2	0.333	0	62	58	100	2.7	0.1	0.1	0.4	0.0	2.0	0	2.3	0.4	2.0
RAEN RAPOLEHE																0.0	0.0	0.0	0.0	0.0	0.0				
RAEN RAPOLEHE																0.0	0.0	0.0	0.0	0.0	0.0				
RAEN RAPOLEHE																0.0	0.0	0.0	0.0	0.0	0.0				
CHAI BOOTA	45	0.097	41	2	1	0	0.000	0	0	1	0.167	1	59	53	100	40.7	2.0	1.1	0.0	0.0	1.0	0	43.8	0.0	1.0
CHAI BOOTA																0.0	0.0	0.0	0.0	0.0	0.0				
CHAI BOOTA																0.0	0.0	0.0	0.0	0.0	0.0				
CHAI BOOTA																0.0	0.0	0.0	0.0	0.0	0.0				
KHOIRAN DA KHOO	30	0.065	27	1	1	0	0.000	0	0	0	0.000	0	52	55	100	27.0	1.4	0.7	0.0	0.0	0.0	0	29.2	0.0	0.0
KHOIRAN DA KHOO																0.0	0.0	0.0	0.0	0.0	0.0				
KHOIRAN DA KHOO																0.0	0.0	0.0	0.0	0.0	0.0				
KHOIRAN DA KHOO																0.0	0.0	0.0	0.0	0.0	0.0				
HYE SUNDRANWALI	16	0.034	14	1	0	0	0.000	0	0	0	0.000	0	54	51	100	14.5	0.7	0.4	0.0	0.0	0.0	0	15.6	0.0	0.0
HYE SUNDRANWALI																0.0	0.0	0.0	0.0	0.0	0.0				
HYE SUNDRANWALI																0.0	0.0	0.0	0.0	0.0	0.0				
HYE SUNDRANWALI																0.0	0.0	0.0	0.0	0.0	0.0				
KHAND	105	0.226	95	5	2	1	0.200	0	0	1	0.167	1	63	51	100	95.6	4.8	2.5	0.4	0.0	1.0	0	102.3	0.4	1.0
KHAND																0.0	0.0	0.0	0.0	0.0	0.0				
KHAND																0.0	0.0	0.0	0.0	0.0	0.0				
KHAND																0.0	0.0	0.0	0.0	0.0	0.0				

BEST AVAILABLE DOCUMENT

XTRDLF.WK1

This spreadsheet was created to calculate the values that are needed in the XTRDLF.DAT transfer file. That transfer file was created to provide an alternate way of doing the DLF load forecast if the program load forecast algorithm does not give acceptable load growth patterns in the individual small areas.

The values that the user must enter in the spreadsheet are the following:

- The years of the load forecast iterations, across the top.
- The customer counts for each class for each forecast iteration year. These can be copied from thhe Global Model table if that has been entered.
- The base year and horizon year customer load profile value for each class, for the hour of the system peak load. These can be copied from the Load Model profiles if they have been entered.

The results of the spreadsheet calculation are as follows:

- Load profile values for each class for each forecast iteration year at the system peak load hour. These are calculated by linear interpolation between the base year and the horizon year values, based on the years of each.
- Map multipliers for each class for each forecast iteration year. These represent the fraction of the base year to horizon year customer growth which occurs by that iteration year, based on the customer counts for that year.
- Calculated load for each class for each forecast iteration year. These are only for review and checking.
- Total load for each forecast iteration year, for checking.

The profile values and map multipliers are entered in the transfer file and the transfer file is run in DLF to do the forecast. The load results of the forecast, in Maps 23-29, should be compared to the total loads computed in the spreadsheet, as a check.

The spreadsheet will handle customer growths that are positive, negative or zero thriugh the study period. It will not properly handle growths that are positive during part of the study period and negative during another part of the study period.

xtrdlf.wk1 COMPUTE TRANSFER FILE VALUES FOR ALTERNATE DLF FORECAST

ITER	0	1	2	3	4	5	6	
YEAR	1993	1995	1997	2000	2003	2008	2013	
CLASS								
	NUMBER OF CUSTOMERS FROM LOADSITE GLOBAL MODEL							
1	182303	198011	218307	247927	276202	314007	346689	
2	74111	80462	88709	100745	112235	127597	140877	
3	19106	20718	22841	25940	28899	32854	36274	
4	29386	32976	35496	39241	42963	48965	53375	KVA PER
5	3310	3657	3906	4272	4641	5134	5472	CUSTOMER
6	5160	6362	6652	7087	7513	8134	8565	FROM
7	30	48	57	69	80	98	112	LOADSITE
8	9	9	9	9	9	9	9	LOAD
9	960	500	350	200	58	58	58	MODEL
10	3120	3120	3481	3804	4014	4252	4473	

	PROFILE VALUES FOR TRANSFER FILE XTRDLF.DAT							BASE YR
1	0.1016	0.1118	0.1221	0.1376	0.1530	0.1787	0.2045	0.101556
2	0.3015	0.3321	0.3628	0.4087	0.4547	0.5313	0.6079	0.301461
3	0.8278	0.9187	1.0096	1.1460	1.2824	1.5097	1.7370	0.827765
4	0.1134	0.1226	0.1319	0.1457	0.1595	0.1826	0.2056	0.113417
5	0.5655	0.6151	0.6647	0.7390	0.8134	0.9373	1.0612	0.565542
6	0.6800	0.7297	0.7794	0.8539	0.9284	1.0526	1.1768	0.68
7	37.0000	40.9665	44.9330	50.8828	56.8326	66.7489	76.6652	37
8	88.0000	88.0000	88.0000	88.0000	88.0000	88.0000	88.0000	88
9	7.0000	7.0000	7.0000	7.0000	7.0000	7.0000	7.0000	7
10	0.5100	0.5483	0.5865	0.6439	0.7013	0.7970	0.8926	0.51

	MAP MULTIPLIERS FOR TRANSFER FILE XTRDLF.DAT							HORIZ YR
1	0.0000	0.0956	0.2190	0.3992	0.5712	0.8012	1.0000	0.20446
2	0.0000	0.0951	0.2186	0.3989	0.5710	0.8011	1.0000	0.607919
3	0.0000	0.0939	0.2176	0.3981	0.5704	0.8008	1.0000	1.736987
4	0.0000	0.1497	0.2547	0.4108	0.5660	0.8162	1.0000	0.20563
5	0.0000	0.1605	0.2757	0.4450	0.6156	0.8437	1.0000	1.061216
6	0.0000	0.3530	0.4382	0.5659	0.6910	0.8734	1.0000	1.176796
7	0.0000	0.2195	0.3293	0.4756	0.6098	0.8293	1.0000	76.66523
8	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	88
9	0.0000	0.5100	0.6763	0.8426	1.0000	1.0000	1.0000	7
10	0.0000	0.0000	0.2668	0.5055	0.6608	0.8367	1.0000	0.892613

	LOADS - COMPARE LOADSITE BASE & HORIZON YR PROFILES						
1	18514	22147	26663	34108	42261	56124	70884
2	22342	26722	32179	41177	51032	67793	85642
3	15815	19033	23060	29727	37059	49599	63007
4	3333	4044	4680	5717	6854	8940	10976
5	1872	2249	2596	3157	3775	4812	5807
6	3509	4642	5184	6051	6975	8562	10079
7	1110	1966	2561	3511	4547	6541	8587
8	792	792	792	792	792	792	792
9	6720	3500	2450	1400	406	406	406
10	1591	1711	2042	2449	2815	3389	3993
TOTAL	75598	86807	102209	128090	156516	206958	260172

APPENDIX - C

UTILITY PROGRAMS

VAX UTILITY PROGRAMS

During the data processing for the various LOADSITE studies, it became evident that some aspects of the work could be made easier and faster with the aid of small utility programs. The programs were written in FORTRAN, on the VAX, where they are used and where they reside.

A description of each program and its use is given, along with a listing of the program.

The programs are listed below, in alphabetical order, along with reference to Sections of this manual where their use is described in the context of the procedures.

COMB	IV.D.8
COMBINE	IV.D.6
CUSTMAPS	IV.D.6
PRMB2	V.B.7
PRMB5	V.F.3
PRNZ	V.B.6
PROOB	V.B.4
SDAREA	IV.D.5
WRR	V.G.4 and VI.I

These programs are located in the directory $DISK0:[CADPAD.UTIL] and may be run by entering the command "R $DISK0:[CADPAD.UTIL]progname", where progname is the name of the program you wish to run. For example, to run the program COMB, enter "R $DISK0:[CADPAD.UTIL]COMB".

To avoid having to enter the path name each time you run a program, the user may add entries to his LOGIN.COM file, of the form "$ progname :== R $DISK0:[CADPAD.UTIL]progname". For example, for the program COMB, enter "$ COMB :== R $DISK0:[CADPAD.UTIL]COMB". After these entries are made in the LOGI.COM file, and the user logs in again, the programs can be run by simply entering the program name, "COMB" for example, because that is now a defined command.

COMB

This program is used to combine all the data entries in a file for each cell (small-area) into a single entry for the cell. Each entry consists of an X-coordinate, a Y-coordinate, and a single floating point value for the cell.

This combining has to be done because, during the data creation, a cell may receive customers from more than one batch. If those were not combined into a single entry the last entry would replace any previous entry and only the last entry value would be included in the results.

The file must be SORT-ed before this program is run so that all entries for a cell appear together in the file.

The program prompts the user for input and output file names.

This program can be used instead of doing the visual inspection and manual combining described in Section IV.D.8.

```
      COMMON /FILES/ INPT, IOUT, ICRT
C ******-------------------------------------------------------******
C ------ COMB - COMBINES VALUES FOR REPEATING CELL ADDRESSES ----
C ------         SORT THE FILE FIRST                          ----
C ******-------------------------------------------------------******
C     OPEN ALL NEEDED FILES
C
      CALL GETFL( IERR )
C
      IF ( IERR .NE. 0 ) GO TO 999
C
C*********************************DO YOUR THING HERE
      READ(INPT,1000)IXP,IYP,VP
 1000 FORMAT(2I5,F7.0)
   10 READ(INPT,1000)IX,IY,V
      IF(IX.EQ.-99)GO TO 25
      IF(IX.EQ.IXP.AND.IY.EQ.IYP)GO TO 20
   15 WRITE(IOUT,1000)IXP,IYP,VP
      IXP=IX
      IYP=IY
      VP=V
      GO TO 10
   20 VP=VP+V
      GO TO 10
   25 WRITE(IOUT,1000)IXP,IYP,VP
  999 STOP
      END
C*****************************************************************
C
      BLOCK DATA
C
      COMMON /FILES/ INPT,IOUT,ICRT
C
C      INPT - INPUT FILE UNIT NUMBER
C      IOUT - OUTPUT FILE UNIT NUMBER.
C      ICRT - CRT UNIT NUMBER.
C
      DATA INPT,IOUT,ICRT/10,11,1/
      END
C
C*****************************************************************
C
      SUBROUTINE GETFL( IERR )
C
      COMMON /FILES/ INPT,IOUT,ICRT
C
      CHARACTER*30  INAME, JNAME
C      RESET IERR TO ZERO
C
      IERR = 0
```

```
C
      WRITE( * ,1000)
 1000 FORMAT(5X,'ENTER INPUT FILE NAME ')
C
      READ ( * ,3000 ) INAME
 3000 FORMAT(A30)
C
      WRITE( * ,2000 )
 2000 FORMAT(5X,'ENTER OUTPUT FILE NAME ')
C
      READ ( * ,3000 ) JNAME
C
C      OPEN INPUT FILE
C
      OPEN( UNIT=INPT,FILE=INAME,IOSTAT=IERR,ERR=910,
     1      STATUS='OLD',ACCESS='SEQUENTIAL' )
C
C      OPEN OUTPUT FILE
C
      OPEN( UNIT=IOUT,FILE=JNAME,IOSTAT=IERR,ERR=920,
     1      STATUS='NEW',ACCESS='SEQUENTIAL',DISP='SAVE')
C
      RETURN
C
  910 WRITE( * ,9100 ) IERR
 9100 FORMAT(5X,'ERROR IN OPENING OLD FILE - ERROR = ',I5)
      RETURN
C
  920 WRITE( * ,9200 ) IERR
 9200 FORMAT(5X,'ERROR IN OPENING NEW FILE - ERROR = ',I5)
C
      RETURN
      END
```

COMBINE

This program is used to combine all the data entries in a file for each cell (small-area) into a single entry for the cell. Each entry consists of an X-coordinate, a Y-coordinate, and six floating point values for the cell.

This combining has to be done because, during the data creation, a cell may receive customers from more than one batch. If those were not combined into a single entry the last entry would replace any previous entry and only the last entry values would be included in the results.

The file must be SORT-ed before this program is run so that all entries for a cell appear together in the file.

The program prompts the user for input and output file names.

```
      COMMON /FILES/ INPT, IOUT, ICRT, VP(6), V(6), AP(5), A(5)
C ******-------------------------------------------------------******
C -- COMBINE - COMBINE VALUES FOR REPEATING CELL ADDRESSES.------
C --            SORT THE FILE FIRST. HANDLES 6 CLASSES.     ------
C ******-------------------------------------------------------******
C     OPEN ALL NEEDED FILES
C
      CALL GETFL( IERR )
C
      IF ( IERR .NE. 0 ) GO TO 999
C
C*********************************DO YOUR THING HERE
      READ(INPT,1000)IXP,IYP,(VP(I),I=1,6),(AP(J),I=1,5)
 1000 FORMAT(2I5,6F7.0,5A4)
 1001 FORMAT(2I5,6F7.1,5A4)
   10 READ(INPT,1000)IX,IY,(V(I),I=1,6),(A(J),J=1,5)
      IF(IX.EQ.-99)GO TO 25
      IF(IX.EQ.IXP.AND.IY.EQ.IYP)GO TO 20
   15 WRITE(IOUT,1001)IXP,IYP,(VP(I),I=1,6),(AP(J),J=1,5)
      IXP=IX
      IYP=IY
      DO 16 I=1,5
      AP(I)=A(I)
   16 VP(I)=V(I)
      VP(6)=V(6)
      GO TO 10
   20 DO 21 I=1,6
   21 VP(I)=VP(I)+V(I)
      GO TO 10
   25 WRITE(IOUT,1001)IXP,IYP,(VP(I),I=1,6),(AP(J),J=1,5)
      WRITE(IOUT,1002)
 1002 FORMAT(3H-99)
  999 STOP
      END
C*****************************************************************
C
      BLOCK DATA
C
      COMMON /FILES/ INPT,IOUT,ICRT
C
C      INPT - INPUT FILE UNIT NUMBER
C      IOUT - OUTPUT FILE UNIT NUMBER.
C      ICRT - CRT UNIT NUMBER.
C
      DATA INPT,IOUT,ICRT/10,11,1/
      END
C
C*****************************************************************
C
```

```
      SUBROUTINE GETFL( IERR )
C
      COMMON /FILES/ INPT,IOUT,ICRT
C
      CHARACTER*30  INAME, JNAME
C      RESET IERR TO ZERO
C
      IERR = 0
C
      WRITE( * ,1000)
 1000 FORMAT(5X,'ENTER INPUT FILE NAME ')
C
      READ ( * ,3000 ) INAME
 3000 FORMAT(A30)
C
      WRITE( * ,2000 )
 2000 FORMAT(5X,'ENTER OUTPUT FILE NAME ')
C
      READ ( * ,3000 ) JNAME
C
C      OPEN INPUT FILE
C
      OPEN( UNIT=INPT,FILE=INAME,IOSTAT=IERR,ERR=910,
     1      STATUS='OLD',ACCESS='SEQUENTIAL' )
C
C      OPEN OUTPUT FILE
C
      OPEN( UNIT=IOUT,FILE=JNAME,IOSTAT=IERR,ERR=920,
     1      STATUS='NEW',ACCESS='SEQUENTIAL',DISP='SAVE')
C
      RETURN
C
  910 WRITE( * ,9100 ) IERR
 9100 FORMAT(5X,'ERROR IN OPENING OLD FILE - ERROR = ',I5)
      RETURN
C
  920 WRITE( * ,9200 ) IERR
 9200 FORMAT(5X,'ERROR IN OPENING NEW FILE - ERROR = ',I5)
C
      RETURN
      END
```

CUSTMAPS

This program reads in data from a file that contains customer data for six customer classes per entry, and creates a new file, separating the classes, and in the proper Card Image format for them to be read into their separate LOADSITE customer maps.

The input file must be previously SORT-ed and COMBINE-d, otherwise any repeated entries for a cell (small-area) will overwrite any previous entries and they will be lost.

The program prompts the user for input and output file names.

```
      COMMON/FILES/INPT,IOUT,ICRT,IX(10000),IY(10000),V(6,10000),
     1                IM(6), IN(3,6)
      DATA IM/8,9,10,11,12,14/
      DATA IN/4HDOM ,4HLOW ,4HCSTS,     4HDOM ,4HMED ,4HCSTS,
     1        4HDOM ,4HHGH ,4HCSTS,     4HCOM ,4HLOW ,4HCSTS,
     2        4HCOM ,4HMED ,4HCSTS,     4HIND ,4HLOW ,4HCSTS/
C ******-------------------------------------------------------------******
C ---- CUSTMAPS - CREATES FILE TO LOAD THE CUSTOMER MAPS FOR ----
C ----             SIX CUSTOMER CLASSES.
C ******-------------------------------------------------------------******
C     OPEN ALL NEEDED FILES
C
      CALL GETFL( IERR )
C
      IF ( IERR .NE. 0 ) GO TO 999
C
C*********************************** DO YOUR THING HERE
 1000 FORMAT(2I5,6F7.0,5A4)
      I=1
   10 READ(INPT,1000)IX(I),IY(I),(V(II,I),II=1,6)
      IF(IX(I).EQ.-99)GO TO 15
      I=I+1
      GO TO 10
   15 CONTINUE
      DO 101 IC=1,6
      WRITE(IOUT,1001)IM(IC),(IN(I,IC),I=1,3)
 1001 FORMAT(5H   40,I5,3A4)
      DO 99 IL=1,10000
      IF(IX(IL).EQ.-99)GO TO 100
      IF(V(IC,IL).LE.0.0)GO TO 99
      WRITE(IOUT,1010)IX(IL),IY(IL),V(IC,IL)
 1010 FORMAT(2I5,F7.2)
   99 CONTINUE
  100 CONTINUE
      WRITE(IOUT,1002)
 1002 FORMAT(1H )
  101 CONTINUE
      WRITE(IOUT,1003)
 1003 FORMAT(5H   90)
  999 STOP
      END
C*****************************************************************
C
      BLOCK DATA
C
      COMMON /FILES/ INPT,IOUT,ICRT
C
C      INPT - INPUT FILE UNIT NUMBER
C      IOUT - OUTPUT FILE UNIT NUMBERC.
       ICRT - CRT UNIT NUMBER.
```

```
C
      DATA INPT,IOUT,ICRT/10,11,1/
      END
C
C*****************************************************************
C
      SUBROUTINE GETFL( IERR )
C
      COMMON /FILES/ INPT,IOUT,ICRT
C
      CHARACTER*30  INAME, JNAME
C      RESET IERR TO ZERO
C
      IERR = 0
C
      WRITE( * ,1000)
 1000 FORMAT(5X,'ENTER INPUT FILE NAME ')
C
      READ ( * ,3000 ) INAME
 3000 FORMAT(A30)
C
      WRITE( * ,2000 )
 2000 FORMAT(5X,'ENTER OUTPUT FILE NAME ')
C
      READ ( * ,3000 ) JNAME
C
C      OPEN INPUT FILE
C
      OPEN( UNIT=INPT,FILE=INAME,IOSTAT=IERR,ERR=910,
     1      STATUS='OLD',ACCESS='SEQUENTIAL' )
C
C      OPEN OUTPUT FILE
C
      OPEN( UNIT=IOUT,FILE=JNAME,IOSTAT=IERR,ERR=920,
     1      STATUS='NEW',ACCESS='SEQUENTIAL',DISP='SAVE')
C
      RETURN
C
  910 WRITE( * ,9100 ) IERR
 9100 FORMAT(5X,'ERROR IN OPENING OLD FILE - ERROR = ',I5)
      RETURN
C
  920 WRITE( * ,9200 ) IERR
 9200 FORMAT(5X,'ERROR IN OPENING NEW FILE - ERROR = ',I5)
C
      RETURN
      END
```

PRMB2

This program was created to allow the user to print out the contents of a map in a form that could be easily read and interpreted. There were no existing display methods to do this.

The program is designed to display only one or two digit integer numbers in a compact print space. In this form the user can see the entire map of data on a few sheets of paper, with the cells arranged in the proper geographical relationship to each other.

One application is viewing a map showing where customers are located with respect to the service area. Map Mathematics is used to create a map with 1's, 2's, and 3's indicating the service area and cells with customers inside and outside the service area. This map is dumped to a Map Backup file which is then processed by this program.

The program reads a Map Backup file and stores the contents in a geographically correct integer form in a printable output file.

The program prompts the user for input and output file names and for the map dimensions.

```
      DIMENSION V(10), IVAL(264,264), HDR(10), IO(264)
      COMMON /FILES/ INPT, IOUT, ICRT
C -------------------------------------------------------
C  PRMB2 - PRINT MAP BACKUP FILE WITH 2 CHARACTER FIELD
C -------------------------------------------------------
C     OPEN ALL NEEDED FILES
C
      CALL GETFL( IERR )
C
      IF ( IERR .NE. 0 ) GO TO 910
C
C***********************************DO YOUR THING HERE
C
C IXD AND IYD ARE MAP X AND Y DIMENSIONS
      WRITE( * , 9998)
 9998 FORMAT(5X, 'ENTER MAP X DIMENSION')
      READ ( * , 1000) IXD
      write( * , 9999)
 9999 FORMAT(5X, 'ENTER MAP Y DIMENSION')
      READ ( * , 1000) IYD
C
C NCIS IS NUMBER OF COLUMNS IN A SWATH OF OUTPUT
C ****** CHANGE NEXT LINE TO CHANGE NO. OF CELL COLUMNS PER SWATH
*******
      NCIS = 60
      TOT = 0.0
      ITOT = 0
C
C READ IN THE MAP CARD IMAGE DATA (MAP BACKUP FORMAT)
      READ (INPT, 1001) I, J, ( HDR( K ), K = 1, 10 )
 1000 FORMAT (2I5, 10F7.0)
 1001 FORMAT (2I5, 10A2 )
      IF (I .LE. 0) GO TO 999
C
  100 READ (INPT, 1000) IXS, IY, (V(I), I = 1, 10)
      IF( IXS .LE. 0 ) GO TO 300
      IXF = IXS + 9
      IF (IXF .GT. IXD) IXF = IXD
      DO 200 IX = IXS, IXF
      I = IX - IXS + 1
      IVAL (IX, IY) = V(I)
      TOT = TOT + V(I)
      ITOT = ITOT + IVAL(IX,IY)
  200 CONTINUE
      GO TO 100
C
C WRITE OUT THE MAP IN INTEGER FORMAT FROM IVAL
  300 CONTINUE
      WRITE( * , 2400 ) TOT, ITOT
 2400 FORMAT( / 1X, 5HTOT =, F12.2, 5X, 6HITOT =, I9 )
```

```
      IXS - 1 - NCIS
      NS = IXD / NCIS
      IF( NS * NCIS .LT. IXD) NS = NS +1
      DO 400 IS = 1, NS
      IXS = IXS + NCIS
      IXF = IXS + NCIS - 1
      IF( IXF .GT. IXD) IXF = IXD
      WRITE( IOUT, 2500) J
C ******* CHANGE LINE SPACING WITH FORMATS 2500 AND 3000 *******
 2500 FORMAT( 1H1 / 45X, 4HMAP , I3, 2X, 20A2/ )
      DO 330 I = IXS, IXF
      IO(I) = MOD(I,100)
  330 IF( IO(I) .EQ. 100) IO(I) = 0
      WRITE ( IOUT, 3000) (IO(I), I = IXS, IXF)
 3000 FORMAT ( / 9X, 60I2)
      DO 350 IY = 1, IYD
  350 WRITE (IOUT, 4000)  IY, (IVAL (I, IY), I = IXS, IXF )
C ****** CHANGE FIELD SIZE & NO. OF FIELDS WITH FORMAT 4000 ******
 4000 FORMAT ( 1X, 2I5, 59I2)
      WRITE( IOUT , 2400 ) TOT, ITOT
  400 CONTINUE
      GO TO 999
  910 CONTINUE
  999 STOP
      END
C*****************************************************************
C
      BLOCK DATA
C
      COMMON /FILES/ INPT,IOUT,ICRT
C
C      INPT - INPUT FILE UNIT NUMBER
C      IOUT - OUTPUT FILE UNIT NUMBER.
C      ICRT - CRT UNIT NUMBER.
C
      DATA INPT,IOUT,ICRT/10,11,1/
      END
C
C*****************************************************************
C
      SUBROUTINE GETFL( IERR )
C
      COMMON /FILES/ INPT,IOUT,ICRT
C
      CHARACTER*30  INAME, JNAME
C      RESET IERR TO ZERO
C
      IERR = 0
C
      WRITE( * ,1000)
```

```
 1000 FORMAT(5X,'ENTER INPUT FILE NAME ')
C
      READ ( * ,3000 ) INAME
 3000 FORMAT(A30)
C
      WRITE( * ,2000 )
 2000 FORMAT(5X,'ENTER OUTPUT FILE NAME ')
C
      READ ( * ,3000 ) JNAME
C
C      OPEN INPUT FILE
C
      OPEN( UNIT=INPT,FILE=INAME,IOSTAT=IERR,ERR=910,
     1      STATUS='OLD',ACCESS='SEQUENTIAL' )
C
C      OPEN OUTPUT FILE
C
      OPEN( UNIT=IOUT,FILE=JNAME,IOSTAT=IERR,ERR=920,
     1      STATUS='NEW',ACCESS='SEQUENTIAL' )
C
      RETURN
C
  910 WRITE( * ,9100 ) IERR
 9100 FORMAT(5X,'ERROR IN OPENING OLD FILE - ERROR = ',I5)
      RETURN
C
  920 WRITE( * ,9200 ) IERR
 9200 FORMAT(5X,'ERROR IN OPENING NEW FILE - ERROR = ',I5)
C
      RETURN
      END
```

PRMB5

This program was created to allow the user to print out the contents of a map in a form that could be easily read and interpreted. There were no existing display methods to do this.

The program is designed to display up to five-digit integer numbers in a compact print space. In this form the user can see the entire map of data on a relatively few sheets of paper, with the cells arranged in the proper geographical relationship to each other.

This format is ideal for working with maps such those containing customer counts start years, etc.

For maps containing large numbers, they must be scaled down to 4 or 5 digits before dumping to a Map Backup File.

The program reads a Map Backup file and stores the contents in a geographically correct integer form in a printable output file.

The program prompts the user for input and output file names and for the map dimensions.

```
      DIMENSION V( 10 ), IVAL( 264, 264 ), HDR( 10 )
      COMMON /FILES/ INPT, IOUT, ICRT
C -------------------------------------------------------
C  PRMB5 - PRINT MAP BACKUP FILE WITH 5 CHARACTER FIELD
C -------------------------------------------------------
C     OPEN ALL NEEDED FILES
C
      CALL GETFL( IERR )
C
      IF ( IERR .NE. 0 ) GO TO 910
C
C***********************************DO YOUR THING HERE
C
C IXD AND IYD ARE MAP X AND Y DIMENSIONS
      WRITE( * , 9998)
 9998 FORMAT(5X, 'ENTER MAP X DIMENSION')
      READ ( * , 1000) IXD
      WRITE( * , 9999)
 9999 FORMAT(5X, 'ENTER MAP Y DIMENSION')
      READ ( * , 1000) IYD
C
C NCIS IS NUMBER OF COLUMNS IN A SWATH OF OUTPUT
C *** CHANGE NEXT LINE TO CHANGE NO. OF CELL COLUMNS PER SWATH ***
      NCIS = 25
C ** CHANGE NEST LINE TO CHANGE NO. OF MAP ROWS PRINTED PER PAGE **
      NLIP = 28
C
      TOT = 0.0
      ITOT = 0
C
C READ IN THE MAP CARD IMAGE DATA (MAP BACKUP FORMAT)
      READ (INPT, 1001) I, J, ( HDR( K ), K = 1, 10 )
 1000 FORMAT (2I5, 10F7.0)
 1001 FORMAT (2I5, 10A2 )
      IF (I .LE. 0) GO TO 999
C
  100 READ (INPT, 1000) IXS, IY, (V(I), I = 1, 10)
      IF( IXS .LE. 0 ) GO TO 300
      IXF = IXS + 9
      IF (IXF .GT. IXD) IXF = IXD
      DO 200 IX = IXS, IXF
      I = IX - IXS + 1
      IVAL (IX, IY) = V(I)
      TOT = TOT + V(I)
      ITOT = ITOT + IVAL(IX,IY)
  200 CONTINUE
      GO TO 100
C
C WRITE OUT THE MAP IN INTEGER FORMAT FROM IVAL
  300 CONTINUE
```

```
      WRITE( * , 2400 ) TOT, ITOT
 2400 FORMAT( / 1X, 5HTOT =, F12.2, 5X, 6HITOT =, I9 )
      IXS = 1 - NCIS
      NS = IXD / NCIS
      IF( NS * NCIS .LT. IXD) NS = NS +1
      NP = IYD / NLIP
      IF( NP * NLIP .LT. IYD ) NP = NP + 1
      DO 400 IS = 1, NS
      IXS = IXS + NCIS
      IXF = IXS + NCIS - 1
      IF( IXF .GT. IXD) IXF = IXD
      IYS = 1 - NLIP
      DO 370 IP = 1, NP
      IYS = IYS + NLIP
      IYF = IYS + NLIP - 1
      IF( IYF .GT. IYD) IYF = IYD
      WRITE( IOUT, 2500) J, ( HDR( K ), K = 1, 10 )
C ******* CHANGE LINE SPACING WITH FORMATS 2500 AND 3000 *******
 2500 FORMAT( 1H1 / 45X, 4HMAP , I3, 2X, 20A2 )
      WRITE ( IOUT, 3000) (I, I = IXS, IXF)
 3000 FORMAT ( / 6X, 25I5)
      DO 350 IY = IYS, IYF
  350 WRITE (IOUT, 4000)  IY, (IVAL (I, IY), I = IXS, IXF
C ****** CHANGE FIELD SIZE & NO. OF FIELDS WITH FORMAT 4000 ******
 4000 FORMAT ( / 1X, I5, 25I5)
  370 CONTINUE
  400 CONTINUE
      GO TO 999
  910 CONTINUE
  999 WRITE( IOUT , 2400 ) TOT, ITOT
      STOP
      END
C*****************************************************************
C
      BLOCK DATA
C
      COMMON /FILES/ INPT,IOUT,ICRT
C
C      INPT - INPUT FILE UNIT NUMBER
C      IOUT - OUTPUT FILE UNIT NUMBER.
C      ICRT - CRT UNIT NUMBER.
C
      DATA INPT,IOUT,ICRT/10,11,1/
      END
C
C*****************************************************************
C
      SUBROUTINE GETFL( IERR )
C
      COMMON /FILES/ INPT,IOUT,ICRT
```

```
C
      CHARACTER*30  INAME, JNAME
C      RESET IERR TO ZERO
C
      IERR = 0
C
      WRITE( * ,1000)
 1000 FORMAT(5X,'ENTER INPUT FILE NAME ')
C
      READ ( * ,3000 ) INAME
 3000 FORMAT(A30)
C
      WRITE( * ,2000 )
 2000 FORMAT(5X,'ENTER OUTPUT FILE NAME ')
C
      READ ( * ,3000 ) JNAME
C
C      OPEN INPUT FILE
C
      OPEN( UNIT=INPT,FILE=INAME,IOSTAT=IERR,ERR=910,
     1      STATUS='OLD',ACCESS='SEQUENTIAL' )
C
C      OPEN OUTPUT FILE
C
      OPEN( UNIT=IOUT,FILE=JNAME,IOSTAT=IERR,ERR=920,
     1      STATUS='NEW',ACCESS='SEQUENTIAL' )
C
      RETURN
C
  910 WRITE( * ,9100 ) IERR
 9100 FORMAT(5X,'ERROR IN OPENING OLD FILE - ERROR = ',I5)
      RETURN
C
  920 WRITE( * ,9200 ) IERR
 9200 FORMAT(5X,'ERROR IN OPENING NEW FILE - ERROR = ',I5)
C
      RETURN
      END
```

PROOB

This program was written to provide an easy way of seeing what classes of customers are in the cells which are outside the service area. This helps the user to know where to look for the problem.

The program prompts the user for the name of the Map Backup format input file, and for the map dimensions, reads in the file, and outputs the results to a file named OOBOUT.DAT. The Map Backup file is created in LOADSITE using the transfer file TROOB.

```
      DIMENSION V( 10 ), IVAL( 264, 264 ), HDR( 10 ), IFLAG( 10 )
      COMMON /FILES/ INPT, IOUT, ICRT
C **************-------------------------------------------**************
C -------------- PROOB - PRINT OUT-OF-BOUNDS CELLS --------------
C **************-------------------------------------------**************
C     OPEN ALL NEEDED FILES
C
      CALL GETFL( IERR )
C
      IF ( IERR .NE. 0 ) GO TO 910
C
C*********************************DO YOUR THING HERE
C
C IXD AND IYD ARE MAP X AND Y DIMENSIONS
C    TYPE *,'ENTER MAP X AND Y DIMENSIONS SEPERATED BY A SPACE'
C      ACCEPT *,IXD,IYD
C
C NCIS IS NUMBER OF COLUMNS IN A SWATH OF OUTPUT
C
C READ IN THE MAP CARD IMAGE DATA (MAP BACKUP FORMAT)
      READ (INPT, 1001) I, J, ( HDR( K ), K = 1, 10 )
 1000 FORMAT (2I5, 10F7.0)
 1001 FORMAT (2I5, 10A2 )
      IF (I .LE. 0) GO TO 999
      WRITE( IOUT, 2500) J, (L, L=1,10)
 2500 FORMAT(15X,6HMAP --,I3,3X, 'CLASSES IN OUT-OF-BOUNDS CELLS'
     1  // 12X,'OUT-OF-BOUNDS CELLS  '
     2 ,'--  1 -> CLASS IN THE CELL'/
     3 37X,'0 -> CLASS NOT IN THE CELL' //
     4 17X,'---------------------CLASSES----------------------'/
     5 4X,1HX,4X,1HY, 2X,5HVALUE, 10I5 / )
C
  100 READ (INPT, 1000, END=3002) IXS, IY, (V(I), I = 1, 10)
C
C WRITE OUT THE MAP X, Y , VALUE FORMAT
      DO 340 I = 1, 10
      IX = IXS + I - 1
      IF ( V(I) .NE. 0) THEN
      NUM = V( I )
      DO 101 J = 1, 10
  101 IFLAG( J ) = 0
  102 IF( NUM .LT. 512 ) GO TO 110
      IFLAG( 10 ) = 1
      NUM = NUM - 512
  110 IF( NUM .LT. 256 ) GO TO 120
      IFLAG( 9 ) = 1
      NUM = NUM - 256
  120 IF( NUM .LT. 128 ) GO TO 130
      IFLAG( 8 ) = 1
      NUM = NUM - 128
```

```
  130 IF( NUM .LT. 64 ) GO TO 140
      IFLAG( 7 ) = 1
      NUM = NUM - 64
  140 IF( NUM .LT. 32 ) GO TO 150
      IFLAG( 6 ) = 1
      NUM = NUM - 32
  150 IF( NUM .LT. 16 ) GO TO 160
      IFLAG( 5 ) = 1
      NUM = NUM - 16
  160 IF( NUM .LT. 8 ) GO TO 170
      IFLAG( 4 ) = 1
      NUM = NUM - 8
  170 IF( NUM .LT. 4 ) GO TO 180
      IFLAG( 3 ) = 1
      NUM = NUM - 4
  180 IF( NUM .LT. 2 ) GO TO 190
      IFLAG( 2 ) = 1
      NUM = NUM - 2
  190 IF( NUM .LT. 1 ) GO TO 200
      IFLAG( 1 ) = 1
  200 CONTINUE
      WRITE ( IOUT, 3000) (IX,IY,V(I),(IFLAG(J),J=1,10))
 3000 FORMAT (2I5,F7.0,10I5)
      ENDIF
  340 CONTINUE
      GO TO 100
 3002 CONTINUE
  910 CONTINUE
  999 STOP
      END
C*****************************************************************
C
      BLOCK DATA
C
      COMMON /FILES/ INPT,IOUT,ICRT
C
C      INPT - INPUT FILE UNIT NUMBER
C      IOUT - OUTPUT FILE UNIT NUMBER.
C      ICRT - CRT UNIT NUMBER.
C
      DATA INPT,IOUT,ICRT/10,11,1/
      END
C
C*****************************************************************
C
      SUBROUTINE GETFL( IERR )
C
      COMMON /FILES/ INPT,IOUT,ICRT
C
      CHARACTER*30  INAME, JNAME
```

```
C       RESET IERR TO ZERO
C
      IERR = 0
      JNAME='OOBOUT'
C
      WRITE( * ,1000)
 1000 FORMAT(5X,'ENTER INPUT FILE NAME ')
C
      READ ( * ,3000 ) INAME
 3000 FORMAT(A30)
C
C      WRITE( * ,2000 )
 2000 FORMAT(5X,'ENTER OUTPUT FILE NAME ')
C
C      READ ( * ,3000 ) JNAME
C
C      OPEN INPUT FILE
C
      OPEN( UNIT=INPT,FILE=INAME,IOSTAT=IERR,ERR=910,
     1      STATUS='OLD',ACCESS='SEQUENTIAL' )
C
C      OPEN OUTPUT FILE
C
      OPEN( UNIT=IOUT,FILE=JNAME,IOSTAT=IERR,ERR=920,
     1      STATUS='NEW',ACCESS='SEQUENTIAL',DISP='SAVE')
C 'PRINT/DELETE' )
C
      RETURN
C
  910 WRITE( * ,9100 ) IERR
 9100 FORMAT(5X,'ERROR IN OPENING OLD FILE - ERROR = ',I5)
      RETURN
C
  920 WRITE( * ,9200 ) IERR
 9200 FORMAT(5X,'ERROR IN OPENING NEW FILE - ERROR = ',I5)
C
      RETURN
      END
```

PRNZ

This is a very useful program which lets the user print out only the non-zero valued cells of a Map Backup file, without having to print out the entire map or to search through the map, using tabular and graphical displays, looking for the values.

The program prompts the user for the input Map Backup file named and for the map dimensions, and the results are stored in the file TEMOUT.DAT for printing.

```
      DIMENSION V( 10 ), IVAL( 264, 264 ), HDR( 10 )
      COMMON /FILES/ INPT, IOUT, ICRT
C ******-------------------------------------------------------******
C ------ PRNZ - PRINT NON-ZERO VALUES FROM MAP BACKUP FILE ------
C ******-------------------------------------------------------******
C     OPEN ALL NEEDED FILES
C
      CALL GETFL( IERR )
C
      IF ( IERR .NE. 0 ) GO TO 910
C
C*********************************DO YOUR THING HERE
C
C IXD AND IYD ARE MAP X AND Y DIMENSIONS
C    TYPE *,'ENTER MAP X AND Y DIMENSIONS SEPERATED BY A SPACE'
C      ACCEPT *,IXD,IYD
C
C NCIS IS NUMBER OF COLUMNS IN A SWATH OF OUTPUT
C
C READ IN THE MAP CARD IMAGE DATA (MAP BACKUP FORMAT)
   10 READ (INPT, 1001) I, J, ( HDR( K ), K = 1, 10 )
      IF(I.EQ.90)GO TO 3002
 1000 FORMAT (2I5, 10F7.0)
 1001 FORMAT (2I5, 10A2 )
      IF (I .LE. 0) GO TO 999
      WRITE( IOUT, 2500) J, (HDR( K ), K = 1, 10)
 2500 FORMAT( 3X,'40',I5, 10A2 )
C
  100 READ (INPT, 1000, END=3002) IXS, IY, (V(I), I = 1, 10)
      IF(IXS.EQ.0.AND.IY.EQ.0) THEN
      WRITE(IOUT,3003)
 3003 FORMAT( 1H  )
      GO TO 10
      ENDIF
C
C WRITE OUT THE MAP X, Y , VALUE FORMAT
      DO 340 I = 1, 10
      IX = IXS + I - 1
      IF ( V(I) .NE. 0) THEN
      WRITE ( IOUT, 3000) (IX,IY,V(I))
 3000 FORMAT (2I5,F7.2)
      ENDIF
  340 CONTINUE
      GO TO 100
 3002 WRITE (IOUT,3001)
 3001 FORMAT ('   90')
  910 CONTINUE
  999 STOP
      END
C*****************************************************************
```

```
C
      BLOCK DATA
C
      COMMON /FILES/ INPT,IOUT,ICRT
C
C      INPT - INPUT FILE UNIT NUMBER
C      IOUT - OUTPUT FILE UNIT NUMBER.
C      ICRT - CRT UNIT NUMBER.
C
      DATA INPT,IOUT,ICRT/10,11,1/
      END
C
C*****************************************************************
C
      SUBROUTINE GETFL( IERR )
C
      COMMON /FILES/ INPT,IOUT,ICRT
C
      CHARACTER*30  INAME, JNAME
C      RESET IERR TO ZERO
C
      IERR = 0
      JNAME='TEMOUT'
C
      WRITE( * ,1000)
 1000 FORMAT(5X,'ENTER INPUT FILE NAME ')
C
      READ ( * ,3000 ) INAME
 3000 FORMAT(A30)
C
C      WRITE( * ,2000 )
 2000 FORMAT(5X,'ENTER OUTPUT FILE NAME ')
C
C      READ ( * ,3000 ) JNAME
C
C      OPEN INPUT FILE
C
      OPEN( UNIT=INPT,FILE=INAME,IOSTAT=IERR,ERR=910,
     1      STATUS='OLD',ACCESS='SEQUENTIAL' )
C
C      OPEN OUTPUT FILE
C
      OPEN( UNIT=IOUT,FILE=JNAME,IOSTAT=IERR,ERR=920,
     1      STATUS='NEW',ACCESS='SEQUENTIAL',DISP='SAVE')
C 'PRINT/DELETE' )
C
      RETURN
C
  910 WRITE( * ,9100 ) IERR
 9100 FORMAT(5X,'ERROR IN OPENING OLD FILE - ERROR = ',I5)
```

```
      RETURN
C
  920 WRITE( * ,9200 ) IERR
 9200 FORMAT(5X,'ERROR IN OPENING NEW FILE - ERROR = ',I5)
C
      RETURN
      END
```

SDAREA

This program was written to create input data for creating maps that show which cells contain customers from the different subdivisions' customer data. By displaying these maps, the user can easily make a visual check of the customer data for all the subdivisions, verifying the geographical locations of the subdivisions data with respect to each other and with respect to the service area.

The program prompts the user for the input and output file names. The input file is a customer file containing the number of customers for each of six classes for each cell entry in the file. The output file is a Card Image file containing a value of 1 for each cell that had customers of any class.

```
      COMMON /FILES/INPT,IOUT,ICRT, VP(6), V(6), T(6), AP(5), A(5)
C ******-------------------------------------------------------------******
C -- SDAREA - CREATES FILE TO LOAD A MAP SHOWING WHICH SMALL ----
C --          AREAS CONTAIN CUSTOMERS.
C ******-------------------------------------------------------------******
C     OPEN ALL NEEDED FILES
C
      CALL GETFL( IERR )
C
      IF ( IERR .NE. 0 ) GO TO 999
C
C*********************************DO YOUR THING HERE
      ONE=1.0
      DO 5 I=1,6
    5 T(I)=0.0
      WRITE(IOUT,9999)
 9999 FORMAT(20H   40   MN S/DIV-NAM   )
 1000 FORMAT(2I5,6F7.0,5A4)
 1001 FORMAT(2I5,6F7.1,5A4)
   10 READ(INPT,1000)IX,IY,(V(I),I=1,6),(A(J),J=1,5)
      IONE=0
      IF(IX.EQ.-99)GO TO 25
      DO 15 I=1,6
      IF(V(I).EQ.0.0)GO TO 15
      T(I)=T(I)+V(I)
      IF(IONE.EQ.1)GO TO 15
      WRITE(IOUT,1001)IX,IY,ONE
      IONE=1
   15 CONTINUE
      GO TO 10
   25 CONTINUE
      WRITE(IOUT,9998)
 9998 FORMAT(/5H   90)
      WRITE(*,9997)(I,T(I),I=1,6)
      WRITE(IOUT,9997)(I,T(I),I=1,6)
 9997 FORMAT(14H CLASS TOTALS:/(/5X,I2,F10.2))
  999 STOP
      END
C*****************************************************************
C
      BLOCK DATA
C
      COMMON /FILES/ INPT,IOUT,ICRT
C
C      INPT - INPUT FILE UNIT NUMBER
C      IOUT - OUTPUT FILE UNIT NUMBER.
C      ICRT - CRT UNIT NUMBER.
C
      DATA INPT,IOUT,ICRT/10,11,1/
      END
```

```
C
C*****************************************************************
C
      SUBROUTINE GETFL( IERR )
C
      COMMON /FILES/ INPT,IOUT,ICRT
C
      CHARACTER*30  INAME, JNAME
C      RESET IERR TO ZERO
C
      IERR = 0
C
      WRITE( * ,1000)
 1000 FORMAT(5X,'ENTER INPUT FILE NAME ')
C
      READ ( * ,3000 ) INAME
 3000 FORMAT(A30)
C
      WRITE( * ,2000 )
 2000 FORMAT(5X,'ENTER OUTPUT FILE NAME ')
C
      READ ( * ,3000 ) JNAME
C
C      OPEN INPUT FILE
C
      OPEN( UNIT=INPT,FILE=INAME,IOSTAT=IERR,ERR=910,
     1      STATUS='OLD',ACCESS='SEQUENTIAL' )
C
C      OPEN OUTPUT FILE
C
      OPEN( UNIT=IOUT,FILE=JNAME,IOSTAT=IERR,ERR=920,
     1      STATUS='NEW',ACCESS='SEQUENTIAL',DISP='SAVE')
C
      RETURN
C
  910 WRITE( * ,9100 ) IERR
 9100 FORMAT(5X,'ERROR IN OPENING OLD FILE - ERROR = ',I5)
      RETURN
C
  920 WRITE( * ,9200 ) IERR
 9200 FORMAT(5X,'ERROR IN OPENING NEW FILE - ERROR = ',I5)
C
      RETURN
      END
```

WRR

This program was written for two purposes. One was to assist in an automated method of creating start year values for the Start Year Map of DLF. The other was to assist in scattering the locations of the customers growth in SLF.

The program prompts the user for the input and output files, for the map dimensions, and for a year number to be used as a seed for the random number generator.

In the DLF application, the input file is a Map Backup file containing values representing nearness of a cell to the most existing customers but excluding cells that contain customers. The output file is also a Map Backup file, containing the order that those cells will begin to receive customer growth in future years.

In the SLF application, the input file is a Map Backup file containing a Preference Map as created by the SLF program, and taken to some power, for a given class. The output file is also a Map Backup file, with a modified ("scattered") ranking of which cells have the higher preferences. This processing allows some of the growth to occur in areas other than those that had the highest preferences values in the Preference Maps created in SLF.

```
      COMMON /FILES/ INPT, IOUT, ICRT
      DIMENSION VO(220,115),IXY(25300),VAL(25300)
      DIMENSION HI(25300), HDR(40), V(10)
C ***********-----------------------------------------***********
C ----------- WRR - WEIGHTED RANDOM RANKING -----------
C ***********-----------------------------------------***********
      INTEGER*4 ISEED, NXNY, IXY
C
C OPEN ALL NEEDED FILES
C
      CALL GETFL( IERR )
C
      IF ( IERR .NE. 0 ) GO TO 910
C
C*********************************DO YOUR THING HERE
C
C NX AND NY ARE MAP X AND Y DIMENSIONS
      WRITE( * , 9998)
 9998 FORMAT(5X, 'ENTER MAP X DIMENSION')
      READ ( * , 2000) NX
      WRITE( * , 9999)
 9999 FORMAT(5X, 'ENTER MAP Y DIMENSION')
      READ ( * , 2000) NY
      NXNY = NX * NY
      WRITE( * , 9997)
 9997 FORMAT(5X,'ENTER YEAR (USED AS "SEED" FOR RANDOM NUMBER GEN')
      READ( * ,. 2000) ISEED
      ISEED = 123456789 - ISEED
C
      DATA BL, I90  /2H  , 2H90/
C
C       VO IS THE OUTPUT ARRAY CONTAINING RANKINGS
C       IXY IS THE MAP CELL NUMBER
C       VAL IS THE INPUT CELL VALUE
C       HI IS THE HIGH VALUE OF THE CELL'S 'RANGE'
C       HDR IS THE FILE HEADER LINE
C       N IS THE ARRAY COUNTER/POINTER FOR CELLS WITH VALUES
C       TOT IS THE SUM OF THE VALUES IN THE ARRAY VAL
C       RANK IS THE COUNTER FOR MARKING CELL RANKINGS
C       NXNY IS THE NUMBER OF CELLS IN THE MAP
C INITIALIZE ARRAYS AND ACCUMULATORS TO 0.0
      N = 0
      TOT = 0.0
      RANK = 0.0
      DO 100 INX = 1, NX
      DO 100 INY = 1, NY
  100 VO ( INX, INY ) = 0.0
      DO 110 NN = 1, NXNY
      IXY ( NN ) = 0
      VAL ( NN ) = 0.0
```

```
  110 HI ( NN ) = 0.0
C
C READ HEADER LINE
      READ ( INPT, 1000 ) ( HDR (I), I = 1, 40)
 1000 FORMAT ( 40A2 )
C
C READ A LINE AND STORE VALUES IN ARRAYS
C IXS IS STARTING X-COORD, IY IS Y-COORD
C
  200 READ ( INPT, 2000 ) IXS, IY, ( V(I), I = 1, 10 )
 2000 FORMAT ( 2I5, 10F7.0 )
      IF ( IXS .EQ. 0 ) GO TO 300
      IXB = IXS - 1
      DO 250 I = 1, 10
      IF ( V(I) .LE. 0.0 ) GO TO 250
      N = N + 1
      IXY( N ) = IY + 1000 * ( IXB + I )
      VAL( N ) = V( I )
      TOT = TOT + V( I )
      HI( N ) = TOT
  250 CONTINUE
      GO TO 200
C
C INPUT COMPLETE. PROCESS DATA IN ARRAYS & FILL OUTPUT ARRAY
C
  300 CONTINUE
C GENERATE A RANDOM NUMBER AND SCALE IT TO THE TOTAL
C RAN FUNCTION, SEE P. D-49 OF VAX FORT LANG REF MAN VOL 2
C                AND P. 15-12 VAX FORT USERS MAN VOL 1
      RAND = RAN( ISEED )
      RN = RAND * TOT
C FIND WHICH CELL IS 'HIT' BY THAT VALUE
      IT = 0
      DO 350 I = 1, N
      IT = IT + 1
      IF ( HI( I ) .LT. RN ) GO TO 350
C THIS IS THE 'HIT' CELL
      RANK = RANK + 1.0
      IX = IXY( I ) / 1000
      IY = IXY( I ) - 1000 * IX
      VO( IX, IY ) = RANK
      GO TO 360
  350 CONTINUE
  360 CONTINUE
C SHUFFLE ARRAYS DATA UP TO REMOVE LINE I
      VIT = VAL( IT )
      TOT = TOT - VIT
      DO 400 II = IT, N
      VAL( II ) = VAL( II + 1 )
      HI( II ) = HI( II + 1 ) - VIT
```

```
      IXY( II ) = IXY( II + 1 )
  400 CONTINUE
      N = N - 1
      IF ( N .GT. 0 ) GO TO 300
C
      WRITE(*,7777)RANK
 7777 FORMAT(1X,15HMAXIMUM RANK =  ,F7.0)
C
C WRITE RESULTS TO CARD IMAGE OUTPUT FILE
C WRITE HEADER
      WRITE ( IOUT, 1000 ) ( HDR( I ), I = 1, 40 )
C WRITE OUTPUT ARRAY IN MAP BACKUP FORMAT, 10 VALUES PER LINE
      DO 500 NR = 1, NY
C NCS IS NUMBER OF COLUMN SWATHS
      NCS = NX / 10
      IF ( MOD( NX, 10 ) .NE. 0 ) NCS = NCS + 1
      NCST = -9
      DO 450 NC = 1, NCS
      NCST = NCST + 10
      NCND = NCST + 9
      IF ( NCND .GT. NX ) NCND = NX
      WRITE ( IOUT, 5000 ) NCST ,NR,( VC( N, NR ),N = NCST, NCND )
 5000 FORMAT ( 2I5, 10F7.2 )
  450 CONTINUE
  500 CONTINUE
C WRITE A BLANK LINE FOLLOWED BY AN UP AT THE END OF THE FILE
      WRITE ( IOUT, 6000 ) BL, I90
 6000 FORMAT ( A2 / 3X, A2 )
      GO TO 999
  910 CONTINUE
  999 STOP
      END
C*********************************************************************
C
      BLOCK DATA
C
      COMMON /FILES/ INPT,IOUT,ICRT
C
C      INPT - INPUT FILE UNIT NUMBER
C      IOUT - OUTPUT FILE UNIT NUMBER.
C      ICRT - CRT UNIT NUMBER.
C
      DATA INPT,IOUT,ICRT/10,11,1/
      END
C
C*********************************************************************
C
      SUBROUTINE GETFL( IERR )
C
      COMMON /FILES/ INPT,IOUT,ICRT
```

```
C
      CHARACTER*30  INAME, JNAME
C      RESET IERR TO ZERO
C
      IERR = 0
C
      WRITE( * ,1000)
 1000 FORMAT(5X,'ENTER INPUT FILE NAME ')
C
      READ ( * ,3000 ) INAME
 3000 FORMAT(A30)
C
      WRITE( * ,2000 )
 2000 FORMAT(5X,'ENTER OUTPUT FILE NAME ')
C
      READ ( * ,3000 ) JNAME
C
C      OPEN INPUT FILE
C
      OPEN( UNIT=INPT,FILE=INAME,IOSTAT=IERR,ERR=910,
     1      STATUS='OLD',ACCESS='SEQUENTIAL' )
C
C      OPEN OUTPUT FILE
C
      OPEN( UNIT=IOUT,FILE=JNAME,IOSTAT=IERR,ERR=920,
     1      STATUS='NEW',ACCESS='SEQUENTIAL' )
C
      RETURN
C
  910 WRITE( * ,9100 ) IERR
 9100 FORMAT(5X,'ERROR IN OPENING OLD FILE - ERROR = ',I5)
      RETURN
C
  920 WRITE( * ,9200 ) IERR
 9200 FORMAT(5X,'ERROR IN OPENING NEW FILE - ERROR = ',I5)
C
      RETURN
      END
```

APPENDIX - D

USEFUL VAX PROCEDURES

USEFUL VAX PROCEDURES

Included are several procedures and commands which may be helpful to the CADPAD user. This is not a comprehensive selection. See the system operators, supervisors, etc. for assistance if you have any problems or questions.

1. Sending ASCII Files from the VAX to the PC

PC Prompt	User Entry	Description
C:\>	D:	Go to the D: drive.
D:\>	CD\ST320	Go to ST320 subdirectory.
D:\ST320>	ST320	Enter the SMARTERM menu.
[menu]	<ENTER>	Choose ST320 emulator mode.
	<ENTER>	Display the VAX logo and prompt.
username:	KLPT	Example of user name for Kot Lakhpat.
password:	KLPT	Example of password.
$	KERMIT	Enter the KERMIT program.
KERMIT-32>	SEND filnam	Give SEND command and the name of the file to be sent.
,Sp/@#y1~y	ALT-C	Break out to the menu. Give the TRANSMIT command.
[MENU]	<ENTER> or F	Select "Enter PC file name"
Filename:	pathname	Give path and filename for file to be received. Example:D:\LOTUS\VIL\OKLAS
[menu]	B	Choose BEGIN CAPTURE option. The file is transmitted.
[display]	<ESC>	Go back to the menu.
[menu]	E	Return to Emulator Mode.
# N3	CTRL-Y	Go to the $ prompt.

Repeat the above 9 steps, starting at the $ prompt and entering KERMIT, for each file to be sent.

$	LO	Logout from the VAX
	ALT-X or ALT-SHIFT	Return to the PC permanently or Return to the PC temporarily. Use ALT-SHIFT to go back.

2. Sending ASCII Files from the PC to the VAX

PC Prompt	User Entry	Description
C:\>	D:	Go to the D: drive.
D:\>	CD\ST320	Go to ST320 subdirectory.
D:\ST320>	ST320	Enter the SMARTERM menu.
[menu]	<ENTER>	Choose ST320 emulator mode.
	<ENTER>	Display the VAX logo and prompt.
username:	KLPT	Example of user name.
password:	KLPT	Example of password.
$	KERMIT	Enter the KERMIT program.
KERMIT-32>	RECEIVE filnam	Give RECEIVE command and the name to be given to the received file. Add a .DAT extension to the file name.
# N3	ALT-T	Give the TRANSMIT command.
[MENU]	F	Choose FILENAME option.
Filename:	pathname	Give path and filename of file to be sent. Example:D:\LOTUS\VIL\OKLAS
[menu]	B	Choose BEGIN TRANSMISSION option. The file is transmitted
[display]	<ESC>	Go back to the menu.
[menu]	E	Return to Emulator Mode.
# N3	CTRL-Y	Go to the $ prompt.

Repeat the above 9 steps, starting at the $ prompt and entering KERMIT, for each file to be sent.

$	LO	Logout from the VAX
	ALT-X or ALT-SHIFT	Return to the PC permanently or Return to the PC temporarily. Use ALT-SHIFT to go back.

3. Creating FORTRAN Programs

Some users may want to create simple FORTRAN utility programs. The easiest way is to modify one of the utility programs in Appendix - C. The structure is already there for opening input and output files, and the user can simply modify the section called "C***...** DO YOUR THING HERE" plus adding any needed changes to the COMMON statement at the beginning.

To modify a program and create another, use the VAX editor to enter and modify the source file and save it under a new name. The source file must have an extension of .FOR.

To compile the new programs use the command FORT xxx.FOR, where xxx is the new source file name.

To link the new program use the command LINK xxxx, where xxxx is the new source file name. The extension is not needed.

4. Creating New Subdirectories in your Directory

To create a new subdirectory, go the directory where you want to create the new subdirectory and enter the command CREATE/DIR [.xxxx], where xxxx is the new subdirectory name. The Set Directory command SD [.xxxx] will take you into it.

5. Restoring the TEK4205 Screen in SETUP mode

To restore alphanumeric screen size:

```
DALINES    30
DAMARGINS  1  30
```

To restore screen colors:

```
DAINDEX    A  B  C  -  Non-characters Background
           |  |_____   Characters Background
           |__________ Characters
```

A,B,C = 0 = black
A,B,C = 1 = white
A,B,C = 2 = red
A,B,C = 3 = green
A,B,C = 4 = blue
A,B,C = 5 = cyan
A,B,C = 6 = magenta
A,B,C = 7 = yellow

FDRDZ sets Background (non-char) to black. After "red" message in WGT/RDB, program sets char. background to blue. We need to set non-char background and char background both to blue on reentry to WGT/RDB

DAINDEX 1 4 4 is the proper setting. White on blue & blue.

6. Sorting Files

The command "SORT filename1 filename2" will sort the contents of filename1 and put the results in filename2. The SORT utility assumes default keys starting with column 1. If the user wants different keys he must provide them.

7. Comparing Files

The command "DIFF filename1 filename2" will compare the two files and list the differences.

8. Capturing a Screen Session

It is possible, on the VAX, to capture, in an ASCII file, all of the alphanumeric output to the screen. However, this can only be done if the VAX Network is set up and the Network License is installed on the VAX. This would have to be done by the VAX representative.

This feature may be useful for making a hard copy record of important session. It was used to capture th sessions included in Sections IX and XI of this manual.

The procedure is as follows:

1. Log onto the VAX in the normal way.
2. Enter the VAX command "SET HOST/LOG 0" or "SET HOST/LOG-filename 0". If the first form is used, the session will be stored in a file SETHOST.LOG. If the second is used, it will be stored in a file filename.LOG.
3. Log onto the VAX again, in the working directory.
4. Do whatever you want to make a record of.
5. Log out of the working session with the command "LO".
6. Edit, print, display, or transfer the SETHOST.LOG or filename.LOG file.

You will need to edit the ASCII file to remove Escape Sequences, graphics control characters, etc. You may insert comments, etc.

It is recommended that you avoid graphical displays during the session, because they generate a lot of unuseable character strings that will have to be edited out and may even prevent you from being able to edit the file with the VAX Editor. Also, work done in a VAX Editor session will not be captured.

9. **Using the VAX Editor**

a. Go to the directory where you want to create or edit a file.

b. Type EDIT FILENAME.EXT, where FILENAME is the name of the new file to be created or edited (limit is 6 characters for files that will be read by CADPAD) and EXT is a filename extension (limited to 3 characters). For CADPAD files the extension must be DAT.

c. The editor will start out in the "line" mode indicated by a "*" prompt in column 1. To change to "full screen" mode, enter "C".

d. In full screen mode, enter the data or changes using keyboard keys (arrows, return, etc).

e. When finished with the changes and additions, save the file by first entering "Control-Z" and then enter "EX" or "EXIT" at the "*" prompt. If you do not want to save the changes, enter "QUIT" instead of "EX".

f. For those who want to know more about EDT, a section of a manual, "Editing Files with EDT" is included.

g. The Keypad Editing Keys - LK201 Keyboard at the bottom of Figure 2-1 on Page 2-8 should be used. It may be helpful to keep a copy of this next to the keyboard. The lower commands on the keys are to be used with the Gold key. The upper commands are used alone.

2 Editing Files with EDT

EDT is an interactive text editor. You can use EDT to edit many kinds of text files—letters, memos, or complex computer programs. With EDT you can create new files, insert text into them, and edit that text. You can also edit text in existing files.

2.1 Introduction

EDT offers many features to make text editing easier and more efficient. These features include the following:

- Three types of editing—keypad mode, line mode, and nokeypad mode. Keypad mode is screen-oriented, which allows you to see several lines of text simultaneously and move the cursor throughout the text in any direction. Line mode enables you to edit text by using line numbers. You can use nokeypad mode commands to define keys. You can move from one mode to another during the same editing session.
- Online HELP. You can use HELP any time during your editing session without affecting your work.
- Journal facility. The journal file protects your editing work in case of a system interruption.
- Access to files and buffers. You can work with as many files and buffers as you need during your EDT session.
- Startup command files. These enable you to personalize the characteristics of your editing sessions.
- Key definition facility. You can define keys to automate your keypad editing work.
- EDT macros. You can create EDT macros to automate your editing work. Macros can be saved for use in later editing sessions.
- Tabbing facility. This feature enables you to create layered text formats.

The discussion of EDT in this guide is designed for the novice as well as the more experienced EDT user. For more detailed information about the EDT editor, see the *VAX EDT Reference Manual*.

2.1.1 Invoking and Terminating EDT

An editing session begins when you invoke EDT using the DCL command EDIT and ends when you terminate EDT with the EXIT or QUIT command. You can start an editing session by creating a file and inserting the text for the file during the course of the session, or you can specify an existing file when you start the session. EDT does not destroy the contents of any existing file that you edit; it simply produces a new version, leaving the old version intact

Editing Files with EDT

2.1 Introduction

2.1.1.1 Invoking EDT

To invoke EDT, enter the DCL command EDIT. You are prompted for the name of a file. The following example shows how you invoke EDT to edit a file named MEMO.TXT:

```
$ [illegible]
_File: [illegible]
```

If you are creating a new file, EDT displays the message *Input file does not exist* followed by the end-of-buffer sign [EOB] and the asterisk prompt (*). If you are editing an existing file, a copy of the first line of text appears on the screen followed by the asterisk prompt.

The following example demonstrates how to invoke EDT to create a new file:

```
$ [illegible]
Input file does not exist
[EOB]
*
```

The following example demonstrates how to invoke EDT to edit a file that already exists:

```
$ EDIT OLDFILE.DAT
    1        This is the first line of the file
*
```

Once you enter EDT, you can choose between three different modes:

- Line mode—Line mode allows you to use line numbers during your editing session. Line-mode commands are particularly useful for manipulating large blocks of text.
- Keypad mode—Keypad mode allows you to move the cursor to the text you want to edit and perform most editing functions by pressing keypad keys. In keypad mode, you insert text by typing from the main keyboard.
- Nokeypad mode—Nokeypad mode allows you to move the cursor directly to the text you want to modify and to enter nokeypad commands.

One difference between the three modes is that you press keys to edit text in keypad mode, whereas you enter commands to edit text in line mode and in nokeypad mode.

By default, EDT puts you into line mode. You know that you are in line mode when you see the asterisk prompt (*). If you want to enter keypad mode, type the letter C (abbreviation for CHANGE command) when you see the asterisk prompt and press RETURN. If you want to enter line mode from keypad mode, press CTRL/Z. If you want to enter nokeypad mode, enter the SET NOKEYPAD command when you see the asterisk prompt, press RETURN, type the letter C, and press RETURN again.

The following table shows the three EDT modes and the commands you enter to invoke each mode on a video terminal.

Mode	Commands to Invoke Mode
Line	$ EDIT •
Keypad	$ EDIT • C
Nokeypad	$ EDIT • SET NOKEY • C

2.1.1.2 Terminating EDT

Both the EXIT and QUIT commands terminate an editing session; however only EXIT saves your edits. When you enter the EXIT command at the asterisk prompt, EDT creates an output file containing the edited version of the input file. By default, the output file has the same name and type as the input file. (The version number is incremented by one.) The following example demonstrates how to invoke EDT to edit a file named FUN.DAT how to terminate the editing session. The output file has the same name the input file and the version number is increased by one.

```
DBA2:[WHITEBRIDGE]FUN.DAT;5  2 lines
```

If you want to override the default and specify a different output file name enter the EXIT command and specify the new file name as a parameter. In the following example, you invoke EDT to edit a file named FUN.DAT and specify JOKE.DAT as the new file name when you terminate the session

```
$
```

```
DBA2:[WHITEBRIDGE]JOKE.DAT;1  2 lines
```

If you do not want to save your edits when you end an editing session, enter the QUIT command. All the edits you made to the file are lost and no output file is created.

The following table shows the three EDT modes and the commands you enter to terminate each mode:

Editing Mode	Commands to Terminate EDT
Line	* EXIT or QUIT $
Keypad	CTRL/Z * EXIT or QUIT $ or GOLD key, COMMAND key, EXIT or QUIT command, ENTER key $
Nokeypad	EX * EXIT or QUIT $ or QUIT $

2.1.2 Using the HELP Facility

EDT's online HELP Facility allows you to get help during your editing session without interrupting your work.

In keypad mode, press the HELP key to get information about keypad functions. For information about line and nokeypad commands, use the line-mode command HELP. The following sections discuss the HELP facility in more detail.

2.1.2.1 Accessing HELP from Line Mode

You can enter the HELP command after the asterisk prompt (*) for information about EDT commands. If you want information about specific commands, type the HELP command followed by the name of the command and press RETURN. For example, if you want to know more about the INSERT command, enter the following:

```
*
```

If you want information on a qualifier, for example /SAVE, enter the following:

```
*
```

You must include the name of the command, in this case EXIT, and the slash (/) before the qualifier.

EDT can help you get information even when you supply only the first letter or so of the command name. If you enter HELP D, EDT prints the information for both the DEFINE and DELETE commands. HELP CH gives you the CHANGE command, but HELP C supplies information on CHANGE, CLEAR, and COPY.

Use the wildcard character (*) with the HELP command to get information on all subtopics for a command without having to supply the subtopic name. For example, the following command prints information on TYPE/BRIEF and TYPE/STAY:

```
*
```

2.1.2.2 Accessing HELP from Keypad Mode

From keypad mode, press the HELP key to get a diagram of the keypad functions. The screen goes blank for a few seconds before the diagram appears.

After EDT displays the diagram, you can press any keypad key to see a description of what that key does. If you press keypad key number 5, for example, descriptions of the BACKUP and TOP keypad functions appear on the screen. At the end of each description are directions for seeing the whole keypad diagram again (by pressing RETURN), reading about other functions (by pressing another keypad key), or returning to your editing session.

For help on a control key sequence such as CTRL/A, press both the control key and the keyboard key. For help on a GOLD key sequence, such as GOLD/A, press only the keyboard key, not the GOLD key.

Note: The HELP diagrams do not display any keyboard or keypad keys that you have redefined.

2.1.2.3 Accessing HELP from Nokeypad Mode

If you are in nokeypad mode and want to get HELP information about nokeypad commands, type EXIT, press RETURN, and enter HELP CHANGE at the asterisk prompt. After the help entry on CHANGE, there are five subtopics:

- ENTITIES
- HARDCOPY
- KEYPAD
- NOKEYPAD
- SUBCOMMANDS

The ENTITIES subtopic contains a list of the nokeypad entity subtopics: character, word, line, range, sentence, page, paragraph, select, vertical, and string. When you want information about one of these entities, include the entity name (for example, sentence) as the last HELP command subtopic:

```
*
```

The HARDCOPY, KEYPAD, and SCREEN subtopics provide brief descriptions of hardcopy, change mode, keypad mode, and screen editing. These do not have further subtopics.

Further information on nokeypad commands is contained in the SUBCOMMANDS subtopic. For a complete list of the subtopics covered enter the following:

```
*
```

To leave HELP and return to your editing session, enter the CHANGE command at the asterisk, as follows:

```
* CHANGE
```

2.1.3 Recovering from System Interruptions

If your EDT editing session is interrupted, you can recover your work by using a journal file. Journal files and the method for recovering from interruptions are discussed in Section 2.7.

2.1.4 Moving from Mode to Mode

Once you become familiar with the three modes in EDT, you can travel from one mode to another to perform your editing tasks. The following table lists the commands you need to know to move from mode to mode:

From	To	Command
Line Mode	Keypad Mode	•CHANGE
Line Mode	Nokeypad Mode	•SET NOKEYPAD •CHANGE
Keypad Mode	Line Mode	CTRL/Z
Keypad Mode	Nokeypad Mode	CTRL/Z •SET NOKEYPAD •CHANGE
Nokeypad Mode	Line Mode	EX
Nokeypad Mode	Keypad Mode	EX •SET KEYPAD •CHANGE

The following example demonstrates how to invoke EDT to create a new file named FUN.FUN, move to line mode (by default), and then move to keypad mode:

```
$ EDIT FUN.FUN                ❶
Input file does not exist
[EOB]
*                             ❷
```

❶ The EDIT command invokes EDT.

❷ The asterisk prompt (*) indicates that you are in line mode and the CHANGE command invokes keypad mode.

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The following example demonstrates how to invoke EDT to create a new file named WHY.NOT, enter line mode (by default), enter keypad mode, return to line mode, and, finally, enter nokeypad mode.

```
$ [illegible] ❶
Input file does not exist
[EOB]
* [illegible] ❷
[EOB]
[illegible] ❸
* SET NOKEYPAD ❹
* [illegible] ❺
```

❶ The EDIT command invokes EDT.

❷ The asterisk prompt (*) indicates that you are in line mode and the CHANGE command invokes keypad mode.

❸ CTRL/Z returns you to line mode.

❹ The asterisk prompt indicates line mode and the SET NOKEYPAD command invokes nokeypad mode.

❺ The CHANGE command invokes nokeypad mode (only after you enter the SET NOKEYPAD command).

2.2 Using Keypad Mode

Keypad editing is available on VT300-series, VT200 series, VT100 series, and VT52 terminals. In keypad editing, the contents of a file are displayed on the screen as you edit. You can see the changes you make to a file as they take place.

In keypad editing, you press keys to perform editing functions rather than type commands as is done in line and nokeypad editing.

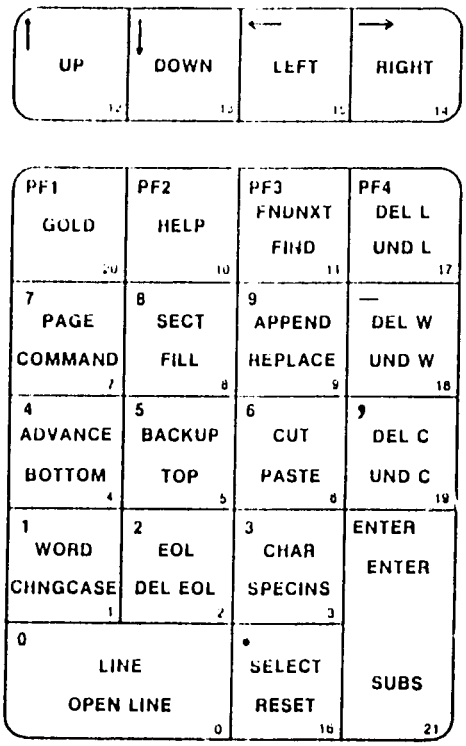
2.2.1 Terminal Keypads

Figure 2-1 shows all the keypad functions available on VT52, VT100-series and LK201 keyboards. (An LK201 keyboard is used with VT200 series and VT300-series terminals.) Each key in the keypad performs at least one editing command; many of the keys perform two. You can use the standard function (the upper half of the key) by pressing the key. You can use the alternate function (the lower, shaded half of the key) by pressing the GOLD key before pressing the function key.

Notice that the LK201 keyboard includes a numeric keypad (like the keypad on the VT100-series terminal) and a six key editing keypad with four arrow keys. (Two of the twenty available function keys, HELP and DO, are also displayed.) See the *VAX EDT Reference Manual* for more detailed information about the LK201 function keys.

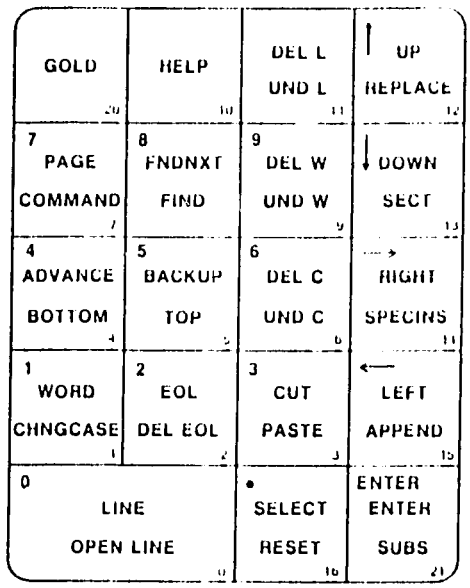
Figure 2–1 VT100, VT52, and LK201 Keypads

Keypad Editing Keys – VT100 Terminals



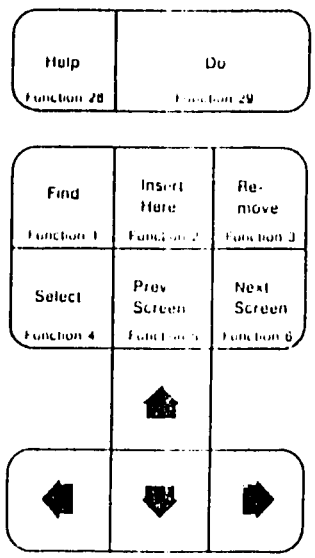
VT100

Keypad Editing Keys – VT52 Terminals

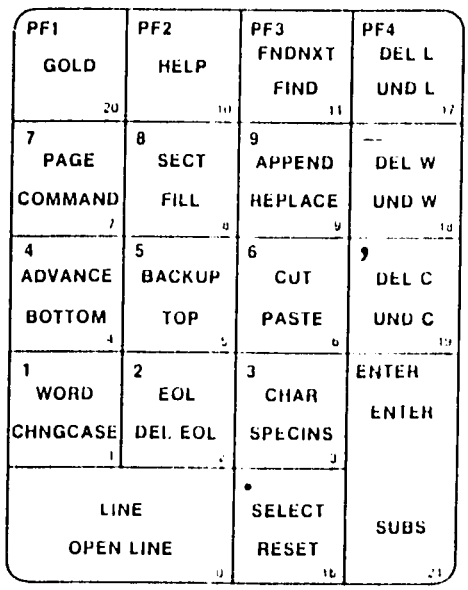


VT52

Keypad Editing Keys – LK201 Keyboard



VT200 Series



2.2.2 Using the GOLD Key

You can use the GOLD key for two purposes:

- To use the alternate of two functions on a keypad key
- To execute a function a specified number of times

To use an alternate function, press the GOLD key followed by the desired key. (You do not need to hold down the GOLD key.) For example, to use UND C, you press the GOLD key first, then the UND C key.

To execute a function a specified number of times, press the GOLD key, type a number (on the main keyboard), and press the function you want repeated. Try it and see how much time you save. The following steps show how to repeat any keypad function a specified number of times:

1. Press the GOLD key.
2. Type a number.
3. Press the desired function.

2.2.3 Inserting Text

Once you have entered keypad mode, you can insert text by typing it on the keyboard. No command is required. Whatever you type becomes part of the file. Your insertion appears on the screen as you type it, and the surrounding text moves as necessary to accommodate it. The cursor marks the starting location for the insertion. When you want to begin a new line, press RETURN to move the cursor to the beginning of the next line and continue typing your text.

As you type new text, you may notice errors in surrounding text. You can move the cursor to these errors and correct them at any time and then move the cursor back and continue to insert text.

2.2.4 Moving the Cursor

There are many ways to move the cursor in keypad mode. The following table lists several keypad functions that move the cursor:

Function Key	Destination of Cursor
TOP	Beginning-of-Buffer
BOTTOM	End-of-Buffer
Left arrow	One character to the left
Up arrow	Up one character
Right arrow	One character to the right
Down arrow	Down one character

The ADVANCE and BACKUP keypad functions cause the cursor to move in a forward or backward direction.

The following example demonstrates how to move the cursor to the beginning (or top) and to the end (or bottom) of the buffer, using the TOP and BOTTOM keypad functions.

Insert the following three lines of text:

```
Five golden rings,
four calling birds,
three french hens,
```

1 Press the GOLD key followed by TOP to move the cursor to the *F* in the word *Five*.

2 Press the GOLD key followed by BOTTOM. Notice the cursor moving to the left bracket of the end-of-buffer sign [EOB].

3 Press the GOLD key followed again by TOP to move the cursor back to the *F*.

Repeat these steps to become familiar with the TOP and BOTTOM keypad functions.

The following example demonstrates how to move the cursor using the four arrow keys: Up, Down, Left, Right.

```
Under a toadstool crept a wee elf,
Out of the rain to shelter himself.
Under a toadstool all in a heap,
Sat a big doormouse, fast asleep.
```

1 Press the TOP keypad function (the GOLD key followed by TOP) to move the cursor to the letter *U* in the word *Under*.

2 Press the Right arrow 9 times, then press the Down arrow once, moving the cursor to the *e* in the word *the*.

3 Press the Left arrow 5 times, then press the Down arrow once, moving the cursor to the *r* in the word *under*.

4 Press the Right arrow 8 times, then press the Down arrow once, moving the cursor to the second *o* in the word *doormouse*.

5 Press the Left arrow 6 times, then press the Up arrow 3 times, moving the cursor to the word *a*.

The next example demonstrates the keypad functions for TOP, LINE, EOL, WORD, and CHAR. Enter the following four lines of text:

```
ONE TWO THREE FOUR FIVE
SIX SEVEN EIGHT NINE
TEN ELEVEN TWELVE THIRTEEN
FOURTEEN
```

1 Press TOP to move the cursor to the first letter of the word *ONE*.

2 Press LINE once, moving the cursor to the *S* in the word *SIX*.

3 Press WORD twice, moving the cursor to the *E* in the word *EIGHT*. Then press EOL. The cursor moves to the end of the line.

4 Press WORD three times, moving the cursor to the *T* in the word *TWELVE*. Then press EOL. The cursor moves to the end of the line.

5 If you are using a VT100-series, a VT200-series, or a VT300-series terminal, press CHAR four times. The cursor moves to the *E* in the word *FOURTEEN*.

The following figure shows the approximate distances that some keypad commands move the cursor.

Keypad Function	Distance Keypad Function Moves Cursor
CHAR	#
WORD	######
EOL	############
LINE	##
SECT	## ## ## ## ## ## ## ## ## ## ## ## ## ## ## ## ##

Keypad Function	Distance Keypad Function Moves Cursor
PAGE	##

Note that the PREV SCREEN and NEXT SCREEN keys (on an LK201 keyboard) work like the SECT keypad function, moving the cursor back or ahead by 16 lines.

2.2.4.1 How EDT Views Words

You can determine the way that EDT recognizes a word, sentence, paragraph, or page. By default, EDT identifies a word as any group of contiguous characters starting at the current cursor position and continuing in the current direction until one of the following characters is encountered:

- Space ( )
- Horizontal tab (TAB)
- Linefeed (LF)
- Vertical tab (VT)
- Form feed (FF)

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- Carriage return (CR)
- Line terminator

For example, enter the following text and move the cursor throughout the paragraph by pressing the WORD key. Notice that the cursor stops on the first letter of each word.

```
This is the first line of text.
Is this the second?
This must be the third
How about a fourth line?
And, a fifth, perhaps?
Will anyone take a sixth?
Number seven, please
```

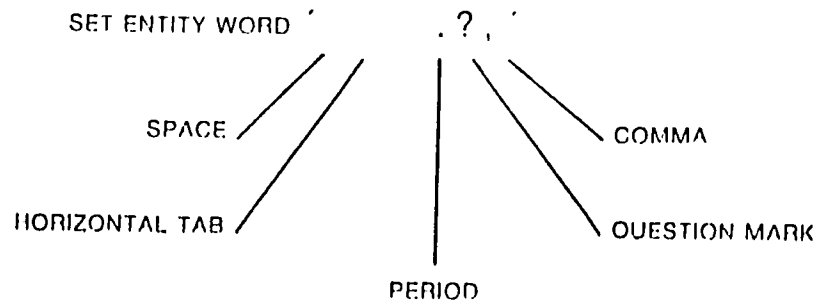
You can use the SET ENTITY WORD command to change the way EDT views words. If you want EDT to recognize periods, question marks, and commas, enter the following command line in your startup command file (for information about startup command files, see Section 2.11):

```
SET ENTITY WORD ".?,"
```

When you use the WORD key to move throughout the text again, notice that the cursor stops on all periods, question marks, and commas. For more information about the SET ENTITY command, see the *VAX EDT Reference Manual*.

Figure 2–2 shows the characters that can be used in the SET ENTITY command.

Figure 2–2 Using the SET ENTITY WORD Command



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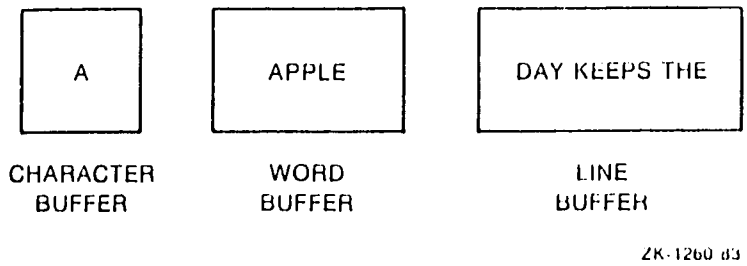
2.2.5 Deleting and Undeleting Text

You can delete text by character, word, and line. The DELETE and DEL C keys delete characters. DEL W and LINEFEED delete words or part of words. DEL L, DEL EOL, and CTRL/U delete single lines or parts of lines. The deleted text is stored in one of three buffers so that you can [illegible] it using the UND commands (UND C, UND W, and UND L). A buffer is a temporary holding area for text. The character buffer contains the last character deleted; the word buffer contains the last word deleted; and the line buffer contains the last line deleted. Only the most recent deletion can [illegible]

restored; you can restore this unit of text numerous times to any location. See Section 2.6 for more information on buffers.

Figure 2–3 shows the three buffers that EDT fills when you use the delete and undelete keys.

Figure 2–3 Three EDT Buffers Used for Deleting and Undeleting Text



Use the following keypad functions to delete text:

Keypad Function	What It Does
DELETE	Deletes the preceding character
DEL C	Deletes the current character
DEL W	Deletes to the end of the word
LINE FEED	Deletes to the beginning of the previous word
DEL L	Deletes to the next line
CTRL/U	Deletes from the beginning of the line to the cursor
DEL EOL	Deletes from the cursor to the end or beginning of the line, depending on the current cursor direction
CUT	Deletes the selected string from the current file and stores it in the PASTE buffer. The selected string is all the text between the cursor location when you pressed the SELECT keypad function and the position to which you moved the cursor. (Note that the REMOVE key on the LK201 keypad works like the CUT keypad function.)

Enter the following three lines of text:

```
CHARACTER

WORD WORD WORD WORD WORD

LINE LINE LINE LINE LINE LINE LINE LINE
```

The following steps show how to delete and restore characters:

1. Move the cursor to the first C in the word *character*. Press DEL C. The C disappears.
2. Press the GOLD key followed by UND C. The C reappears.
3. Move the cursor to the *H*. Press DEL C to make it disappear.

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4 Then press the GOLD key followed by UND C. The H is restored.

5 Press the GOLD key followed by UND C again, another H appears.

Notice that the DEL C keypad function deletes the character directly at the cursor and the DELETE key (on the main keyboard) deletes the character immediately to the left of the cursor. You can use the UND C keypad function to restore the most recently deleted character in either case. Press the DELETE key and the DEL C keypad function to see the difference between the two.

Use the following steps to delete and restore words:

1 Move the cursor to the *W* in *WORD*. Press DEL W. The word *WORD* disappears.

2 Press the GOLD key followed by UND W to restore the word.

3 Press the GOLD key followed by UND W again, another *WORD* appears.

Notice that the DEL W keypad function deletes to the end of the current word, and the LINE FEED key (on the main keyboard) deletes to the beginning of the preceding word. Press the LINE FEED key to see the difference between the DEL W keypad function and the LINE FEED key. Again, you can use the UND W keypad function to restore the deleted word in either case.

To delete and restore entire lines of text, do the following:

1 Move the cursor to the beginning of the line of LINES. Press the DEL L keypad function. The entire line disappears.

2 Press the GOLD key followed by UND L to restore the line.

3 Press the GOLD key and UND L several times to create multiple lines.

Press CTRL/U to delete text from the cursor to the beginning of the line. Notice that the cursor moves to the beginning of the line. Press UND L to restore the line.

2.2.6 Locating Text

Use the FIND and FNDNXT keypad functions to locate strings of text. When you press the GOLD key followed by FIND, the following prompt appears at the bottom of the screen:

```
Search for:
```

Type the string of text you are looking for and press one of the following keys:

- ADVANCE
- BACKUP
- ENTER
- DO

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If you press ADVANCE, EDT searches in a forward direction for the specified string. If you press BACKUP, EDT searches in a backward direction. If you press ENTER or DO, EDT searches in the direction already set.

Note: The ADVANCE and BACKUP keys also set the direction for subsequent EDT commands.

Enter the following text:

```
Ella will not be able to attend the concert
tonight. She has a sore throat.  Perhaps you could give
the ticket to somebody in your music class.  Ella wants
to see the program when she is feeling better.
```

Press the GOLD key followed by the FIND keypad function. When you are prompted for a search string, enter the word *ticket*.

```
Search for:
```

Now press BACKUP. The search starts at the end of the text (where the cursor is located) and continues towards the beginning of the text until it finds the word *ticket*.

Next search for the word *program*. Press the GOLD key followed by FIND. When you are prompted for the search string, enter the word *program*.

```
Search for:
```

If you press BACKUP again, you see the response *String was not found* because the word *program* is located after the word *ticket*. Now press ADVANCE followed by FNDNXT, and EDT finds the string.

Remember the following three items when you are entering a search string:

1. EDT ignores diacritical marks and the case of letters while making searches (unless you enter the SET SEARCH EXACT command).
2. DELETE is the only key you can use to edit an incorrectly typed search string.
3. To cancel a search string, press CTRL/U.

If you want to find the next occurrence of the string you are searching for, use the FNDNXT keypad function. EDT searches in the direction already set. If EDT cannot find the string, it displays the message *String was not found*. You can reverse the direction of the search by pressing either ADVANCE or BACKUP before pressing FNDNXT.

Enter the following text, then press GOLD and FIND, and enter the search string *little* when prompted:

```
One little, two little, three little chickadees,
four little, five little, six little chickadees,
seven little, eight little, nine little chickadees,
ten little chickadees feeding
```

```
Search for:
```

Because the cursor is at the end of the text, you must press the BACKUP keypad function to set the search in a backward direction. Now press FNDNXT nine times. EDT finds each occurrence of the search string. When the cursor arrives at the first *little*, press the ADVANCE keypad function to reverse the direction of the search. Every time you press FNDNXT, the cursor moves forward to the next occurrence of the word *little*.

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2.2.7 Moving Text

You can move text using three different groups of keypad functions:

- RETURN and OPENLINE—Pressing RETURN causes both text and cursor to move down the screen line by line. If you press OPENLINE the text moves down the screen line by line, but the cursor remains in the same place.
- DEL L, UND L, DEL W, UND W, DEL C, and UND C - Deleting a unit of text (character, word, or line) from one location, moving the cursor to another location, and then undeleting the text is a way to move small portions of text. (See Section 2.2 for more information about deleting and undeleting text.)
- CUT and PASTE (or REMOVE and INSERT HERE) - Cutting (or removing) a unit of text and pasting (or inserting) it in another location is the method you use for moving large portions of text. This method is described in the rest of this section.

Use the following three keypad functions to move text:

- SELECT
- CUT (or REMOVE)
- PASTE (or INSERT HERE)

Press SELECT to mark one end of the string of text that you want to delete or move. Then move the cursor either backward or forward to the other end of the string, and press CUT. Before you press CUT, you can correct a mistake by pressing the GOLD key followed by RESET to cancel the select range and start over. The selected text is highlighted in reverse video.

Press CUT to delete the selected string of text from the current file and store it in the PASTE buffer. (See Section 2.6 for more information about the PASTE buffer.) The selected text is all the text between the cursor location when you pressed SELECT and the position to which you have moved the cursor.

If you press CUT before you press SELECT, you see the message *No select range active.*

To insert the contents of the PASTE buffer to the left of the cursor position, press GOLD followed by PASTE.

To summarize, use the following steps to move text:

1. Place the cursor at the beginning of the text you want to move.
2. Press SELECT to mark the location.
3. Move the cursor to the end of the select range.
4. Press CUT to delete the text from its current position.
5. Move the cursor to the character just beyond where you want the text inserted.
6. Press the GOLD key followed by PASTE.

Note: If you want to restore the select string to its original location after you perform Step 4 above, press the GOLD key followed by PASTE.

Enter the following text:

```
january february march april
may june july november
december august september october
```

In order to move the string *august september october* after *july*, move the cursor to the *a* in *august*. Press SELECT. Then move the cursor to the *r* in *october*. Press CUT. The selected string disappears into the PASTE buffer. Now move the cursor after the word *july* and press GOLD followed by PASTE (GOLD/PASTE). A copy of the selected string in the PASTE buffer appears on the screen between the words *july* and *november*.

If you press GOLD/PASTE again, you get another copy of the contents of the PASTE buffer. Every time you press GOLD/PASTE, you get another copy of the string *august september october*. You can always get as many copies of the PASTE buffer as you want by pressing GOLD/PASTE. However, once you perform another SELECT and CUT operation specifying a different string, the contents of the PASTE buffer change.

If you want to add to the text in the PASTE buffer, retaining the text already there, use APPEND. APPEND deletes the select range from the current buffer and adds it to the end of the PASTE buffer.

For example, if your PASTE buffer contains the text *Wolfgang Amadeus* and you want to add the text *Mozart*, follow the steps below:

1. Press SELECT.
2. Type the word *Mozart*. (Precede the word with a space.)
3. Press APPEND.

Now the PASTE buffer contains the text:

```
Wolfgang Amadeus Mozart
```

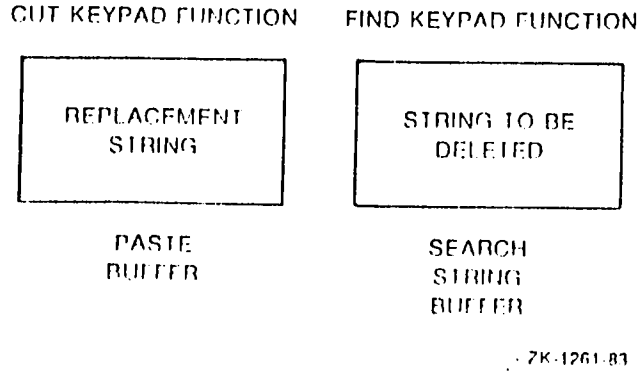
2.2.8 Substituting Text

You can use the SUBS keypad function or the REPLACE keypad function to replace one string of text with another.

When you make substitutions using SUBS, you are using both the PASTE buffer and the search string buffer. You use CUT to put the replacement string into the PASTE buffer and FIND to put the string you want to find and delete into the search string buffer. Figure 2-4 shows both buffers. The following five steps demonstrate how to use SUBS to make substitutions:

1. Press SELECT and enter the replacement text.
2. Press CUT. (The select range disappears into the PASTE buffer.)
3. Press the GOLD key followed by FIND and enter the search string (the text you want to replace).
4. Press either ADVANCE or BACKUP to find the first occurrence of the search string in the direction you choose.
5. Press the GOLD key followed by SUBS to exchange the existing text for the replacement text.

Figure 2–4 Two EDT Buffers Used for Substituting Text



When you use SUBS, EDT performs the substitution first and then moves to the next occurrence of the search string. If EDT cannot find another occurrence of the search string, it prints the message "String was not found." If you do not want to make a particular substitution, press the FNDNXT keypad function, and the cursor moves to the next occurrence of the search string. If you want to change that one, press SUBS again. Thus, you can move through the buffer pressing SUBS each time you want to make a replacement and pressing FNDNXT when you want EDT to leave the search string alone.

Note: You must use the FIND keypad function when you are making substitutions with SUBS because you are replacing text that matches the search string with the contents of the PASTE buffer. SUBS does not work correctly if you do not use FIND.

Enter the following text:

```
Susanne grabbed the red apple and gobbled it down.
Suddenly her face turned quite red.  Glancing towards
the red house she saw the huge tree bathed in red
leaves.
```

Now perform the following steps to substitute the word *green* for the word *red*:

1. Press SELECT and enter the word *green*.
2. Press CUT. (The word *green* disappears into the PASTE buffer.)
3. Press GOLD followed by FIND and enter the word *red*.
4. Press either ADVANCE or BACKUP to find the first occurrence of *red* in the direction you choose.
5. Press SUBS to substitute the word *green* for the word *red*.
6. Press SUBS three more times.

Your resulting text should look like the following:

```
Susanne grabbed the green apple and gobbled it down.  Suddenly
her face turned quite green.  Glancing towards the green house
she saw the huge tree bathed in green leaves.
```

REPLACE deletes the text in the select range and replaces it with the contents of the PASTE buffer. For example, if your PASTE buffer contains the words *paste paste paste*, and your select range contains the words *select select select*, press REPLACE to make your select range contain the words *paste paste paste*, as the following steps demonstrate:

1. Press SELECT.
2. Type the words *paste paste paste*.
3. Press CUT. Now your PASTE buffer contains the words *paste paste paste*.
4. Press SELECT again.
5. Type the words *select select select*.
6. Press REPLACE. Now your select range contains the words *paste paste paste*.

2.2.9 Five More Keys to Use with the GOLD Key

Five keypad functions associated with the GOLD key are summarized in the following table:

Keypad Function	What It Does
COMMAND	Enables you to enter a line-mode command from keypad mode.
CHNGCASE	Reverses the case of letters in your text. Uppercase letters become lowercase; lowercase letters become uppercase.
FILL	Reorganizes the select range so that the maximum number of whole words can fit within the current line width.
RESET	Changes the following conditions of your editing session: • Cancels an active select range. • Empties the search buffer so that there is no current search string. • Sets EDT's current direction to ADVANCE. • Sets EDT to the default DMOV state. (DMOV is a Nokeypad command that returns your editing session to EDT's default state, where EDT does not alter the case of letters during move operations.)
SPECINS (special insert)	Enables you to insert any character from the DEC Multinational Character Set into your text using the character's decimal equivalent value. For information about the DEC Multinational Character Set, see the *VAX EDT Reference Manual*.

For more information about all the available keypad keys, see the *VAX EDT Reference Manual*.

2.3 Using Line Mode

You can use EDT's line editing facility with any interactive terminal – hardcopy or screen. Line editing uses the line as its point of reference. EDT moves through the text line by line, not character by character as in the two other editing modes. Line editing commands are particularly useful for manipulating large blocks of text.

2.3.1 Line Numbers

To help you locate and edit text, EDT assigns line numbers. These line numbers are not part of the text and are not kept when you end an editing session. To see the line numbers of an already existing file, enter the TYPE WHOLE command after the asterisk prompt (*). Notice that the text you enter is indented 12 spaces.

The following example demonstrates how to display your line numbers:

```
*
    1           oneoneoneoneoneoneone
    2           twotwotwotwotwo
    3           threethreethree
    4           fourfourfourfour
    5           fivefivefivefive
[EOB]
*
```

Line numbers have the following characteristics:

- They are assigned to every line in every buffer in every editing session, including newly inserted lines and text added with the INCLUDE command.
- They start with 1 and increment by 1, unless otherwise specified with the RESEQUENCE/SEQUENCE command.
- They are decimal numbers if newly inserted.
- They are removed by the EXIT command, unless otherwise specified
- They can be renumbered in increments of 1 or more with the RESEQUENCE command.

When you insert new text, EDT numbers the lines using decimal numbers. For example, if you add a line of text between lines 13 and 14, it is numbered 13.1. To avoid any visual confusion when working with decimal numbers enter the RESEQUENCE command after the asterisk prompt to change the sequence of line numbers. When you enter RESEQUENCE, EDT renumbers all the lines from the cursor to the end of the buffer in increments of 1. You can specify a range of lines within the file by entering a range after typing RESEQUENCE.

If you insert text after the fourth line in the following example and enter the TYPE WHOLE command again, you will see the newly inserted text preceded by decimal numbers. To change the sequence of line numbers, enter the RESEQUENCE command.

```
*TYPE WHOLE
    1           oneoneoneoneoneoneone
    2           twotwotwotwotwo
    3           threethreethree
    4           fourfourfourfour
    4.1         four_point_one
    4.2         four_point_two
    4.3         four_point_three
    5           fivefivefivefive
[EOB]
*RESEQUENCE
    1           oneoneoneoneoneoneone
    2           twotwotwot  two
    3           threethreethree
    4           fourfourfourfour
    5           four_point_one
    6           four_point_two
    7           four_point_three
    8           fivefivefivefive
[EOB]
*
```

The /SEQUENCE qualifier determines the increments EDT uses to number lines. When you enter the following command and include two numbers separated by a colon (n:m), EDT numbers the lines in the buffer, assigning number *n* to the first line and incrementing by number *m*:

```
RESEQUENCE/SEQUENCE:n:m
```

The following example resequences the contents of the buffer, assigning number 6 to the first line and incrementing by 4:

```
*RESEQUENCE/SEQUENCE  6:4 [EOB]
3 lines resequenced
*
    6           Washington, Maine
    10          Vermont, New York
    14          Ohio, New Mexico
    18          Colorado, Virginia
    22          Florida, Arizona
    26          Alabama, Oregon
    30          Minnesota, New Hampshire
    34          Texas, California
    38          Delaware, Michigan
[EOB]
```

2.3.2 Inserting Text

When you want to insert text, enter the INSERT command after the asterisk prompt (*). The cursor indents 16 spaces and waits for you to start typing. (Indenting is on the screen or paper only and does not become part of the edited text.) You can enter as many lines as you want. Each time you come to the end of a line, press RETURN to move to the beginning of the next line.

As you enter a line, you can delete characters by pressing the DELETE key. You can delete a portion of a line, from the cursor to the left margin, by pressing CTRL/U. However, when you end a line with RETURN, you can no longer delete characters from that line in insert mode. (See Section 2.3 for more information about deleting text.) When you finish entering text, press CTRL/Z. EDT echoes ^Z on the screen and returns you to the asterisk prompt.

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To display the text you just inserted, enter the TYPE WHOLE command after the prompt.

Note: EDT, which inserts text in front of the current line, is different from many other text editors that insert text following the current line.

The following example demonstrates how to insert text:

```
$ [illegible]
Input file does not exist
[EOB]
* [illegible]
                    This is the first [illegible] I could
                    to type. At the [illegible] here [illegible]
                    named newfile.dat [illegible] directory [illegible]
                    I finish my editing [illegible] and [illegible]
                    EXIT command, EDT will [illegible] a copy [illegible]
                    this text in my dir[illegible] under the name
                    newfile.dat.
[EOB]
* [illegible]
DRAO:[GLOVER]NEWFILE.DAT;1 5 lines
```

2.3.3 Ranges

When you want a line-mode command to affect a specific part of the buffer, you must enter a range. Ranges can specify one or more lines. In addition the multiple-line ranges can be contiguous or noncontiguous.

The following table describes the different ranges you can specify when editing in line mode:

Range Type	Description
period(.)	Current line
number	EDT line number
'string'	Next line containing the quoted string
BEGIN	First line of the buffer
END	After the last line in the buffer ([EOB])
LAST	Last line EDT was at in the previous buffer
WHOLE	Entire buffer
BEFORE	All lines in the buffer before the current line
REST	All lines in the buffer starting with the current line and ending with the last line

The following examples demonstrate each range type just listed:

EXAMPLES

1. TYPE

This command displays the current line.

2. TYPE 35

This command displays line 35.

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3 TYPE *December*

This command displays the first line it encounters containing *December*.

4 TYPE BEGIN

This command displays the first line of the current buffer.

5 TYPE END

This command displays the [EOB] mark.

6 TYPE LAST

This command displays the most recent line of text you displayed. The LAST specifier can only be used by itself; EDT does not accept LAST with other range specifiers or symbols or with buffer names.

7 TYPE WHOLE

This command displays every line in the current buffer.

8 TYPE BEFORE

This command displays the group of lines in the current buffer starting with the first line and ending with the line just before the current line.

9 TYPE REST

This command displays the group of lines in the current buffer starting with the current line and ending with the last line in the buffer.

You can use the following symbols and words with the range types listed above while editing in line mode:

Symbol/Word	Description
, or AND	Used to join noncontiguous ranges in a list; only single lines can be joined in this way
: or THRU	Indicates a group of lines starting with the first range specifier and ending with the second
n	Indicates the number of lines from the current line
# n or FOR n	Indicates the next "n" number of lines
+ "string" or "n"	Indicates that "string" or "n" refers to a line or lines after the current line
– "string" or "n"	Indicates that "string" or "n" refers to a line or lines before the current line
ALL "string" or "n"	Indicates that the command applies to all lines containing "string"

The following examples demonstrate the symbols and words just listed:

EXAMPLES

1. `TYPE 3,6,8`

   This command displays lines 3, 6, and 8.

2. `DELETE 4 AND 13`

   This command deletes lines 4 and 13.

3. `TYPE 25 Hartford`

   This command displays the group of lines starting with line number 25 and ending with the line containing *Hartford*.

4. `TYPE . THRU 150`

   This command displays all the lines in the group starting with the current line and stopping with line number 150.

5. `DELETE 4#3`

   This command deletes line 4 and the three lines following line 4.

6. `TYPE . FOR 10`

   This command displays the current line and the next ten lines; the number 10 refers to the tenth line after the current line.

7. `TYPE BEGIN +6`

   This command displays the seventh line of the current buffer.

8. `DELETE . 3 THRU .`

   This command deletes the current line and the three lines preceding it; the number –3 refers to the third line before the current line.

9. `TYPE "Dear"+2 THRU "Sincerely"-2`

   This command displays the body of the letter, starting with the first paragraph and ending with the last.

10. `TYPE . THRU 1000 ALL "Date:"`

    This command displays every line containing the string "Date:" that appears in the group of lines starting with the current line and ending with line number 1000.

2.3.4 Deleting Text

You can delete individual lines or groups of lines by using the DELETE command. After a delete operation, EDT displays the line following the last line deleted; this line is the new current line.

Use the following syntax:

```
DELETE range
```

The following example demonstrates how to delete line 2 in a file named FUN.DAT:

```
$
*   1           This is the first line of a file named FUN DAT
*
    1           This is the first line of a file named FUN DAT
    2           This is the second.
    3           This is the third,
    4           and the fourth.
*
1 line deleted
    3           This is the third,
*
    1           This is the first line of a file named FUN DAT.
    3           This is the third,
    4           and the fourth
*
```

If you enter the DELETE command and do not specify a range, EDT deletes the current line.

When you delete a range of lines, EDT deletes the lines and displays a message stating the number of lines deleted. The message is followed by a display of the next line in the text buffer.

You can use the /QUERY qualifier if you want EDT to prompt you before deleting each line of a specified range. The prompt is a question mark. Answer the prompt with one of the following four responses:

- Y (Yes) Delete this line.
- N (No) Do not delete this line.
- A (All) Delete all remaining lines in the specified range.
- Q (Quit) Quit the delete operation.

You must enter one of these responses before EDT continues to the next line or exits from the delete operation. The following example demonstrates the /QUERY qualifier with the DELETE command:

```
*
    7           This is the first line of the range
?
    8           This is the second line of the range.
?
1 line deleted
    9           This is the third line.
?
5 lines deleted
    14          This line is not in the range.
*
```

2.3.5 Substituting Text

When you want to substitute one string for another, use either the SUBSTITUTE or SUBSTITUTE NEXT command. These are the only line editing commands that can alter text within a line, as opposed to changing the entire line. The SUBSTITUTE command operates on the current line or on a specified range. It has the capacity to make a global substitution; that is, you can replace every occurrence of one string with another by using only one line mode command. The SUBSTITUTE NEXT command makes a substitution at the next occurrence of the string within the buffer.

The syntax for the SUBSTITUTE command is as follows:

```
SUBSTITUTE /old string/new-string/[range] [/QUERY]
```

To substitute the string GOOD for BAD throughout a buffer, enter the line mode command SUBSTITUTE, followed by the old string and the new string. Separate all three with the same delimiter. (A delimiter is a character that marks the beginning or end of a string.) To apply the command to the entire buffer, specify WHOLE as the range parameter. When the operation completes, EDT supplies a message indicating how many substitutions were made.

Enter the following text:

```
He felt bad.  He had had a bad time in a bad part of
the city. How did he know that all the stores would
have bad merchandise. So, he had bad luck trying to
find the perfect gift.  His stomach felt bad after a
bad lunch.
```

Enter the following command:

```
* SUBSTITUTE /BAD/GOOD/WHOLE
```

The resulting text will look like this:

```
He felt GOOD.  He had had a GOOD time in a GOOD part of
the city. How did he know that all the stores would
have GOOD merchandise.  So, he had GOOD luck trying to
find the perfect gift.  His stomach felt GOOD after a
GOOD lunch.
```

Slashes are not the only characters you can use to delimit strings. Most nonalphanumeric characters will work, as long as the delimiters are matched and do not occur in either string. For example, the following command substitutes the string A/3 for A/2 in the current line, using dollar signs ($) as delimiters:

```
*
   25          SIZE = A/3;
1 substitution
*
```

Note that a global substitution replaces all occurrences of the string, regardless of case, diacritical marks, or surrounding characters. If you want EDT to search for exact comparisons of case, enter the SET SEARCH command and specify the parameter EXACT. (For information about the SET SEARCH command, see the *VAX EDT Reference Manual*.)

If the search string occurs in the middle of a longer string, the substitution will still be made. For instance, a global substitution of IN for AT would change all words containing the string AT. (LATER would become LINER, THAT would become THIN, SAT would become SIN, and so on.) To get EDT to prompt you before each substitution, use the /QUERY qualifier with the SUBSTITUTE command:

```
*[illegible]
    1       He was in the point of no return
?
    1       He was at the point of no return
1 substitution
```

EDT prompts you for one of the following responses before each occurrence of the search string:

Y—Yes, do the substitution
N—No, do not do the substitution
Q—Quit, terminate the command
A—All, do the rest of the substitutions without query

2.3.6 Moving Text from One Location to Another

You can use the MOVE and COPY commands to move one or more lines of text from one place to another. The effect of these commands is similar; the only difference is that the COPY command does not delete the text from its original location, whereas the MOVE command does.

The syntax for the MOVE command is as follows:

```
MOVE first range TO second range/QUERY
```

When you use the MOVE command, EDT moves the lines in the first range above the line in the second range. EDT deletes the original copy of the text. For example, if you want to move lines 43 through 56 to above line 13, enter the following command:

```
*[illegible]
```

In the following example, EDT moves the current line to above line 65:

```
*[illegible]
```

The second range always refers to a single line. EDT inserts the line or lines specified by the first range just above the line specified by the second range. The lines that are moved are renumbered to be consistent with their new location.

You can use the /QUERY qualifier with the MOVE and COPY commands to verify each line to be inserted in the range. (See Section 2.3 for more information about the /QUERY qualifier.)

Use the following COPY command to copy text without deleting the original text:

```
COPY first-range TO second-range/QUERY/DUPLICATE.n
```

When you use the COPY command, EDT copies the lines in the first range to a location above the line in the second range. For example, if you want to copy lines 16 through 24 to above line 3, enter the following command:

In the following example, EDT copies lines 15 through 60 to the position just before line 95.

```
*
```

You can use the /DUPLICATE qualifier with the COPY command if you want to insert the range of text more than once. In the following example, EDT copies the first line and places it just above line 65. This operation is repeated 9 times.

```
*
1 line copied 9 times
*
```

2.3.7 Replacing Text

The REPLACE command combines the DELETE and INSERT functions in one command. You can use REPLACE when you need to delete a block of text and want to type new text in that same location. The syntax of the REPLACE command is as follows:

REPLACE range [RET] text [CTRL/Z]

When you use the REPLACE command, EDT deletes the line or lines specified by the range. As with the DELETE command, EDT prints a message telling you how many lines you have removed.

If you supply no specifiers with the command, EDT deletes the current line. As soon as EDT finishes deleting the specified line or lines, it shifts to the insert state. (The cursor moves to the right, just as it does when you enter the INSERT command.)

Anything you type after pressing RETURN is inserted. When you finish typing the new text, press CTRL/Z to signal EDT that you want to return to the asterisk prompt (*).

The following REPLACE command deletes the current line and shifts to the insert state:

```
*
   17       This is the current line.
*REPLACE
1 line deleted
            I have just deleted the current line and
            am adding new lines to my text

   18       This is the next line
*
   16       This is the line before the current line
   16 1     I have just deleted the current line and
   16 2     am adding new lines to my text.
   18       This is the next line.
```

2.4 Using Nokeypad Mode

You can use nokeypad editing on VT300-series, VT200-series, VT100-series, and VT52 terminals.

The commands you use in nokeypad editing are English words or abbreviations that you enter from the main keyboard to move the cursor and edit text. As you type nokeypad commands, they are displayed in the lower left portion of the screen. As in line mode, you press RETURN to process the commands. You can join several commands on a single line and process all of them by pressing RETURN. Note the following characteristics of the cursor in nokeypad mode:

- The cursor is at the top of the screen when you enter nokeypad mode.
- You can move the cursor by using the arrow keys.
- When you do not specify a range with your nokeypad command, you can affect the text at the cursor.

When you type two commands on the same line, such as 3W D-C, you have the option of separating them with a space (for the sake of clarity), even though EDT does not require one.

Nokeypad commands can be used to define keys for keypad mode editing.

See the *VAX EDT Reference Manual* for information on using nokeypad mode.

2.5 Modifying an EDT Environment

EDT provides many tools for modifying your own EDT environment. You can change the appearance of your screen display, the behavior of lines of text as you insert them, and the mode in which you are working. The following section discusses some of the SET commands provided by EDT. See the *VAX EDT Reference Manual* for descriptions of all the available SET commands.

2.5.1 Using SET Commands

You can use the SET commands to change the way EDT works. Some SET commands affect the display of text on your screen. For example, you can specify the number of lines you want displayed (SET LINES number) and whether or not the lines have line numbers (SET [NO]NUMBERS). You can also specify that EDT make an exact search (SET SEARCH EXACT).

By default, your screen contains 22 lines. If you want to decrease the screen display to 5 lines, enter the command SET LINES 5. If you are editing at slow data rates, you can increase your editing speed by decreasing the number of lines displayed on your screen.

When you are working in line mode, EDT displays line numbers by default. If you do not want the numbers to appear on the screen or paper, enter the command SET NONUMBERS.

By default, when you press the GOLD key followed by the FIND key, EDT searches for the specified string, disregarding the case of letters. For example, if you enter the search string *course*, EDT finds every occurrence of the word (for example, *course*, *Course*, *COURSE*). But, when you enter SET SEARCH

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EXACT, EDT only finds occurrences of the word that exactly match the specified string (*course*).

You can use the following line-mode commands to enter one of the other modes:

```
SET KEYPAD
SET NOKEYPAD
```

In a startup command file, you would use the following SET commands to determine your own default editing mode:

```
SET MODE LINE
SET MODE CHANGE
```

For example, to enter nokeypad mode from keypad mode, enter the following command after pressing GOLD/COMMAND:

```
Command: SET NOKEYPAD
```

One SET command, SET QUIET, even controls the sound of your terminal. You can use this command to suppress the terminal bell that signals an error

2.5.2 Using SHOW Commands to See What Is Set

EDT provides the SHOW commands to enable you to see what is set and what is not set. For every SET command there is a SHOW command. If you want to see the number of lines on your screen, enter the SHOW LINES command. If you want to see whether EDT is performing an exact search, enter the SHOW SEARCH command.

For example, if you want to check the number of lines displayed on your screen, enter the following command:

```
* SHOW LINES
22
```

Or, if you want to see whether line numbers will be displayed in line mode, enter the following command:

```
* SHOW NUMBERS
numbers
```

The following table lists the SET commands discussed so far along with their corresponding SHOW commands:

SET Command	SHOW Command
SET KEYPAD SET NOKEYPAD	SHOW KEYPAD
SET LINES	SHOW LINES
SET MODE LINE SET MODE CHANGE	SHOW MODE
SET NUMBERS SET NONUMBERS	SHOW NUMBERS

SET Command	SHOW Command
SET QUIET SET NOQUIET	SHOW QUIET
SET SCREEN	SHOW SCREEN
SET TRUNCATE SET NOTRUNCATE	SHOW TRUNCATE
SET WRAP SET NOWRAP	SHOW WRAP

For a complete list of the SHOW commands provided by EDT, see the *VAX EDT Reference Manual*.

2.6 Using Buffers

Buffers are temporary holding areas for text. They enable you to work with more than one file at a time. You can use the buffers available in EDT to do the following:

- Divide one or more files into sections
- Move part or all of another file into your editing session
- Create a file from part or all of the text in a buffer

When you start an editing session, EDT automatically provides a buffer called MAIN. The MAIN buffer serves as the work area for text you insert and edit. If you are editing a file that already exists, EDT puts a copy of the contents of the file into this MAIN buffer.

The MAIN buffer has the following characteristics:

- MAIN is provided automatically when you invoke EDT.
- MAIN exists during your entire editing session.
- MAIN cannot be deleted. (Only the contents, not the name, of this buffer can be deleted.)

The other buffer that EDT provides automatically is called the PASTE buffer. When you use the CUT keypad function, the deleted text goes into the PASTE buffer. Every time you perform a new CUT operation, EDT clears the PASTE buffer and replaces its contents with the newly deleted text.

The PASTE buffer has the following characteristics:

- The PASTE buffer is provided automatically when you begin your editing session.
- The PASTE buffer can be edited.
- The PASTE buffer can be loaded with the contents of another file. (Use the INCLUDE command.)
- The PASTE buffer cannot be deleted. (Only the contents, not the name, of this buffer can be deleted.)

2.6.1 Viewing Existing Buffers

If you want to see a list of the buffers in your editing session, enter the line mode command SHOW BUFFER. If you are working in your MAIN buffer and you have not used the CUT command or created any new buffers, you get the following display:

```
=MAIN     23      lines
 PASTE    no      lines
```

(The number of lines, 23, used in this example is arbitrary.)

These two buffers, MAIN and PASTE, are always displayed when you enter the SHOW BUFFER command because they always exist and you cannot delete them.

If you have just used the CUT and PASTE commands to move three lines of text and you enter the SHOW BUFFER command again, the display indicates those three lines in the PASTE buffer:

```
=MAIN     20      lines
 PASTE    3       lines
```

The current buffer (the buffer in which you are working) is preceded by an equal sign. In the example above, MAIN is the current buffer. If you cannot remember which buffer you are working in, enter the SHOW BUFFER command.

Sometimes you will notice an asterisk (*) following the line count for the MAIN buffer. This asterisk indicates that EDT has not had a chance to read through the entire input file and has seen only as many lines as are indicated

2.6.2 Creating Buffers

To create a buffer from keypad mode, press the GOLD key, followed by the COMMAND function. When EDT prompts you with *Command:*, enter the FIND command, then an equal sign followed immediately by the buffer name of your choice. A buffer name can contain any alphanumeric characters, but it must begin with a letter. The only punctuation character you can use in a buffer name is an underscore.

To create a buffer named BIRD, enter the following line after the command prompt:

```
Command:
```

When you enter this command, the screen clears except for the [EOB] symbol indicating that the current buffer, BIRD, is empty. After you press RETURN, you can insert and edit text just as you would in the MAIN buffer.

To create a buffer from line mode, enter the FIND command, an equal sign, and the buffer name after the asterisk prompt. For example:

To return to the MAIN buffer, type FIND MAIN. The buffer named BIRD remains intact until you exit from the file, when only the MAIN buffer is saved.

You can also create a buffer during a MOVE operation. For example, to move lines 1 through 17 to a new buffer named AINGE, enter the following line-mode command:

```
* MOVE 1 17 TO =AINGE
```

2.6.3 Deleting Buffers

Use the line-mode command CLEAR to delete buffers during an editing session. For example, to delete a buffer named WALTON, type the following command:

```
* CLEAR WALTON
```

You cannot delete the buffers MAIN and PASTE, only their contents. If you enter the command CLEAR MAIN, the contents of your MAIN buffer disappear, but the buffer name remains. When you e[illegible] from EDT, the contents of all the existing buffers, except MAIN, are deleted.

2.6.4 Copying Text from One Buffer to Another Buffer

To copy text from one buffer to another, enter the COPY command. For example, to copy the contents of a buffer named BIRD to a buffer named PARISH, enter the following command:

```
* COPY =BIRD TO =PARISH
```

When you complete this operation, the current buffer will be PARISH.

2.6.5 Copying Text from a File Into a Buffer

To copy text from a file outside of EDT into a buffer, use the INCLUDE command. For example, to copy the contents of a file named JOHNSON.DAT to your MAIN buffer, type the following command:

```
* INCLUDE JOHNSON.DAT =MAIN
```

2.6.6 Copying Text from a Buffer to a File

To copy text from a buffer to a file, use the WRITE command. You can use this command to copy text to a new file without affecting your editing session. For example, the following command puts a copy of lines 23 through the end of the current buffer into a file that you name MCHALE.DAT:

The following table lists the three commands you need to copy text between buffers and external files:

Direction	Command
One buffer to another	• COPY other_buffer TO this_buffer
External file to buffer	• INCLUDE alien_file_type buffer
Buffer to external file	• WRITE alien_file_type n n

2.7 Recovering a Lost Editing Session

While you are editing or inserting text, EDT is keeping track of every keystroke you enter at your terminal. EDT records this information in a file called a journal file. Unless you specify otherwise, this journal file is deleted as soon as you enter the EXIT or QUIT command. However, when you experience a system interruption, the journal file is not deleted.

The journal file does not contain a version of your text. Rather, it contains a record of the keystrokes you entered during the session. By combining the journal file with the text that you had at the beginning of your session, you can recover your session to a point just before the interruption.

Note: Sometimes, the last few keystrokes are missing. This is normal. No work from earlier in your session will be omitted.

The following command line demonstrates how to recover a file named TRAVEL.SDML after the editing session has been interrupted:

```
$ EDIT/RECOVER TRAVEL.SDML
```

When you work with journal files, you will notice that they have a file type of JOU. The file name is the same as the file you were editing. The journal file for TRAVEL.SDML is TRAVEL.JOU. And, the journal file for ASCONA.LIS is ASCONA.JOU.

To recover an editing session you had begun with the command EDIT JONES.DAT, enter the following command line:

```
$ EDIT/RECOVER JONES.DAT
```

Notice that you enter the name of the file you were editing, not the name of the journal file. If you enter the JOU file type, you edit the journal file. After you enter the EDIT/RECOVER command, EDT replays the editing session. When it finishes, you can continue editing.

You can start an editing session and interrupt it to see how the /RECOVER qualifier works with the following steps:

1. Invoke EDT to create a file named NBA.FUN.
2. Insert text into NBA.FUN and perform a number of edits.
3. Press CTRL/Y to end the editing session abruptly. (You will be at the DCL command level at this point.)
4. Enter the DCL command DIRECTORY to see the newly created journal file (NBA.JOU).

5 Invoke EDT again, using the /RECOVER qualifier to recover your lost session, by entering the command line:

```
$ EDIT/RECOVER NBA.LIS
```

6 Be sure that your last few keystrokes were recovered and continue to edit the file. Then enter the EXIT or QUIT command to terminate your editing session.

7 Enter the DCL command DIRECTORY again. The journal file, NBA.JOU, is not there because you have exited normally from EDT.

2.8 Creating Columns and Layered Text

You can use EDT's tabbing facility in keypad mode to format text in two ways: in columns of eight and in layers.

2.8.1 Creating Columns of Eight

EDT has automatic tabs set for columns eight characters wide. Therefore, when you press TAB, your text moves to the nearest preset tab stop: column 9, 17, 25, 33, 41, 49, and so on. TAB always moves your text to the right regardless of EDT's current direction. If you want to move text back toward the left margin, use the DELETE key.

The following example demonstrates how to use TAB. Enter the following lines of text:

```
Tab each word in this sentence?
Tab each word in this sentence?
Tab each word in this sentence?
```

Move the cursor to the first letter of the first word and press TAB. Then move the cursor to the first letter of the second word and press TAB; then, to the third word and press TAB, and so on. When you are done, the sentences look as follows:

```
Tab     each    word    in      this    sentence?
Tab     each    word    in      this    sentence?
Tab     each    word    in      this    sentence?
```

The words are organized in columns of eight characters. As long as you want to arrange text in columns of eight, you can use TAB.

2.8.2 Creating Layers of Text

If you have layered text, such as an outline, you can use the line mode command SET TAB along with the TAB key to format the lines. When you enter the SET TAB command and specify a value (for example, 15), you can tab your first item over 15 spaces by pressing TAB. The following example shows a list of colors:

```
red
green
beige
blue
white
```


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After you enter the following line mode command, move the cursor to the first letter of each word in your list of colors and press TAB:

```
* SET TAB 10
```

Your tabbed list is shown below:

```
red
green
beige
blue
white
```

The two most important things to remember when you are using SET TAB are the following:

- The SET TAB value only affects the first indentation on a line.
- The cursor must be at the left edge of the screen on the line being moved

To format an outline, use the line-mode command SET TAB along with the keys CTRL/E, CTRL/D, and TAB to change the indentation level of your lines.

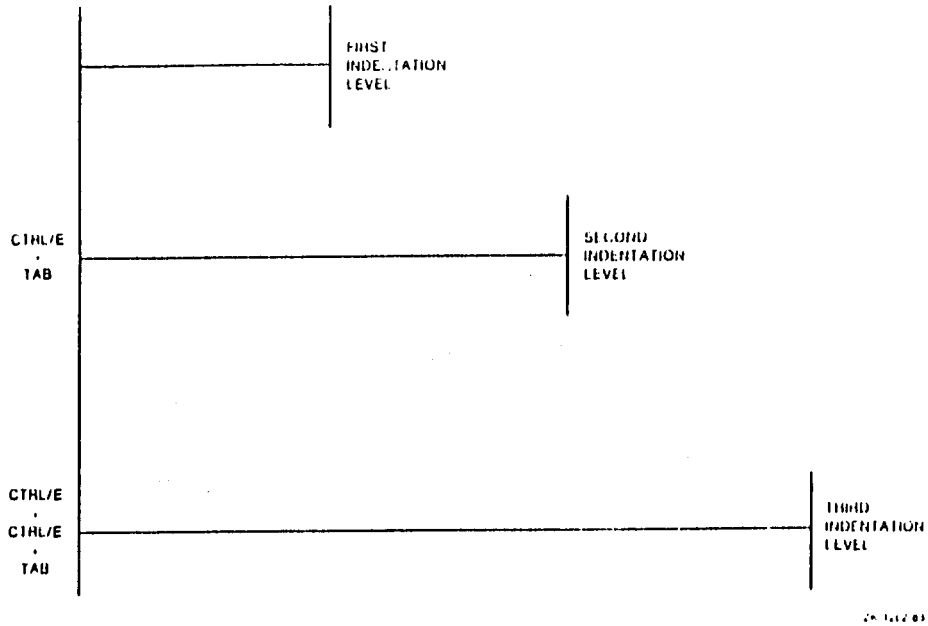
Enter the SET TAB command to set the indentation level. After you enter the SET TAB command, you can move the first line to be indented to the first indentation level by pressing TAB. To move a line of text to the second indentation level, press CTRL/E. Then press TAB to actually move the line of text. You increase the indentation level of the text by pressing CTRL/E, and you move the text to the desired level by pressing TAB.

For example, enter the command SET TAB 10, press TAB, and type the word TEN. Press RETURN. Then press CTRL/E, followed by TAB, and type the word TWENTY. Press RETURN. Next, press CTRL/E again, TAB, and type the word THIRTY. Press RETURN. Finally, press CTRL/E, TAB, and type the word FORTY. Your display will look as follows:

```
TEN
          TWENTY
                    THIRTY
                              FORTY
```

Figure 2–5 shows the keys TAB and CTRL/E with their corresponding indentation levels.

Figure 2–5 Using CTRL/E to Increase the Indentation Level



Use CTRL/D to select the next lower indentation level. CTRL/D does the opposite of CTRL/E. It lowers the indentation level count by the value of SET TAB. It does not move text back toward the left margin; rather, it reduces the number of spaces that text is moved to the right.

Figure 2–6 shows the keys TAB and CTRL/D with their corresponding indentation levels.

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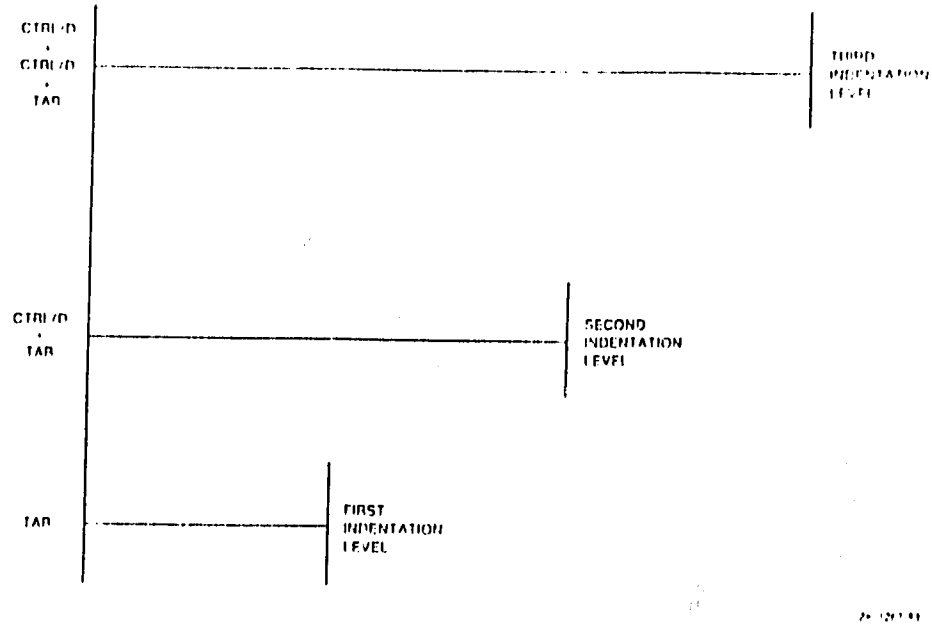
Figure 2–6 Using CTRL/D to Decrease the Indentation Level



The following sampling shows part of an outline before you indent the lines:

```
I
A.
B.
1.
C.
II
```

Now perform the following steps:

1. Choose the number of spaces you want to indent (for example, 5).
2. Enter the SET TAB command followed by that number.
3. Move the cursor to the Roman numeral I and press TAB.
4. Move the cursor to the letter A, press CTRL/E, and press TAB.
5. Move the cursor to the letter B and press TAB.
6. Move the cursor to the number 1, press CTRL/E, and press TAB.
7. Move the cursor to the letter C, press CTRL/D, and press TAB.
8. Move the cursor to the Roman numeral II, press CTRL/D, and press TAB.

The outline is now formatted as follows:

```
        A.
        B.

        C.
    II
```

The following shows a longer outline and the tabbing keys you press to create it:

```
                    Malcolm's Family Tree

[TAB]
     I. Malcolm
[CTRL/E] + [TAB]
          A. Ian
[TAB]
          B. Tatiana
[TAB]
          C. Lars
[CTRL/E] + [TAB]
               1.  Stephanie
[TAB]
               2.  Brian

[CTRL/D] + [CTRL/D] + [TAB]
     II.Frederick
[CTRL/E] + [TAB]
          A. Louis
[CTRL/E] + [TAB]
               1.  Elsa

[CTRL/D] + [CTRL/D] + [TAB]
     III.Louisa
[CTRL/E] + [TAB]
          A. Jeffrey
[TAB]
          B. Andrew

[CTRL/D] + [TAB]
     IV.Sonya
[CTRL/E] + [TAB]
          A. Beth
[TAB]
          B. Celia
[TAB]
          C. Franklin
[CTRL/E] + [TAB]
               1. Martin
[CTRL/E] + [TAB]
                    a) Stephan
[CTRL/D] + [CTRL/D] + [TAB]
          D. Martha
```

Note: Only two keypad tabbing functions actually move text: TAB . [CTRL/T. The remaining three functions (CTRL/A, CTRL/D, and CTRL/E) determine the effect that the first two have on your text. CTRL/A and CTRL/T are discussed in the following sections.

2.8.3 Using CTRL/A to Indent Text

You can use CTRL/A to move a line of text to more than one indentation level without having to enter repeated tab increments (CTRL/E). There are three steps to the process:

1. Enter a SET TAB command, specifying a value.
2. Move the cursor to one of the indentation levels. The indentation level must be a character position that is a multiple of the value you specified with SET TAB. For example, you could move the cursor to 20 or 25 if the tab size is 5.
3. Press CTRL/A.

Once you choose the indentation level you want, and establish the position with CTRL/A, you can use TAB to indent the line of text to that place.

If you want to indent text to a different indentation level after establishing a position with CTRL/A, you can either use CTRL/A again to reset the position or use CTRL/E and CTRL/D to adjust the indentation level up or down.

Note: **If the cursor position is not evenly divisible by the SET TAB value when you press CTRL/A, EDT displays the message *Could not align tabs with cursor*.**

2.8.4 Using CTRL/T to Indent Groups of Lines of Text

Use CTRL/T to indent groups of lines using the current SET TAB value. The CTRL/T function is similar to CTRL/A, CTRL/D, and CTRL/E in the following ways:

- CTRL/T has no effect unless you have specified a value with the SET TAB command.
- CTRL/T moves entire lines of text.

On the other hand, CTRL/T differs from these other CTRL tabbing functions in the following ways:

- When you press CTRL/T, you do not press TAB to make the block of text move to the right. The text moves automatically.
- The block of text is indented only the amount of the value established with the SET TAB command, without regard to the current indentation level.

To allow CTRL/T to work correctly in EDT, you must disable DCL control over CTRL/T. By default, DCL displays process statistics when you press CTRL/T. To disable DCL control, enter the following command at the DCL command level:

```
$
```

To indent text using CTRL/T, use the SELECT command to choose a range of lines, and then press CTRL/T. EDT indents the range of lines only to the current SET TAB value. To indent text by multiples of the SET TAB value use the GOLD repeat function described in Section 2.2.2.

Note: All the functions, except for TAB, require that a SET TAB value be established for your editing session. EDT's default is SET NOTAB. As long as NOTAB is in effect, pressing CTRL/A, CTRL/D, CTRL/E, or CTRL/T has no effect on the text you are editing.

2.8.5 Looking at the Indentation Level

Use the SHOW TAB command to see the value specified with the SET TAB command and the current indentation level. For example, if you set your tab size to 15 and press CTRL/E twice, EDT displays the following information when you enter the SHOW TAB command:

```
* SHOW TAB
tab size 15, tab level 3
```

For more information on the SHOW TAB command, see the *VAX EDT Reference Manual*.

2.9 Defining Keys

When you define or redefine a key, you change the function of that key. You can use combinations of nokeypad commands or existing keypad functions to dictate what a key does.

Some advantages of defining keys are as follows:

- You can take advantage of different entities available in nokeypad mode. For example, you can define keys to delete sentences, paragraphs, and pages.
- You can combine several nokeypad commands into one key definition. For example, you can define a key to find a word, delete it, and substitute several words in its place.
- You can access nokeypad commands that do not exist in keypad editing, such as SHL, SHR, CHGL, CHGU, and DATE.

2.9.1 Definition Procedure

EDT provides two commands to define keys: CTRL/K and DEFINE KEY. The line-mode command DEFINE KEY allows you to put key definitions in startup command files and EDT macros, as well as to create key definitions during your EDT session. You can only use CTRL/K when working in keypad mode.

2.9.1.1 Using CTRL/K to Define a Key

To define a key in keypad mode, do the following:

1. Press CTRL/K.
2. Press the key (or key sequence) you want to define (for example, GOLD/A or CTRL/H).
3. Type in the key definition. (Either enter a string of nokeypad commands or press a sequence of keypad function keys, or both.)

4 Type a period.

5 Press the ENTER key.

To define keys, you need to be familiar with nokeypad commands. See the *VAX EDT Reference Manual* for more information.

The following example uses D and SEN. D is the delete command and SEN refers to a string of characters (a sentence) enclosed by delimiters. This example defines CTRL/A to delete the sentence at your cursor.

```
Press the key you wish to define

Now enter the definition terminated by ENTER
D SEN. ENTER
```

The following example demonstrates how to define a key in keypad mode to draw a vertical line:

```
Press the key you wish to define
[CTRL/V]
Now enter the definition terminated by ENTER
(22 I |. ENTER
```

In this example, CTRL/K tells EDT to define the key combination CTRL/V. The number 22 tells EDT to execute the commands in the parentheses 22 times. The definition for the Down arrow is +V. The command I tells EDT to put the vertical bar character into your text. The insert command is terminated by ^Z. The period ensures that the command will take effect as soon as you press the key.

Note: The ^Z is typed as a circumflex followed by the letter Z.

2.9.1.2 Using the DEFINE KEY Command

The DEFINE KEY command allows you to assign a different command to a key or assign a string of text to a key. To assign a command to a key, use the following syntax with the DEFINE KEY command:

```
DEFINE KEY key name AS "command(s) "
```

Key name is the name of the key or its keypad number, for example, DEFINE KEY GOLD F or DEFINE KEY 3. (See Figure 2-1 for keypad diagrams showing key names and keypad numbers. Note that you use the small number in the lower right corner on the keypad diagram. For example, you would use the number 11 to redefine keypad key PF3.) Type the *command(s)* which is the actual definition, completely in nokeypad syntax. Follow the nokeypad commands with a period and enclose the definition (and the period) in quotation marks or apostrophes.

Note: To use a key you have defined with the DEFINE KEY command, you must be in keypad mode. To enter keypad mode, see Section 2.1.4.

The steps for defining a key using the DEFINE KEY command are outlined below:

1 Enter line mode. (See Section 2.1.4 if you need help.)

2 Enter the DEFINE KEY command

3 Type the key name you want to define followed by the word AS (for example, DEFINE KEY CONTROL B AS . . .).

4 Enter a string of nokeypad commands followed by a period. Enclose the string and the period in quotation marks (for example, DEFINE KEY CONTROL B AS *D+NL*.).

5 Press RETURN.

6 Exit line mode. (See Section 2.1.4 if you need help.)

To assign a string of text to a key, use the following syntax with the DEFINE KEY command:

```
DEFINE KEY key-name AS "IInsert your te · here ^Z "
```

In this example, the command to insert text is enclosed in quotation marks. The following components are in the quotation marks:

- The INSERT command (I).
- Text to be inserted.
- ^Z (to complete the insertion). Remember to enter the ^Z by typing the circumflex followed by the letter Z.
- A period to enable the command to take effect as soon as you press the key.

When you use the DEFINE KEY command to define CTRL keys, for example CTRL/A, type the word CONTROL:

```
DEFINE KEY CONTROL A AS "command."
```

When you want to define the GOLD key, for example GOLD 5, type the word GOLD:

```
DEFINE KEY GOLD 5 AS "command "
```

When you want to redefine a function key on the LK201 keyboard, type the word FUNCTION, as in the following example:

```
DEFINE KEY FUNCTION 29 AS "command "
```

To create key definitions, you can consolidate several keypad functions into one key definition. The following table lists the key names you use when you define keys:

Key name	VT100	VT52	LK201
20	PF1	red key	PF1
10	PF2	blue key	PF2
11	PF3	black key	PF3
17	PF4	-	PF4
0-9	keypad 0-9	keypad 0-9	keypad 0-9
16	period key	period key	period key
19	comma key	comma key	comma key
18	minus key	minus key	minus key

Key name	VT100	VT52	LK201
21	ENTER key	ENTER key	ENTER Key
FUNCTION 1	-	-	Find
FUNCTION 2	-	-	Insert Here
FUNCTION 3	-		Remove
FUNCTION 4	-		Select
FUNCTION 5	-	-	Previous Screen
FUNCTION 6		-	Next Screen
FUNCTION 28		-	Help
FUNCTION 29	-	-	Do

You can combine keypad functions to correct typing errors. For example, to correct reversed letters, you delete a character, press the Right arrow key and undelete the character. Suppose you type the word *social* as *social*. You would move the cursor to the *o*, delete it, press the Right arrow key to move the cursor to the *c*, and undelete the *o*. The following table displays the steps translated into nokeypad commands:

Function	Nokeypad Commands
delete a character	D+C
move cursor one character to the right	+C
undelete a character	UNDC

To define CTRL/R to do all three commands at once (thus saving you keystrokes), enter the following line:

```
[illegible]
```

Now, when you press CTRL/R, EDT will reverse the two characters at the cursor.

2.9.2 Which Keys Can Be Defined

You can define all keypad keys, all function keys, and GOLD with either a keypad key or a function key.

```
DEFINE KEY 8 AS "command "
DEFINE KEY GOLD 8 AS "command."
DEFINE KEY FUNCTION 34 AS "command "
```

You can define GOLD/keyboard keys. A GOLD/keyboard key refers to the combination of GOLD with a key on the main keyboard.

```
DEFINE KEY GOLD A AS "command "
```

When you define a GOLD/keyboard key sequence, enclose the following symbols within quotation marks (except for quotation marks, which you must enclose within apostrophes):

exclamation point (!)
percent sign (%)

apostrophe (')
quotation marks (")

For example, you can define the following GOLD sequence to exit from EDT in one step, without having to press several keys and type EXIT:

You can also define keys using the control key (CTRL) with letter keys as well as with brackets ([ ]), a backslash (\), a tilde (~), a circumflex (^), and an underscore (_).

```
DEFINE KEY CONTROL A AS "command "
DEFINE KEY CONTROL [ AS "command "
```

You can also define GOLD CONTROL keys (for example, DEFINE KEY GOLD CONTROL AS *command*). When you use GOLD and CONTROL, press the GOLD key first, then hold down the CTRL key while you press the keyboard key.

Do not define the following key combinations:

CTRL/C
CTRL/O
CTRL/Q
CTRL/S
CTRL/T (unless you SET NOCONTROL=T)
CTRL/X
CTRL/Y
GOLD/CTRL/C
GOLD/CTRL/O
GOLD/CTRL/Q
GOLD/CTRL/S
GOLD/CTRL/X
GOLD/CTRL/Y
GOLD/digit (keyboard keys 0 through 9)
GOLD/minus sign (-)

You can redefine the following key combinations, but be aware of their default functions:

CTRL/H (BACKSPACE)
CTRL/I (TAB)
CTRL/J (LINEFEED)
CTRL/M (RETURN)

2.9.3 Saving Key Definitions

Once you define a key, it stays defined throughout your editing session until you EXIT, QUIT, or redefine the key. You can save key definitions, however, by including them in your startup command file or in a macro file. The following is a sample section from a startup command file:

```
DEFINE KEY CONTROL R AS "EXT INCLUDE ?'INCLUDE FILE: ' "❶
DEFINE KEY CONTROL G AS "EXT FIND-MAIN "❷
DEFINE KEY CONTROL L AS "EXT EXIT "❸
DEFINE KEY CONTROL H AS "EXT QUIT "❹
```

When you press:

1. CTRL/R, EDT prompts you for a file to include.
2. CTRL/G, EDT puts you at the top of the MAIN buffer.
3. CTRL/L, EDT exits your editing session.
4. CTRL/N, EDT quits your editing session.

See Section 2.11 for more information about saving key definitions in startup command files.

2.10 Using Macros

EDT allows you to define a series of line mode commands as a macro. The following sections explain how and why you would want to do this.

2.10.1 Introduction

A macro is a sequence of line-mode commands that you can execute when you type the macro name. You use the DEFINE MACRO command to add the macro name to the list of valid line mode commands for the duration of your editing session.

2.10.2 Creating a Macro

To create a macro, assign a name (for example, CONCERTS) with the DEFINE MACRO command:

[illegible]

Next, enter a buffer of the same name:

[illegible]

Then, type the list of line-mode commands; in this case, use the INSERT command to create a list of dates. Type the INSERT command followed by the semicolon, one space, and then the text to be inserted. End the list with CTRL/Z to invoke the line-mode prompt. (To return to the current line in the MAIN buffer, enter the FIND=MAIN command.)

[EOB]

EDT executes that series of commands whenever you type the name of the macro as a line command, as shown in the following example:

```
*
*

1       February 11, 1988
2       May 2, 1988
3       December 9, 1988
4       January 20, 1989
5       March 20, 1989
6       April 7, 1989
7       August 25, 1990
```

2.10.3 Macro Functions

Although macros can contain only line-mode commands, they are able to perform a variety of functions, including the following:

- Macros can contain SET commands to tailor your editing session.
- Macros can contain a series of line mode commands.
- Macros can contain a series of key definitions.
- Macros can define other macros or call up macros from external files.

2.10.4 Comparing Macros to Startup Command Files

Both macros and startup command files contain line-mode commands, but macros are more flexible. A startup command file (see Section 2.11) is executed once at the beginning of an editing session. But, you can create and access many different macros containing different sets of commands during one editing session just by typing the macro name.

2.10.5 Saving Macros

Macros can be created at any time during your editing session and can be used for the remainder of the session. Since they are located in buffers, they disappear as soon as you leave EDT. If you create a macro that you want to save for other EDT sessions, you can use the EDT command WRITE to put a copy of the macro in an external file. When you need that macro again, use the INCLUDE command to copy the macro into a buffer and then establish the macro name as a command with the DEFINE MACRO command.

The following example illustrates this process:

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```
$
*                                  ❶
*                ❷
*
                 ❸

[EOB]
*                                  ❹
DISK$:[HARTWELL]HEADING.MAC;1 4 lines
*

$
*          ❺

Unrecognized command
*
*                                  ❻
*                                  ❼
*          ❽
*          ❾
*

    Name:
    Address:
    Number:
    Date:
```

❶ The DEFINE MACRO command makes HEADING a valid line mode command.

❷ You enter a buffer named HEADING.

❸ You use four INSERT commands to create the text you want to use.

❹ The WRITE command puts a copy of the macro in an external file.

❺ In a new editing session, EDT does not recognize the macro named HEADING until you define the macro with the DEFINE MACRO command.

❻ The INCLUDE command brings the macro in from an outside file and puts it in the buffer named HEADING.

❼ The DEFINE MACRO command makes HEADING a valid line mode command.

❽ You return to the MAIN buffer. (You must leave the buffer containing the macro before you use the macro as a line mode command.)

❾ The HEADING command now functions as a line mode command.

Note: Macros override line-mode commands. If you create a macro with the same name as an existing line-mode command, EDT performs the macro, not the line-mode command. As long as the macro is in effect, it overrides the default line-mode command. If you need to reestablish the default use of the line-mode command, use the CLEAR command to eliminate the buffer with the same name.

2.10.6 Including Specifiers in a Macro

When you use line-mode commands that take specifiers, you must include the appropriate specifier in the macro text. For example, if you create a macro that includes a substitute command, you must supply the strings for EDT to use with that command.

You cannot use the SUBSTITUTE command in a macro and expect to enter the strings after typing the macro name.

The same rule applies when you use a command like TYPE in your macro. If you want to have a command that automatically types the current line and the next 9 lines, you can create the macro XTYPE to be:

```
TYPE . THRU +9
```

You cannot, however, create a command that lets you choose the number of lines to type and allows you to enter the final digit from the terminal.

2.11 Startup Command Files

A startup command file contains EDT line-mode commands that are executed when you invoke EDT—before you receive control of the editor. You can use startup command files to customize your EDT sessions. You can create startup command files in either your current or main directory. Some of the line-mode commands that a startup command file might contain are:

- DEFINE KEY commands—To redefine the function invoked by a function key, a keypad key, or a control character while you are editing in keypad mode.
- DEFINE MACRO commands—To associate a name with a sequence of line editing commands stored in a text buffer. You can then invoke the sequence by entering the macro name in response to the line editing asterisk prompt.
- INCLUDE commands—To bring text from a file into a text buffer. You might use them to load macros into a buffer, or to fill a buffer with text that you often use.
- SET commands—To establish EDT operating parameters. For example, SET TAB establishes the increment for structured tabs, and SET MODE CHANGE invokes keypad mode.

When you begin an editing session, EDT automatically searches your current directory for a startup command file named EDTINI.EDT. EDT then processes the commands in that file before giving control to you. For example, if you create an EDTINI.EDT file and include the following line-mode commands, EDT automatically executes these commands the next time you invoke EDT:

```
$                                  ❶
Input file does not exist
[EOB]
*                                  ❷
                                   ❸

*
                                   ❹
```

❶ EDT is invoked to create the file named EDTINI.EDT.

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❷ SET QUIET suppresses the bell sound when EDT prints an error message (in keypad mode).

❸ SET NONUMBERS suppresses line numbers in line mode.

❹ Now when you invoke EDT to edit a file named LIST.DAT, the commands in EDTINI.EDT execute before you gain control of the editor.

Because EDTINI.EDT is the default startup command file, you do not need to name it in the command line. If you want EDT to use a startup command file with another name, you must include that command file specification in the EDIT/EDT command line.

The following example demonstrates how to create a two-line startup command file:

```
$ [illegible]
Input file does not exist
[EOB]
+ [illegible]
[illegible]

[EOB]
+ [illegible]
```

In this example, the name of your startup command file is SETUP.EDT. It contains two SET commands: SET MODE and SET LINES. SET MODE CHANGE causes EDT to begin your editing session in keypad mode, and SET LINES 5 limits the display of text on your screen to five lines.

Use the qualifier /COMMAND= with the EDIT command to indicate the startup command file you want EDT to use. The following command line tells EDT to execute the line-mode commands in the startup command file named SETUP.EDT to edit a file named FUN.FUN:

```
$ [illegible]
```

The following startup command file contains two SET commands, three DEFINE KEY commands, and one DEFINE MACRO command:

```
SET WRAP 60 ❶
SET SEARCH EXACT ❷
DEFINE KEY GOLD W AS "CHGUW." ❸
DEFINE KEY CONTROL B AS "EXT INCLUDE ?'INCLUDE FILE: '." ❹
DEFINE KEY CONTROL G AS "EXT FIND=MAIN." ❺
FIND=GENERAL ❻
INSERT ;SET SEARCH GENERAL ❼
DEFINE MACRO GENERAL ❽
FIND=MAIN ❾
```

❶ Limits the line length for inserting text in keypad mode to 60 characters.

❷ Causes EDT to match exactly the case and diacritical marks (for example, grave accent or circumflex) of letters in search strings.

❸ Defines GOLD/W to change all lowercase letters in a word to uppercase.

❹ Defines CTRL/B to extend the INCLUDE line command to keypad mode and issue a prompt.

❺ Defines CTRL/G to return to the MAIN buffer.

❻ Creates a buffer named GENERAL and moves there.

❼ Inserts the line-mode command SET SEARCH GENERAL.

❽ Adds GENERAL to the list of valid line mode commands.

❾ Returns to the first line of the MAIN buffer.

APPENDIX - E

PC COORDINATE CONVERSION PROGRAM "CONVERT"

PC COORDINATE CONVERSION PROGRAM "CONVERT"

WAPDA users who undertake different aspects of area planning will have to collect data in different forms. Maps of divisions, towns and other areas will be a part of the data collected. It has been discovered that maps of adjoining areas required for a study may have different scales and different coordinate systems. Some maps may have latitude and longitude markings as well. WAPDA has standardized the Lambert Conformal Conic Projection based on two Standard Parallels as its standard rectangular coordinate systems. This system is being followed by all the mapping contractors in plotting their maps and determining relative locations of surveyed facilities. These maps will be available in due course of time.

For the maps currently available, there will be a frequent need to use a single standardized rectangular coordinate system. This system, as described above, is the Lambert System. This section describes the usage of a PC based program "CONVERT" which is used to convert from Geodetic Position (Latitudes/Longitudes) to Lambert System and vice versa. Pakistan is covered by two Lambert grids i.e. Grid I and Grid IIA.

This section lists the Area Boards covered under each grid and also gives the values of parameters required for conversions in both grids.

The step by step procedure of using the program "CONVERT" is given for the users convenience.

INFORMATION NEEDED TO RUN THE CONVERT PROGRAM

CONVERT Program users may use this information for converting coordinates from Geodetic to Lambert System. These are constants for Grid I and IIA of the Lambert System covering Pakistan.

1. Lambert Grid I

- Regions covered:
  - Faisalabad
  - Gujranwala
  - Islamabad
  - Lahore
  - Peshawar
  - Multan
  - Quetta - Loralai

Inputs

- Standard Parallels
  - 29° 41' 9"
  - 35° 18' 51"
- True Origin

Latitude	24° 16' 0"
Longitude	E 68° 0' 0"
Easting	2,743,196.4 Meters

2. Lambert Grid IIA

- Regions covered:
  - Hyderabad
  - Quetta - Turbat
  - Quetta - Kalat

Inputs

- Standard Parallels
  - 24° 0' 0"
  - 28° 0' 0"
- True Origin

Latitude	17° 45' 52"
Longitude	E 74° 0' 0"
Easting	2,743,196.4 Meters

SAMPLE RUN FOR COORDINATE CONVERSION OF LATITUDE AND LONGITUDE TO LAMBERT GRID I, IN METERS

This is a sample run with the CONVERT program, showing everything that appears on the screen. Two points are computed, one of them being re-computed because of a data entry error.

```
D:\>CD COORDCON

D:\COORDCON>CONVERT


                Welcome to program "CONVERT"
             ************************************
             (by Karl E. Kleinn, Copyright 1988)

Your diskette also contains the complete User Guide
to program "CONVERT" in an ASCII file named CONVERT.DOC.
You can print this file with the DOS "PRINT" command.

Some prompts show a character in these brackets: < >.
The character shown indicates the program default; when
the displayed  character shows the option of your choice
you only need to press the <ENTER> key (carriage return).

When keyboard input is chosen ( K at first prompt ), the
later POINT ID prompt displays <COUNT>.  Pressing <ENTER>
at this prompt causes the program to automatically assign
the current point count number as a point ID starting with 1
for the first point after the program is started.  The
resulting point ID will be right justified in the ten(10)
character output field.  If you enter a point ID it will be
left justified.

                G O O D   L U C K !

Press <ENTER> to continue  <ENTER>


POINTS INPUT FROM KEYBOARD OR FILE ? (K/F) <K> :_K_ or <ENTER>

DO YOU WANT TO CREATE A PRINT FILE ? (Y/N) <N>:_Y_

DESIRED FILENAME FOR PRINT FILE ( WITH DRIVE AND
DIRECTORY IF DESIRED, UP TO 40 CHARACTERS ):PCOORDS
```

```
ASCII OUTPUT FILENAME ? ( WITH DRIVE AND DIRECTORY
IF DESIRED, UP TO 40 CHARACTERS ) : OCOORDS

OLD COORDINATE SYSTEM ?

0     FOR LONGITUDE, LATITUDE
1     FOR UNIVERSAL TRANSVERSE MERCATOR ( U.T.M. )
2     FOR STATE PLANE LAMBERT ( INCLUDES ALASKA ZONE 10 )
3     FOR STATE PLANE TRANSVERSE MERCATOR
4     FOR ALASKA TRANSVERSE MERCATOR ( ZONES 2 THRU 9 )
5     FOR SOUTH-EASTERN ALASKA OBLIQUE MERCATOR, ALASKA ZONE 1
6     FOR MAP UNITS OF EQUATORIAL MERCATOR PROJECTION
7     FOR GENERALIZED LAMBERT CONFORMAL CONIC PROJECTION WITH
      TWO STANDARD PARALLELS


ENTER THE APPLICABLE ONE DIGIT NUMBER : 0

DESIRED NEW COORDINATE SYSTEM ?

0     FOR LONGITUDE, LATITUDE
1     FOR UNIVERSAL TRANSVERSE MERCATOR ( U.T.M. )
2     FOR STATE PLANE LAMBERT ( INCLUDES ALASKA ZONE 10 )
3     FOR STATE PLANE TRANSVERSE MERCATOR
4     FOR ALASKA TRANSVERSE MERCATOR ( ZONES 2 THRU 9 )
5     FOR SOUTH-EASTERN ALASKA OBLIQUE MERCATOR, ALASKA ZONE 1
6     FOR MAP UNITS OF EQUATORIAL MERCATOR PROJECTION
7     FOR GENERALIZED LAMBERT CONFORMAL CONIC PROJECTION WITH
      TWO STANDARD PARALLELS

ENTER THE APPLICABLE ONE DIGIT NUMBER : 7

DO YOU HAVE ALL PARAMETERS AT HAND TO DEFINE THE
LAMBERT  PROJECTION ?     YOU NEED : DEG.MIN.SEC OF THE TWO
STANDARD PARALLELS, OF THE CENTRAL MERIDIAN, AND OF THE LATI-
TUDE FOR THE Y ORIGIN ( WHERE Y = 0 ), THE FALSE
EASTING ( X VALUE ) AT THE CENTRAL MERIDIAN AND ITS UNITS
( FEET OR METERS ), AND HEMISPHERE FOR THE PROJECTION
( NORTH OR SOUTH )


Do you have all those at hand ? ( Y or N ) <Y> : Y

NORTH OR SOUTH OF THE EQUATOR ? ( N OR S ) <N> : N

DEG,MIN,SEC OF STANDARD PARALLEL WITH SMALLER VALUE
OF LATITUDE, USE DECIMAL POINTS, SEPARATE BY COMMAS  : 29.,41.,9.

DEG,MIN,SEC OF STANDARD PARALLEL WITH LARGER VALUE
OF LATITUDE, USE DECIMAL POINTS, SEPARATE BY COMMAS  : 35.,18.,51.
```

DEG,MIN,SEC, OF LATITUDE FOR Y ORIGIN (IS ASSUMED
TO BE IN THE SAME HEMISPHERE AS STANDARD PARALLELS) : 24.,16.,0.

HEMISPHERE,DEG,MIN,SEC OF CENTRAL MERIDIAN
FOR EXAMPLE : W93.,30.,0. ---------- : E68.,0.,0.

UNITS OF FALSE EASTING ?
1 IF IN FEET, 0 IF IN METERS <0>
ENTER THE APPLICABLE ONE DIGIT NUMBER : 0 or <ENTER>
FALSE EASTING FOR CENTRAL MERIDIAN, CARRIAGE RETURN
TO DEFAULT TO 10000000. FEET (10 MILLION) : 2743196.4

DESIRED NEW COORDINATE SYSTEM ?

1 IF IN FEET, 0 IF IN METERS <0>
ENTER THE APPLICABLE ONE DIGIT NUMBER : 0 or <ENTER>

Codes and names of all spheroids this program has available

CODE	SPHEROID NAME
0	EVEREST (DEFAULTS TO THIS WHEN YOU PRESS <ENTER>)
1	CLARKE 1880
2	BESSEL 1967
3	MODIFIED MERCURY 1968 (FISHER 1968)
4	INTERNATIONAL 1909,1924 (HAYFORD)
5	WGS 72 (WORLD GEODETIC SYSTEM 1972)
6	NEW INTERNATIONAL 1967
7	CLARKE 1866
8	WGS 66 (WORLD GEODETIC SYSTEM 1966)
9	GRS 80 (GEODETIC REFERENCE SYSTEM 1980)
10	AIRY
11	MODIFIED EVEREST
12	MODIFIED AIRY
13	WALBECK
14	SOUTH-EAST ASIA 1960 (FISHER)
15	AUSTRALIAN NATIONAL - SOUTH AMERICAN 1969
16	KRASSOVSKY
17	HOUGH
18	MERCURY 1960 (FISHER)

FIND NEW SYSTEM SPHEROID CODE AND ENTER THE NUMBER
(<CR> FOR EVEREST DEFAULT) : 0 or <ENTER>

	COORD.SYS.	ZONE	SPHER.	UNITS
OLD SYSTEM :	0	0	0	0
NEW SYSTEM :	7	0	0	0

```
LONGITUDE, LATITUDE INPUT IN DEG. MIN. SEC ? (1)
DEGREES WITH DECIMAL FRACTIONS ? (2), OR MAP UNITS ? (3)

Enter your choice  ( 1, 2, or 3 ) : 1

POINT ID (UP TO 10 CHARACTERS), <COUNT> : 1  or <ENTER>

ENTER HEMISPHERE (E or W) & DEG,MIN,SEC OF LONGITUDE
USE DECIMAL POINTS,SEPARATE BY COMMAS,E.G.: W93.,27.,45.1234

E or W and Longitude : E72.,0.,0.

ENTER LATITUDE, AS ABOVE BUT N or S FOR HEMISPHERE

N or S and Latitude : N31.,0.,0.


GEODETIC POSITION ( LONG,LAT )  TO: GENERAL LAMBERT CONFORMAL CONIC
                                          USER SPECIFIED
                                       EVEREST SPHEROID
UNITS ARE DEGREES   ,MIN,SEC           UNITS ARE METERS

Point ID : 1          , Running count No.:    1
X,Y       72.000000000  31.000000000  X,Y  3124805.286  755430.252
LONGITUDE  E  72  0   .00000 ,      IN MAP UNITS :   90720000.000
LATITUDE   N  31  0   .00000 ,      IN MAP UNITS :   75960000.000

New point ? (P), Change coordinate system ? (C), or Stop ? (S)

Enter P , C , or S <P> : P

POINT ID (UP TO 10 CHARACTERS), <COUNT> :  <ENTER>

ENTER HEMISPHERE (E or W) & DEG,MIN,SEC OF LONGITUDE
USE DECIMAL POINTS,SEPARATE BY COMMAS,E.G.: W93.,27.,45.1234

E or W and Longitude : 74.,0.,0.     Note: This is a mistake which
                                            will be corrected by
                                            re-computing the point.

ENTER LATITUDE, AS ABOVE BUT N or S FOR HEMISPHERE

N or S and Latitude : N33.,0.,0.

Point ID :            2, Running count No.:    2
X,Y       4.000000000  33.000000000  X,Y -2878442.402  2710046.542
LONGITUDE  E   4  0   .00000 ,      IN MAP UNITS :   66240000.000
LATITUDE   N  33  0   .00000 ,      IN MAP UNITS :   76680000.000

New point ? (P), Change coordinate system ? (C), or Stop ? (S)
```

```
Enter P , C , or S <P> : P

POINT ID (UP TO 10 CHARACTERS), <COUNT> : 2    Note: This is to
                                                     re-compute
                                                     point 2 above.

ENTER HEMISPHERE (E or W) & DEG,MIN,SEC OF LONGITUDE
USE DECIMAL POINTS,SEPARATE BY COMMAS,E.G.: W93.,27.,45.1234

E or W and Longitude : E74.,0.,0.


ENTER LATITUDE, AS ABOVE BUT N or S FOR HEMISPHERE

N or S and Latitude : N33.,0.,0.

Point ID : 2            , Running count No.:     3
X,Y        74.000000000 33.000000000   X,Y 3302979.229  985548.576
LONGITUDE  E  74  0   .00000 ,      IN MAP UNITS :    91440000.000
LATITUDE   N  33  0   .00000 ,      IN MAP UNITS :    76680000.000

New point ? (P), Change coordinate system ? (C), or Stop ? (S)

Enter P , C , or S <P> : S

FILENAME OF PRINT FILE IS : PCOORDS

ASCII OUTPUT FILE IS : OCOORDS

Total number of points converted :       3

Stop - Program terminated.

D:\COORDCON>TYPE OCOORDS |MORE

1                8489990.973    2527269.934  7  0  0  0
          2      2369898.330     976794.625  7  0  0  0
2                8517877.070    2816964.192  7  0  0  0

D:\COORDCON>PRINT PCOORDS
Name of list device (PRN):  <ENTER>
Resident part of PRINT installed

     D:\COORDCON\PCOORDS is currently being printed

C:\COORDCON>
```

Note: The following is the printout from the PRINT PCOORDS command.

```
GEODETIC POSITION ( LONG,LAT )  TO: GENERAL LAMBERT CONFORMAL CONIC
                                          USER SPECIFIED
                                       EVEREST SPHEROID
UNITS ARE DEGREES   ,MIN,SEC           UNITS ARE METERS

Point ID : 1            , Running count No.:
X,Y       72.000000000  31.000000000   X,Y  8489990.973  2527269.934
LONGITUDE  E  72  0    .00000 ,      IN MAP UNITS :    90720000.000
LATITUDE   N  31  0    .00000 ,      IN MAP UNITS :    75960000.000

Point ID :            2, Running count No.:
X,Y       4.000000000   33.000000000   X,Y  2369898.330   976794.625
LONGITUDE  E   4  0    .00000 ,      IN MAP UNITS :    66240000.000
LATITUDE   N  33  0    .00000 ,      IN MAP UNITS :    76680000.000

Point ID : 2            , Running count No.:
X,Y       74.000000000  33.000000000   X,Y  8517877.070  2816964.192
LONGITUDE  E  74  0    .00000 ,      IN MAP UNITS :    91440000.000
LATITUDE   N  33  0    .00000 ,      IN MAP UNITS :    76680000.000
```

User Guide for program "CONVERT"

for

Conversion of geographic coordinates from one coordinate system to another

Among other options "CONVERT" includes all State Plane Coordinate Systems of the United States and its possessions, and all U.T.M. Coordinate Systems worldwide

"CONVERT" can convert an entire digital map stored in an AutoCAD(*) DXF file

This documentation is stored on your diskette as file CONVERT.DOC

```
*****************************************************************************
* This version of the User Guide and the version of CONVERT delivered to *
* WAPDA differ from the original in that the Everest Spheroid is treated *
* as the default Spheroid. In the original Clarke 1866 is the default.   *
*****************************************************************************
```

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(*) AutoCAD is a Registered Trademark of Autodesk, Inc.

Helpful Hint

The best way to familiarize yourself with the operation of CONVERT is to read this documentation first and then simply start the program and play with it . At first you should carefully read each prompt CONVERT displays before responding to it. Although I believe that most prompts are simple to understand you may not know what each of them means at first. In this case refer back to the documentation until the meaning becomes clear.

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For further information or assistance feel free to contact the author :

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****
* Program "CONVERT" *
****
by: Karl E. Kleinn

General Description

Program "CONVERT" will convert coordinates of geographic coordinate systems from one coordinate system to another. Conversions can be accomplished from any of the coordinate systems listed below to any other of those coordinate systems. Care must be taken to assure that the coordinate system and zone " which you want to convert is applicable to the same geographic area as the input coordinates you want to convert.

"CONVERT" is easy to use. Well explanatory prompts will guide you and tell you at each step which parameters and options are available, when to enter them, and what the program's default values are for most parameters. The defaults for one character parameters are displayed with the prompt. They are shown in those brackest: <>. If the character shown is the one you want to choose you only need to press the ENTER key (carriage return) at that prompt.

When you choose the option for manually entering coordinates from the key-board (default "K" at first prompt) a later prompt which asks for a point identifier (PORT ID) will display "<COUNT>" as a default. This means that pressing the ENTER key will cause the program to assign the current running point count number which starts with "1" for the first point converted after the program was started.

When converting "to" or "from" any U.S. State Plane Coordinate System (other than Zones 1 - 9 of Alaska) all you need to know is whether the particular zone is based on a Lambert Conformal Conic Projection or a Transverse Mercator Projection. Alaska s Zones 1 Through 9 appear as separate options in the prompts displayed on the screen. If you don't know which projection a particular State Plane Zone is based on you can look it up in one of the tables on page 7. Every State Plane Zone outside Alaska is listed in one of those two tables.

The following coordinate systems are included :

0. Geodetic Position (Longitude, Latitude).
1. Universal Transverse Mercator (U.T.M.), worldwide.
2. All U.S. State Plane Coordinate Systems based on a Lambert Conformal Conic Projection (includes Alaska Zone 10).
3. All U.S. State Plane Coordinate Systems based on a Transverse Mercator Projection.
4. Alaska s Zones 2 through 9 based on a modified Transverse Mercator Projection.
5. The coordinate system of Alaska's Zone 1 (South-Eastern) based on an oblique Mercator Projection.

6. An arbitrary coordinate system for an Equatorial Mercator Projection as used for marine navigational charts.
7. A user defined coordinate system for a large area Lambert Conformal Conic Projection based on two standard parallels.

All State Plane Coordinate Systems are based on the Clarke 1866 Spheroid and the NAD 1927 horizontal adjustment datum. For all other plane coordinate systems included here one of 19 available spheroids can be selected.

The standard U.T.M. coordinate systems are in units of meters. "CONVERT", however, allows you to choose feet for both the input and output coordinates. This means that you must know the units of your input coordinates. If you convert "to" U.T.M. you need not know the UTM zone number. If you do not specify it "CONVERT" will determine it based on the longitude of each point.

The coordinate system for the Equatorial Mercator Projection uses units of 1/100 seconds of arc of (longitude + 180 degrees) for the X coordinates and determines Y according to the applicable equations. These units were chosen since they are in the same order of magnitude as 1 foot. The coordinates are unique worldwide and are always positive.

Geodetic position (longitude, latitude) can be input and output in three different forms :

(1) Degrees, Minutes, Seconds (with hemisphere codes, E or W for longitude, N or S for latitude). When entering this from the keyboard DO NOT use a comma or space separator between the hemisphere code and "Degrees".
(2) Degrees and decimal fractions of degrees (where longitude West is negative, and latitude South is negative)
(3) Map Units. This was included to make it possible to actually plot a map with geodetic positions as coordinates. The projection of such a map is a Cylindrical Equal Spaced Projection. The units are 1/100 of seconds of arc for longitude and latitude shifted east by 180 degrees such that only positive coordinates result worldwide ((degrees + 180.) * 360000.). Y has a value of 64,800,000 at the equator which is also the value of X at the Greenwich Meridian where longitude is zero(0).

You can even use this program to merely convert longitude and latitude from one of the three forms listed to one of the others.

Input and Output Options

You can input the coordinates you want to convert in three different ways. The options are selected by the appropriate responses to the self explanatory prompts which will appear on the screen. All options will produce an ASCII output file. This file has the same format that is required for an ASCII input file. This means that you can use the file again to do another conversion.

1. Coordinate input from keyboard.

When you want to convert only a few coordinates quickly you might want to simply type them in at the keyboard. The results are instantly displayed on the screen after each entry. When you use this option you can also choose to create a printable output file simultaneously which contains the results

in the same format as they are displayed on the screen. When you are finished with all conversions and tell "CONVERT" to stop you can print this file for a hardcopy record of the conversions. This may be useful if you want to see the input data. You can, of course, also print the ASCII output file created during that session if you want to see only the results.

2. Coordinate Input from an ASCII file.

"CONVERT" can read coordinates or geodetic positions from an ASCII file and write the results to a similar file. The order of data items in your input file must always be the same and there should be only one point per ASCII record (per line). The actual format could be changed since the FORTRAN format descriptors are stored in an external file (CONVERT.FMT). Unless you are very proficient with FORTRAN such a change is not recommended. The ASCII output file always contains all items listed under "b)" below.

Starting on Page 9 of this document are listings of some small files showing the data format of each record.

The order of data items must be :

a) For X,Y coordinates of all options, including "MAP UNITS" of longitude, latitude but not for Long., Lat. in degrees with decimals or in degrees minutes, seconds, and if all points in the file are in the same coordinate system and conversion for all points is to be done according to input coordinate parameters specified during the interactive dialoge:
POINT NUMBER , X , Y
If your input file does not contain point ID's it does not matter. The output file will merely have blank spaces for point numbers as long as the X and Y coordinates are in the proper fields.

b) For X,Y coordinates as under "a)" above if the coordinate system parameters for each point are to be read from the input file (that is, if you enter "9" at the prompt which asks for the code for the OLD COORDINATE SYSTEM). This allows you to convert coordinates of different coordinate systems to the same NEW COORDINATE SYSTEM in the same program run.

POINT NUMBER,	X, Y,	COORDINATE SYSTEM CODE,	ZONE CODE,	SPHEROID CODE,	UNITS CODE

The ASCII output file always contains the coordinate system parameters except when coordinate system code "0" (longitude, latitude) and units are not "MAP UNITS". The ASCII output file also contains the convergence angle for each point in degrees, minutes, seconds and in degrees with decimal fractions (except for NEW COORDINATE SYSTEM codes "0", "6", and "7").

If the ASCII output file is subsequently used as an input file the convergence angle values are not read by "CONVERT". The coordinate system parameters are only read in if "9" was entered at the OLD COORDINATE SYSTEM prompt during the interactive dialoge.

- This option (entering "9" at OLD COORDINATE SYSTEM prompt), if the coordinate system parameters are in the input file, allows you to convert points of different coordinate systems in the same input file to a specified single NEW COORDINATE SYSTEM. When converting to UTM you can even convert to different output zones if you let the NEW SYSTEM ZONE CODE default such that the natural UTM zone is determined

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for each point. You can always convert to Longitude ,Latitude with this option and choose any of the three available output modes.

When converting from such a file which contains a mix of different coordi- systems, you should make sure that each point in the input file applies to the approximate geographic vicinity as the DESIRED NEW COORDINATE SYSTEM. Conversions cannot be done if the input file contains Longitude, Latitude values in the form of degrees, minutes, seconds with hemisphere codes, or if it contains coordinates of coordinate system code "7" (GENERALIZED LAMBERT). Should such coordinates be present in the input file "CONVERT" will NOT abor but will trap these records, issue a message and a prompt, and let you continue and skip the point, or stop the program. Points which are far out of range of the NEW COORDINATE SYSTEM longitude are trapped in the same manner.

c) For Longitude and Latitude in degrees and decimal fractions of degrees
POINT NUMBER , LONGITUDE , LATITUDE
You should always carry 9 places behind the decimal point for degrees of longitude and latitude. Remember that 1/100 second represents a distance in the order of magnitude of 1 foot.

d) For longitude and latitude in Degrees, Minutes, Seconds:
POINT ID, HEMISPHERE (E or W), DEGREES(longitude), MINUTES, SECONDS
HEMISPHERE(N or S), DEGREES(latitude), MINUTES, SECONDS
You should always carry 5 places behind the decimal point in the "SECONDS" items.

4) Coordinate Input from AutoCAD(4) DXF files

CONVERT" can convert the geographic coordinates contained in an AutoCAD(4) DXF file and create a new DXF file with converted coordinates. The input DXF file must have a "HEADER" section, or no conversion will be attempted. Scaling of "dimensions" and rotation of "angles" is done on the basis of the length difference and the azimuth difference of the line defined by the two "EXTENT" points, that is, the length and azimuth of this line is determined based on the coordinates of the "$EXTMIN" and "$EXTMAX" points, first with coordinates in the input coordinate system, then with converted coordinates of the output coordinate system.

Conversions to Map Units of Longitude and Latitude and to an Equatorial Mercator Projection are generally not recommended. These two coordinate systems represent very distorted projections where a circle (ARC) from a plane coordinate system is no longer a circle. Should your AutoCAD(4) "Drawing" from which the DXF file was produded contain only straight line segments and points (symbols) the converted drawing should look fine. DO NOT ATTEMPT to convert DXF files which do not contain geographic coordinates belonging to a coordinate system listed in this document.

Computer Requirements

All modules used by "CONVERT" are FORTRAN based and were compiled with the Microsoft FORTRAN Optimizing Compiler. To run the program you need at least an XT type PC with 256 K of memory and the MS-DOS operating system. A hard disk is recommended especially if you want to convert AutoCAD(4) DXF files. A MATH co-processor is recommended for speed, but is not needed.

How to load the files from the diskette and get started

The diskette you received contains an executable version of CONVERT and all data files needed by the program. All data files on the diskette must be resident on the same subdirectory as the executable module CONVERT.EXE in order for all options of "CONVERT" to work.

The diskette also contains the complete User Guide in file CONVERT.DOC which can be printed with the DOS print command. For proper page separation set your printer to a form length of 60 lines (not 66). The maximum line length in the file is 96 characters.

You can run the program directly from your floppy, but it speeds up a lot when run from hard disk. Also keep in mind that all options create output files. If you run from the floppy and have no other "drive" to which files can be written, make sure there is enough space on the floppy especially when converting AutoCAD(4) DXF files. If you have a hard disk you should download all files from the floppy.

Before loading the files from your diskette onto the hard disk you should make a subdirectory called CONVERT. When set to the root directory issue the following DOS command: "md convert". This makes subdirectory "CONVERT". Then change to that directory with the following DOS command: "cd convert". This sets you to subdirectory "CONVERT". Then proceed as follows depending on whether your diskette is in Drive A or Drive B:

a) If the diskette is in Drive A type:

COPY A:*.*<carriage return>

b) If the diskette is in Drive B type:

COPY B:*.*<carriage return>

When all files are loaded remove the diskette. You can now start the program by typing:

CONVERT<carriage return> (same when running from floppy and you are set to the drive which contains the diskette)

..... and you're off and running. Both upper case and lower case characters can be used when responding to prompts which require an alphabetical character as input.

(Tables and data file sample listings are on the pages that follow)

Coordinate System Codes for program "CONVERT"

CODE	Coordinate System
0	Geodetic Position (Longitude, Latitude)
1	UTM (Universal Transverse Mercator Projection)
2	U.S. State Plane Coordinates based on a Lambert Coformal Conic Projection
3	U.S. State Plane Coordinates based on a Transverse Mercator Projection
4	Alaska's Zones 2 - 9 based on a modified Transverse Mercator Projection
5	Alaska's Zone 1 (South-Eastern) based on an oblique Mercator Projection
6	Equatorial Mercator Projection
7	User defined Lambert Conformal Conic Projection with 2 Standard Parallels

Boundary Meridians for all U.T.M Zones

(Zone options for Coordinate System Code 1)

ZONE	LONGITUDE RANGE	ZONE	LONGITUDE RANGE	ZONE	LONGITUDE RANGE
1	180 - W174 DEG.	21	W60 - W54 DEG.	41	E60 - E66 DEG.
2	W174 - W168 DEG.	22	W54 - W48 DEG.	42	E66 - E72 DEG.
3	W168 - W162 DEG.	23	W48 - W42 DEG.	43	E72 - E78 DEG.
4	W162 - W156 DEG.	24	W42 - W36 DEG.	44	E78 - E84 DEG.
5	W156 - W150 DEG.	25	W36 - W30 DEG.	45	E84 - E90 DEG.
6	W150 - W144 DEG.	26	W30 - W24 DEG.	46	E90 - E96 DEG.
7	W144 - W138 DEG.	27	W24 - W18 DEG.	47	E96 - E102 DEG.
8	W138 - W132 DEG.	28	W18 - W12 DEG.	48	E102 - E108 DEG.
9	W132 - W126 DEG.	29	W12 - W6 DEG.	49	E108 - E114 DEG.
10	W126 - W120 DEG.	30	W6 - 0(Greenwich)	50	E114 - E120 DEG.
11	W120 - W114 DEG.	31	0(Greenwich) - E6	51	E120 - E126 DEG.
12	W114 - W108 DEG.	32	E6 - E12 DEG.	52	E126 - E132 DEG.
13	W108 - W102 DEG.	33	E12 - E18 DEG.	53	E132 - E138 DEG.
14	W102 - W96 DEG.	34	E18 - E24 DEG.	54	E138 - E144 DEG.
15	W96 - W90 DEG.	35	E34 - E30 DEG.	55	E144 - E150 DEG.
16	W90 - W84 DEG.	36	E30 - E36 DEG.	56	E150 - E156 DEG.
17	W84 - W78 DEG.	37	E36 - E42 DEG.	57	E156 - E162 DEG.
18	W78 - W72 DEG.	38	E42 - E48 DEG.	58	E162 - E168 DEG.
19	W72 - W66 DEG.	39	E48 - E54 DEG.	59	E168 - E174 DEG.
20	W66 - W60 DEG.	40	E54 - E60 DEG.	60	E174 - 180 DEG.

Zone Codes for all State Plane Zones using a Lambert Conformal Conic Projection
(Zone options for Coordinate System Code 2)

CODE	ST	ZONE	CODE	ST	ZONE	CODE	ST	ZONE	CODE	ST	ZONE
1	AK	Zone 10	20	KY	North	39	NY	Long Island	58	TX	Central
2	AR	North	21	KY	South	40	NC	(only 1)	59	TX	S. Central
3	AR	South	22	LA	North	41	ND	North	60	TX	South
4	CA	Zone I	23	LA	South	42	ND	South	61	UT	North
5	CA	Zone II	24	LA	Offshore	43	OH	North	62	UT	Central
6	CA	Zone III	25	MD	(only 1)	44	OH	South	63	UT	South
7	CA	Zone IV	26	MA	Mainland	45	OK	North	64	VA	North
8	CA	Zone V	27	MA	Islands	46	OK	South	65	VA	South
9	CA	Zone VI	28	MI	North	47	OR	North	66	WA	North
10	CA	Zone VII	29	MI	Central	48	OR	South	67	WA	South
11	CO	North	30	MI	South	49	PA	North	68	WV	North
12	CO	Central	31	MN	North	50	PA	South	69	WV	South
13	CO	South	32	MN	Central	51	SC	North	70	WI	North
14	CT	(only 1)	33	MN	South	52	SC	South	71	WI	Central
15	FL	North	34	MT	North	53	SD	North	72	WI	South
16	IA	North	35	MT	Central	54	SD	South	73	Puerto Rico & Virgin Islands	
17	IA	South	36	MT	South	55	TN	(only 1)			
18	KS	North	37	NE	North	56	TX	North	74	St. Croix	
19	KS	South	38	NE	South	57	TX	N. Central	75	American Samoa	

Zone Codes for all State Plane Zones using a Transverse Mercator Projection
(Zone options for Coordinate System Code 3)

CODE	ST	ZONE	CODE	ST	ZONE	CODE	ST	ZONE	CODE	ST	ZONE
1	AL	East	13	HI	Zone 3	25	MI	East	37	NJ	(only 1)
2	AL	West	14	HI	Zone 4	26	MI	Central	38	NM	East
3	AZ	East	15	HI	Zone 5	27	MI	West	39	NM	Central
4	AZ	Central	16	ID	East	28	MS	East	40	NM	West
5	AZ	West	17	ID	Central	29	MS	West	41	NY	East
6	DE	(only 1)	18	ID	West	30	MO	East	42	NY	Central
7	FL	East	19	IL	East	31	MO	Central	43	NY	West
8	FL	West	20	IL	West	32	MO	West	44	RI	(only 1)
9	GA	East	21	IN	East	33	NV	East	45	VT	(only 1)
10	GA	West	22	IN	West	34	NV	Central	46	WY	East
11	HI	Zone 1	23	ME	East	35	NV	West	47	WY	E. Central
12	HI	Zone 2	24	ME	West	36	NH	(only 1)	48	WY	W. Central
									49	WY	West

Zone Codes for the modified Transverse Mercator Projection of Alaska's Zones 2 - 9
(Zone options for Coordinate System Code 4)

The actual Alaska Zone numbers 2 through 9 are used for this option.

Coordinate system codes 0, 5, 6, and 7 require no zone Code.

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Codes and names of all spheroids this program has available

CODE	SPHEROID NAME
0	EVEREST (DEFAULT)
1	CLARKE 1880
2	BESSEL 1967
3	MODIFIED MERCURY 1968 (FISHER 1968)
4	INTERNATIONAL 1909,1924 (HAYFORD)
5	WGS 72 (WORLD GEODETIC SYSTEM 1972)
6	NEW INTERNATIONAL 1967
7	CLARKE 1866
8	WGS 66 (WORLD GEODETIC SYSTEM 1966)
9	GRS 80 (GEODETIC REFERENCE SYSTEM 1980)
10	AIRY
11	MODIFIED EVEREST
12	MODIFIED AIRY
13	WALBECK
14	SOUTH-EAST ASIA 1960 (FISHER)
15	AUSTRALIAN NATIONAL - SOUTH AMERICAN 1969
16	KRASSOVSKY
17	HOUGH
18	MERCURY 1960 (FISHER)

Units Codes

0 - Meters (default)
1 - Feet (U.S Survey Foot used in all U.S. State Plane zones)

Important Note

The parameter code numbers have meaning only to program "CONVERT" and should not be construed as having generally accepted meanings. They correspond to the respective numbers listed under "CODE" or "ZONE" in the applicable tables on pages 6, 7, and 8. Any code that does not apply to a particular conversion is meaningless to the program and is usually set to zero(0).

The following listing shows the structure of the ASCII output file. This file is the result of an interactive session where the following parameters were chosen: OLD COORDINATE SYSTEM = 0 (long.,lat.), NEW COORDINATE SYSTEM = 1 (UTM), NEW SYSTEM ZONE CODE = 41. NEW SYSTEM SPHEROID CODE = 0 (Everest, default), NEW SYSTEM UNITS = 0 (meters, default). The meaning of each item in this listing is shown below next to the ending column number of the field.

The listing also illustrates how running point count numbers are assigned as default point ID,s ("1", "2", "4"), and it shows one point for which a point ID string was acually entered during the interactive dialoge ("entered id"). The following was entered during the interactive dialoge to produce the file: (For input mode 2 - degrees with decimal fractions - positive values mean "E" for longitude and "N" for latitude).

```
1st: <carriage return> for point ID (results in "1"); for X,Y: 61.0,24.0
2nd: <carriage return> for point ID (results in "2"); for X,Y: 62.0,25.0
3rd: "entered id" for point ID ( literal as entered ) ; for X,Y: 63.,24.
4th: <carriage return> for point ID (results in "4"); for X,Y: 64.,25.5
```

Here is the resulting output file (File 1):

```
          1     296578.420    2855451.167  1 41  0  0 -0 48 49.514     .81375376
          2     399101.101    2785089.799  1 41  0  0 -0 25 21.555     .42265410
entered id      500000.000    2854006.702  1 41  0  0  0  0    .000     .00000000
          4     600486.654    2820456.183  1 41  0  0  0 25 49.970     .43054730
-----------------------------------------------------------------------------------
          |             |             |  |  |  |  |  |  |  |     |             |
column:  10            25            40 43 46 49 52 55 58    65            78
```

When used as an input file columns 53-78 are always ignored by "CONVERT". Columns 41-52 are also ignored unless coordinate parameter input from file has been specified ("9" at OLD COORDINATE SYSTEM prompt).
Fields ending on the columns indicated below contain the following:

10 - ten(10) character point ID
25 - X coordinate
40 - Y coordinate
43 - Coordinate system code (1 for UTM)
46 - Zone code (since the previous item is 1 (UTM) this means UTM Zone 41)
49 - Spheroid code (0 for Everest default)
52 - Units code (0 for meters default, 1 means feet)
55 - Degrees portion of convergence angle (only the degrees portion has a sign if the convergence angle is negative - West of Central Meridian)
58 - Minutes portion of convergence angle
65 - Seconds portion of convergence angle with decimal fractions
78 - Convergence angle in degrees with decimal fractions

When conversion to Geodetic Position ("0" - Longitude, Latitude) and with option "3" (MAP UNITS) for Longitude Latitude output , or Equatorial Mercator ("6"), or Generalized Lambert Conformal Conic ("7") is chosen as NEW COORDINATE SYSTEM, the format of File 2 below will result.

```
( File 2)  Longitude, Latitude in MAP UNITS
          1   86760000.000   73440000.001  0  0  0  0    | Data and data
          2   87120000.002   73799999.999  0  0  0  0    | items in columns
entered id    87480000.000   73440000.000  0  0  0  0    | 1-52 are the same
          4   87840000.000   73980000.000  0  0  0  0    | as in File 1 above.
```


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The following file was produced by another interactive session in which conversion from UTM Zone 41 to Geodetic Position was specified with degrees, minutes, seconds chosen for the output mode. The UTM coordinates of File 1 above were used for manual keyboard input. This time an explicit string for point ID was input for the first point and all others were left to default.

(File 3)

```
entered ID E   61  0    .00000 N   24  0    .00001
         2 E   62  0    .00002 N   24 59 59.99999
         3 E   63  0    .00000 N   24  0    .00000
         4 E   64  0    .00000 N   25 30    .00000
-------------------------------------------------
         | |    | |        | |    | |        |
        10 12   17 20      29 31   36 39      48
```

The meaning of these data items is obvious. As shown next to the ending column of the field they are:

10 - Ten(10) character point ID
12 - Hemisphere code for Longitude ("E" for East)
17 - Degrees portion of Longitude
20 - Minutes portion of Longitude
29 - Seconds portion of Longitude
31 - Hemisphere code for Latitude ("N" for North)
36 - Degrees portion of Latitude
39 - Minutes portion of Latitude
48 - Seconds portion of Latitude

The following file was produced by using File 1 above as an input file, interactively entering all needed parameters and choosing degrees with decimal fractions as the output mode for Geodetic Position (option "2" at the Longitude, Latitude output prompt):

(File 4)

```
          1   61.000000000   24.000000004  0  0  0  0
          2   62.000000005   24.999999997  0  0  0  0
entered id    63.000000000   23.999999999  0  0  0  0
          4   64.000000000   25.500000001  0  0  0  0
-----------------------------------------------------
          |              |              |  |  |  |  |
         10             25             40 43 46 49 52
```

This file merely contains point ID, LONGITUDE, LATITUDE in that order (in degrees with decimals) and the coordinate system parameters as in File 1 above.

This also illustrates that the reverse conversion produces the correct results with minor differences only in the least significant digits of longitude and latitude.

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Files with a mix of coordinate systems can be produced as a result of interactive sessions were coordinate system parameters can be changed without leaving "CONVERT". Such a file can also result from letting output UTM Zones default according to Longitude (<carriage return> when the prompt for NEW SYSTEM ZONE CODE comes up).

If such a file is used for input, care should be taken that no Longitudes, Latitudes in form of degrees, minutes, seconds get mixed in, and no points in coordinates of the GENERALIZED LAMBERT CONFORMAL CONIC PROJECTION ("7") "CONVERT", however, traps both of these illegal cases and issues a message and a prompt that allows you to skip that point and continue, or to stop the program. When entering "9" at the OLD COORDINATE SYSTEM prompt, proper conversions can be done from this file, but conversions can only be done to one and the same NEW COORDINATE SYSTEM.

The following file has the same structure as File 1 above, but it contains coordinates from different UTM zones (42, 41, 43, 41). At the prompt that asks for the OLD COORDINATE SYSTEM a "9" was entered (input coordinate parameters contained in file). Geodetic position was chosen for the output coordinate system, and output in degrees, minutes, seconds was specified:

(File 5) Format is the same as File 1 above.

```
          1     702627.339    2710827.330  1 42  0  0  0 49 46.813    .82967016
ENTERED ID      701817.695    2766206.683  1 41  0  0  0 50 43.884    .845523 7
          3     296578.420    2655451.167  1 43  0  0 -0 48 49.514   -.81375376
          4     700992.708    2821589.272  1 41  0  0  0 51 40.723    .86131166
```

The resulting output file is shown below:

(File 6) Format is the same as File 3 above.

```
          1 E   71  0   .00000 N   24 29 59.99999
ENTERED ID E   65  0   .00000 N   25  0   .00000
          3 E   73  0   .00000 N   24  0   .00001
          4 E   65  0   .00000 N   25 30   .00001
```

Note on Error Messages

The Error Messages issued by "CONVERT" are not error codes but messages in plain English which are easily understood. Sometimes they are very extensive and very explanatory.

Run time MATH errors can occur when the specified conversion is between two coordinate systems that do not apply to the same geographical area.

When run time MATH errors occur "CONVERT" aborts.

Run time READ errors can occur when input data are in the wrong format. When this happens during conversion from a file with mixed coordinate systems that contains longitude, latitude data which are not in MAP UNITS form, "CONVERT" issues an extensive message and terminates.

ADDENDUM No. 1 to "CONVERT" User Guide

Note on converting an AutoCAD(*) .DXF file created with AutoCAD(*) Version 10 or higher.

When creating a new AutoCAD(*) "Drawing" with AutoCAD(*) Version 10 or above with a converted .DXF file the new map will probably not be displayed correctly, or it may not be displayed at all when the DXFIN operation is completed.

Follow the following steps in AutoCAD(*) as soon as the DXFIN command has finished reading in the .DXF file and before saving the new "Drawing" with the AutoCAD(*) END command or SAVE command:

AutoCAD(*) Commands and resulting option prompts	Your response (followed by a carriage return>)
PLAN<carriage return> <Current UCS>/Ucs/World:	World
UCS<carriage return> Origin/ZAxis/3point/Entity/View/X/Y/Z/Prev/Restore/Save/Del/?/<WORLD>:	World
VPORTS<carriage return> Save/Restore/Delete/Join/Single/?/2/<3>/4:	<carriage return> (only)
Horizontal/Vertical/Above/Below/Left/<Right>:	<carriage return> (only)
VPORTS<carriage return> Save/Restore/Delete/Join/Single/?/2/<3>/4:	SI
ZOOM<carriage return> All/Center/Dynamic/Extents/Left/Previous/Window/<Scale(X)>:	E

Your new map ("Drawing") should now display correctly. When saved at this stage with the AutoCAD(*) END or SAVE command, it will come back correctly when read in with the "Edit an EXISTING drawing" option on AutoCAD's(*) Main Menu.

(*)AutoCAD is a registered Trademark of Autodesk, Inc.

How to load the files from the diskette and get started

The diskette you received contains an executable version of CONVERT and all data files needed by the program. All data files on the diskette must be resident on the same subdirectory as the executable module CONVERT.EXE in order for all options of "CONVERT" to work.

The diskette also contains the complete User Guide in file CONVERT.DOC which can be printed with the DOS print command. For proper page separation set your printer to a form length of 60 lines (not 66). The maximum line length in the file is 96 characters.

You can run the program directly from your floppy but it speeds up a lot when run from hard disk. Also keep in mind that all options create output files. If you run from the floppy and have no other "drive" to which files can be written, make sure there is enough space on the floppy especially when converting AutoCAD(*) DXF files. If you have a hard disk you should download all files from the floppy.

Before loading the files from your diskette onto the hard disk you should make a subdirectory called CONVERT. When set to the root directory issue the following DOS command: "md convert". This makes subdirectory "CONVERT". Then change to that directory with the following DOS command: "cd convert". This sets you to subdirectory "CONVERT". Then proceed as follows depending on whether your diskette is in Drive A or Drive B:

a) If the diskette is in Drive A type:

COPY A:\ *.*<carriage return>

b) If the diskette is in Drive B type:

COPY B:\ *.*<carriage return>

When all files are loaded remove the diskette. You can now start the program by typing:

CONVERT<carriage return> (same when running from floppy and you are set to the drive which contains the diskette)

..... and you're off and running. Both upper case and lower case characters can be used when responding to prompts which require an alphabetical character as input.