VPFView *v2.1*

User's Guide

June 1996

Contents

Appendices

Preface

This manual explains the use of the VPFVIEW application software, which is intended for use with databases structured in Vector Product Format (VPF). It begins with sections that introduce the VPFVIEW software and provide general operating instructions; it then explains how to use each of the VPFVIEW windows.

Intended audience

The VPFVIEW application software operates on Macintosh, UNIX-based workstations, or IBM PC/compatibles with Microsoft Windows or Windows NT.   This manual assumes that you understand the concepts and terms most commonly associated with the use of your system (e.g., window, file directory, pathname, menu, and mouse). Terms having to do with the VPFVIEW software and VPF databases are defined in Section 2, and acronyms and terms related to geographic information systems (GISs) are defined in Appendix A.

You do not need to know how to use the operating system to generate displays on the screen or to save views with VPFVIEW; but if you are comfortable working in a windowing environment, you will find using VPFVIEW easier, and you will be able to take full advantage of the software. For further information about the various operating systems and VPF, see the references cited in Appendix B.

Familiarity with the system and hardware will also make it easier to install the VPFVIEW software and connect the CD—ROM. Installation instructions for the VPFVIEW software are provided under separate cover. To find out how to connect your CD—ROM, however, please refer to the instructions provided by the manufacturer.

Section 1   *Introducing the VPFVIEW software*

The VPFVIEW software is designed

to access any database implemented in Vector Product Format (VPF). The information in this VPFVIEW user's manual is generic and can be used with any VPF database. Therefore, some of the themes, coverages, views, and feature classes used as examples may not be present in the database that you are using.

The VPFVIEW software allows data to be selected for display from one or more databases by geographic region and data type. For example, you can zoom in to a geographic area of interest and request a single type of feature, such as dual-lane highways, to be displayed. Or, you can display a group of related features (e.g., all road types), combinations of feature types (e.g., dual-lane highways and international airports), or all features existing in a database. The software also allows you to display and evaluate the database directly from CD—ROM, hard drive, or other media without loading or converting the data. The hardware and software requirements for VPFVIEW are given in Appendix C.

The VPFVIEW software is not a geographic information system. The software is designed to enable you to view and perform spatial queries on data contained in any VPF database, but its analytical capability is limited to constructing views and themes.

Once you have generated a display, you can save the results of a data request (i.e., a graphic display or the text of a report), or the data request itself (i.e., a feature selection list) on the hard drive. You can also save selected libraries in a user-defined database.

For a description of VPFVIEW software files and subdirectories, see Appendix D. For further information about vector product format, see MIL-STD-2407, *Military Standard–Vector Product Format* (cited in Appendix B). VPF also belongs to a family of standards known as the Digital Geographic Information Exchange Standard (DIGEST). Within this standard, VPF is called the Vector Relational Format (VRF). For further information about DIGEST and VRF see the Digital Geographic Information Exchange Standard (also cited in Appendix B).

Section 2   *VPF database terms*

A *database* is a logical collection of files managed as a unit. A VPF database contains the information about a geographic area, including where features are located; whether they are represented as points, lines, or polygons; and what the attributes (or characteristics) of the feature are. Because storing this kind of information often requires large databases that are cumbersome to manipulate, the information is divided into *libraries*.

A *library* is a database section defined by geographic extent. For example, a large world database containing country boundaries, roads, hydrographic features, and so on, could be divided into several libraries, each containing the data for a continent. The libraries might be North America, South America, Africa, Europe, Asia, Australia and Antarctica.

A *coverage* is a basic unit of data storage. A coverage can be thought of as a kind of file folder. Within the database, information is put into one of several "folders" according to a classification system created by the database's designer. For example, a coverage named "Transportation" might contain all features and their attributes that are related to transportation, such as railroads, roads, and airports.

Coverages give the database its structure, so the coverages contained in a VPF database cannot be altered by the user with VPFVIEW software.

A coverage can have one or more *feature classes*. A feature class is a group of related features that is made up of one or more types of *primitives* (points, lines, and polygons; polygons are also called areas). In the Transportation coverage used in the example above,

railroads, roads, and airports might belong to different feature classes. The Airports feature class could be made up of point features representing airport terminal locations, line features representing runways, and area features representing airport property.

A feature class can be classified as one of three *feature class types*. The Airports feature class just described is a complex feature class, because it includes more than one kind of primitive. A feature class that contains only one kind of primitive is called a simple feature class. The third feature class type is text.

Each feature class has one or more associated *themes*. For example, a library might contain a coverage called "Roads" that contains line features. The line feature class might have an *attribute* that allows the lines to be categorized as follows:

■ Highways
■ Secondary Roads
■ Tracks, Trails, or Footpaths

Each of these categories is a theme that is associated with the Roads line feature class. The VPFVIEW software allows you to create themes from the information contained in the database according to your specifications. A theme is defined with a logical expression that uses attribute names, logical operators, and *attribute values*. In the example above, the theme "Highways" might be defined as TYPE (the attribute name) equals 1 (the attribute value).

Themes can be changed. For example, suppose that the Roads coverage contains another attribute that specifies whether a road is functional or under construction. A different collection of themes could be created for the Roads line features as follows:

■ Highways, Functional
■ Highways, Under Construction
■ Secondary Roads, Functional
■ Secondary Roads, Under Construction

A *view* is a collection of themes. If a database
accompanies this manual, it includes a number of
preconstructed views so that the database can be
displayed immediately.

Whenever you create a new theme or delete a pre-existing
one, you modify your view of the database. The views
you construct to suit your own applications for the
database can be stored and retrieved, as well as displayed.
VPFVIEW enables you to create a view with data from
multiple databases and libraries.

The relationships between a library and its coverages and
feature classes, as well as user-defined views and themes,
are illustrated in Figures 2-1 and 2-2. The structure of the
logical expressions that will allow you to create themes is
discussed in Sections 4 and 8.

Other terms and acronyms related to geographic
information systems (GISes) are defined in Appendix A.

Figure 2-1. Generic view structure for views accessing a single database. Note that views and themes (in italics) are not part of the Vector Product Format (VPF) data hierarchy; they are logical constructs created by the VPFVIEW software.
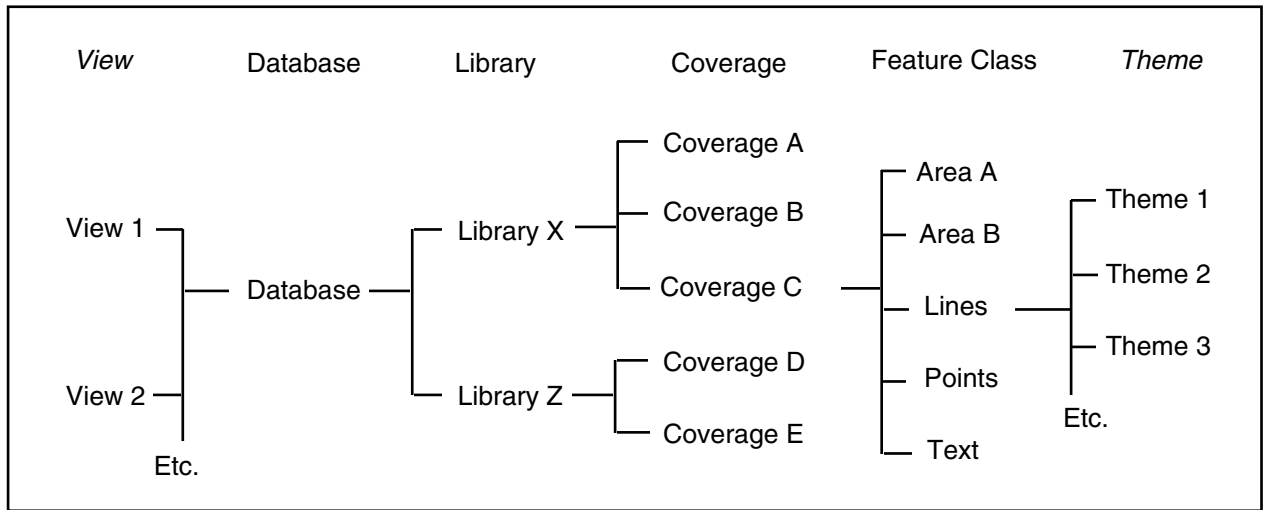

Figure 2-2. Sample predefined view structure.

Section 3 *Getting started with VPFVIEW*

VPFVIEW has a user-friendly

interface where tools and functions are accessed through various windows and menus. Once you learn the basic operations, such as locating and selecting menu options, you will be able to successfully navigate through the software.

This section will get you started with VPFVIEW. It explains how to start VPFVIEW and describes the default windows that first appear. It then relates the steps necessary to display a preconstructed view, which is the recommended starting point for learning the software

Conventions

This manual contains many examples of commands and selection of menu options. In these examples, what the computer displays appears in plain text, and any characters typed in by the user appear in **bold** text. The names of menu options and buttons are placed inside quotation marks, for example, "Load ..." or "Apply".

Before you can start, the VPFVIEW software must reside on your hard drive. Hardware and software requirements are listed in Appendix C. Installation instructions are provided under separate cover.

Starting VPFVIEW

VPFView v2.1 is started differently depending upon the operating environment (in cases where a command line is typed, appending a path to a pre-existing view to the command will cause the program to automatically load that view once the title screen clears).

Sun Sparcstation:

1) By typing the name of the VPFView v2.1 executable file on the system in a command window. An operating system path or alias should be set up so the user may simply type 'vpfview' at the command prompt to start VPFView v2.1. The following process environments must be set up:
VPFVIEW_HOME variable set to the VPFView v2.1 installed directory
Ex: setenv VPFVIEW_HOME /express1/vpfview/bin
UIDPATH variable set to the VPFView v2.1 installed directory which includes a (%U) at the end of the path which XVT will fill in with an appropriate UID filename.
Ex: setenv UIDPATH /express1/vpfview/bin/%U
XVTPATH must identify the full path to the print directory provided with the executable. This allows the program to print reports.
Ex: setenv XVTPATH /express1/vpfview/bin/print

The process should only be run from within Motif 1.1 or later, although its static compilation will allow for it to operate under OpenLook version 3.0 and later with some minor problems.

2) By double-clicking on the executable's icon within the file manager provided with OpenLook. The process environments must be set up as shown above.

Microsoft Windows, Microsoft Windows 95, and Microsoft Windows NT

1) By double-clicking on the icon for the program under Program Manager.

2) By typing the command line for the program from the FILE and RUN... options within Program Manager.

3) By double-clicking on its executable icon in File Manager.

4) Under Windows NT and Windows 95, the program may also be started from an MSDOS shell by typing the program name 'vpfview'. The process environment should be modified to include the path to the executable directory in the PATH variable.

5) Under Windows NT 4.0 and Windows 95, the program may also be started by selecting "run" from the start menu located on the button bar which is usually at the bottom of the screen. Then type in or locate the path and name of the executable.

Macintosh

1) By double-clicking on the program icon. Since the Macintosh does not accept command lines in the same manner as UNIX or MSDOS, it is not possible to auto-load a view on the Macintosh.

Default Screen Layout

After VPFVIEW is started, a default window arrangement will come up on the screen. Because of the ability to change screen resolutions, screen real estate is a problem for this program. At lower resolutions, it is not possible to display the three window GUI. Therefore, the program contains two operating modes: the one window mode and the three window mode. The program uses some startup code to check the platform and to determine the appropriate mode in which to run.
.

The Three Window Mode: In the three window mode, VPFVIEW Version 2.1 contains a map window, which displays all coverage level VPF data, a library reference window, which displays an outline of all libraries within the view and the current

study area, and a feature selection window, which displays the symbology and selection status of the themes within your view. The main menu resides at the top of the screen.

The One Window Mode: In the one window mode, VPFVIEW Version 2.1 will display only the map window at all times so as to save on screen space. Further, the map window will take up the entire screen, whereas in the three window mode it is relatively square and fits in the left-hand side of the screen. The feature selection window as well as others are still available, but are now accessed through the main menu which takes on several modifications due to the reduced screen real estate. This mode maintains all the functionality of the three window mode, but more of the functionality is accessed from the menu. In addition, there is no library reference window. Any time the library reference map is requested, it is displayed in the map window.

As a general rule, if the screen resolution is at or above 1024x768, the program will start in the three window mode. Otherwise, it will start in the one window mode.

Loading a view

You can begin displaying data either by loading/installing a preconstructed view or creating a new view. The procedure for creating a view is described in Chapter 4. The procedure for installing a view is described in Chapter 5. The easiest way to begin learning the software is to start by selecting and loading an existing view following the steps outlined below.

■ In the VPFVIEW window, select the "File" menu from the VPFVIEW window menu bar.

■ Select "View" (the first option), then slide your cursor to the right to view another list of options. Choose "Load ...".

■ The Load View dialog window will appear. Select or enter the drive and path to the "env" file for the desired view. The view is a directory whose name ends with a '%' and the env file is located within that directory.

■ Click "Load" and wait a few moments as the system accesses the data and loads the view. The extent of the library or libraries used for the view will appear in the Library Reference window. In one window mode you will be

presented with the Library Reference Window so you can choose a study area. Move the box over the area you would like to display. In three window mode the study area is automatically set at the center of the Library Reference Window. To move to the area you wish to display, Click on the "Zoom/Pan" button in the Library Reference window. A crosshair will appear inside the extent box, and you will be able to move it by moving the mouse. Enlarge the extent box by pressing the 'o' key (out) a few times. Reduce the extent box by pressing the 'i' key (in) a few times. Finally, position the box in a new location and click the mouse button once to select it. For further discussion on selecting a study area and the Library Reference Window see Chapter 6.

Drawing a theme

When you first load a view, all of the themes in the view may be deselected. As a result, the Map display window will appear blank. To display some features in the Map window, you will need to use some tools in the Feature Selection window, which is the lower right window of the default three window arrangement. To bring up the Feature Selection window from one window mode, choose "Select..." from the Feature Selection menu.

Use the Feature Selection window to select and display the themes you desire. You can view themes in different directories and/or libraries, as well as in different coverages, by making selections from the pop-up lists. Check the box next to the name of the theme you want to view. To save time, you can select more than one theme before you click "Draw," and then all of the newly selected themes will be drawn at once. (The order in which themes are drawn is explained in Section 8, "Using the Feature Selection Window.")

If the display remains blank, the theme(s) you have selected may not have any features within the geographic region that is selected. Try selecting a theme from a different coverage. Select a new coverage from the coverage menu in the Feature Selection window. The themes available for the selected coverage will appear in the window.

You may also try zooming out to a larger geographic extent. Another possibility is that the theme's symbol is white, like the background of the display window, and needs to be changed to a

different color. Zooming and changing symbology are explained in more detail in Chapter 4 and 5.

To cancel a "Draw" request in progress, click on the stop button in the Map window.

- Note: The first time that a particular theme is drawn for a given tile, VPFVIEW creates selection set files and indexes in the view directory. These files store the results of a complex and time-consuming operation after the initial draw for each tile, allowing subsequent draws to be executed faster. See Appendix D for further discussion.

On-line help

VPFVIEW is equipped with on-line help. To access on-line help, select an option from the help menu on the VPFVIEW main window. To search for a particular topic, use the keyword search facility or view the Contents.

Ending a VPFVIEW session

To end a VPFVIEW session, select the "Quit" or "Exit" option from the "File" menu in the VPFVIEW main window.

Fundamental VPFVIEW operations

If you have followed the exercise above (loading and displaying a preconstructed view) you have already gained some first-hand experience with VPFVIEW windows and menus. This section summarizes the fundamental techniques necessary for using VPFVIEW, including those used in the exercise.

Opening and closing menus and selecting menu options

The VPFVIEW main window contains several option menus.

■ To open a menu, place the cursor arrow on the menu button and press and hold the mouse button. To select a menu option drag the cursor to the desired option, and release the mouse button. The mouse button can also be pressed and released and the menu and option buttons will remain visible.

■ Some menu options have their own list of options. A small right-pointing arrow next to the menu option name indicates that there is another option list (for example, the "View" option in the "File" menu has a right-pointing arrow; the submenu lists the options "Load...," "Create...," "Delete...," "Copy...," "Rename", and "Install ...").

■ The names of some menu options end in an ellipsis (e.g., "Data Dictionary..."). The ellipses indicate that a dialog window will pop up if the option is selected.

■ To close a menu without making a selection, move the mouse to another area of the screen and release the mouse button.

Command buttons

VPFVIEW also uses buttons for executing commands. Command buttons contain a name (e.g., "Apply") but do not have an arrow or an ellipsis. When a function is available, the command name will appear normal (i.e., dark). If the function is not currently available, such as when another procedure must first be completed, then the command name will appear gray and fuzzy. To execute a command, click on the command button using the mouse button. Command buttons in error or confirmation dialogs that have a black outline are default commands that may also be selected by pressing the <return> key.

Pulldown menu bars

Pulldown menu bars are one method of accessing lists in VPFVIEW windows. They are most often used for selecting

databases, libraries, and coverages, but projections and other display parameters are also selected from pulldown menus. A pulldown menu bar has three parts: a title, a menu arrow, and a display of the currently selected item from the list. To view the menu or make a new selection, use the mouse button to click on the menu arrow, then select the desired item from the list.

Scrolling lists

Scrolling lists are used by VPFVIEW for displaying a long list, such as a list of colors, symbols, or names. A list is viewed using a slider bar, which is usually located at the right side of the list. Use the mouse button to move the slider bar to see more items.

Section 5   The VPFVIEW Main Menu

The VPFVIEW main menu contains
most of the options for performing specific tasks within
the application. In one window mode (see Section 3,
Getting started with VPFVIEW/default screen layout),
all functions are accessed from this menu (Figure 5-1).
The default menu in the three window mode contains
the following menu options: File, VPF Contents, Text
Report, Window and Help.

The "File" menu contains options for performing
operations on files, such as saving and restoring
symbology, feature selection lists, views, and screen
images; generating plot files of the map contents; saving
a portion of a VPF database and library; and quitting the
application.

The "VPF Contents" menu contains options for
displaying the information in the metadata files for
selected VPF databases and libraries contained within
your view, displaying the on-line data dictionary for a
specified VPF database, and selecting a new study area
by querying the gazetteer coverage (if one exists) of a
VPF database for a specific place name. In the one
window mode, there is an additional option for
performing spatial queries which is normally accessed
through a button in the map window.

The "Text Report" menu contains options for generating
two types of reports. An area content summary report
lists the number of features found within the current study
area. This can be performed on selected themes or all of
them. A feature location list report shows the geographic
location or bounding rectangle of all features from a
specified feature class which fall within the current study
area.

The "Window" menu allows the user to bring focus to any window currently open in the program.

The "Help" menu has on line help. Click on the contents option to see help specific to VPFVIEW.

The one window program mode also contains the "Feature Selection" menu, which opens the Feature Selection window from which all feature selection and drawing is controlled; and the "Map Utilities" menu, which contains options for performing zooms/pans and distance calculations on the map, and modifying the properties of both the coverage map and library reference displays.

The operation and functions of options within these menus are described in this section.

Figure 5-1. The VPFVIEW main menu (one window mode)

Note: In this section, "click on..." means to click on an object using the mouse button. For more information on using buttons, windows, and dialogs, see page 3-5 *Fundamental VPFVIEWoperations*.

File menu

The "File" menu contains options for performing operations on files, such as saving and restoring symbology, feature selection lists, views, and screen images; generating plot files; changing the default workspace for files; saving a portion of a VPF library;

and installing views. The option to Quit the application is also contained in this menu.

View

The "View" option contains a sub-menu that allows the user to manipulate existing views and create new views. (The definition of a view and a discussion of its relationship to other data structure components can be found in Section 2, "VPF database terms".)   The available options include Load, Create, Delete, Copy, Rename, and Install. The functions of each of the sub-menu options are explained below.

Load...

When the "Load..." option is selected, the program will display the load view dialog. Using the mouse, navigate through the file system to locate an "env" file for a view. This file is located in the view directory. Remember that views are folders with an eight character maximum length name, and the last character must be a percent (%) symbol. If you are attempting to load a view from CD-ROM, the view names will most likely end in an underscore (_) character. This is the standard naming convention for views contained on a CD-ROM. However, views cannot be run directly from CD-ROM. If the application finds that the view is not in the proper VPFVIEW version 2.1 format for your system, it will alert you to the fact with a message and ask if you want to install the view on your system. Installing a view is the process of updating the view's format and correcting the paths to the databases and/or symbol set used by the view.

Create...

When the "Create..." option is selected, a dialog window named "Create View" appears. The Create View dialog provides a means to create a new view from a set of selected databases and libraries.

Add a database to the list by clicking "Add." A dialog window will ask you to locate a Database Header Table (DHT) or Library Attribute Table (LAT) file within the database. These files are located within the database

directory. If you want the view to access more than one database, click "Add" again. (If you make a mistake, the "Remove" button will delete the highlighted database from the view.) At this point, all of the available libraries in each of the selected databases will be included in the view. If you wish to include only certain libraries, highlight the appropriate database in the scrolling list, then add or remove the desired libraries from the scrolling list of libraries. Then press "create".

Next is a dialog window asking you to locate the symbol set which you do by locating one of the ".sym" files in the symbol set directory (ex.: markers.sym). This directory will have been installed in the same directory as the VPFVIEW binary or executable file.

Please note that VPFVIEW 2.x will not work with the symbol sets delivered with previous VPFVIEW versions. The software employs a version detection scheme on the symbol set to determine if it is valid.

You will now be prompted to enter the location and name for the view. Remember that its name must be less than or equal to eight characters in length and that the last character must be a percent (%) symbol. After you have selected the name and path, the view will be created and loaded by the application. This may take a couple of minutes depending upon the speed of your machine and the complexity of the VPF databases involved.

The selected database libraries will be loaded and the default themes will appear in the Feature Selection window. Default themes include one theme for every feature class within the library. A default theme includes all features in a feature class. You can create themes, however, that specify a subset of features within the library.
.
The "Cancel" button closes the dialog and cancels the view creation process.

Delete...

When the "Delete..." option is selected, the application will display the delete dialog from which you select a view to delete by locating the "env" file within a view. Once you have located the file, the software will ask you to confirm the deletion of the view. If you elect to delete the view, the software will remove it from your system, prompting you if any errors occur during the delete process. Please note that you may not delete a view which is currently loaded.

** **Warning:** The pre-defined views can be deleted. Therefore it is important that you have a backup copy of these views as they were provided on the distribution medium.   To maintain the integrity of the pre-defined view, make use of the "Copy" and "Rename" options (described below) to create views that you can modify.*

Copy...

When the "Copy..." option is selected the application will display the copy dialog from which you may select a view to copy by locating the "env" file within the view. Once you have selected a view, the software will display the standard file dialog from which you may specify a name and path for the copy. Please remember that the name of the copied view must be no longer than eight characters, and the last character must be a percent (%) symbol. If the view already exists, the program will ask you to confirm the overwrite. If another folder exists with the same name but is not a view, the program will report an error and ask for a new name and path for the copy. Once you have entered an acceptable name and path for the copy, the program will make a duplicate of the chosen view. Note that you may not overwrite a view which is currently loaded. In addition, you may not copy a view over itself.

Rename...

When the "Rename..." option is selected, the application will display the standard file dialog from which you may select a view to rename by locating the "env" file within the view directory. Once you have selected a view, the software will display the standard file dialog from which you may specify a name and path for the renamed view. Please remember that the name of the renamed view must be no longer than eight characters, and the last character must be a percent (%) symbol. If you only wish to move the view, locate a new path and keep the same view name. The program will then move and/or rename the view. Note that you may not overwrite another view with this option and that you may not rename the currently loaded view.

Install...

The install process gives you the capability to copy a view from one system to another or to update any view for which you have changed the location of the databases or symbol set. In addition, it can update view formats to the new VPFVIEW 2.1 view format. This process currently works for views you are transferring between UNIX, MS-Windows, and the Macintosh environments, and it will also update any views stored in the original DOS format. Please note that this process completely overwrites the existing view, so you might want to make backup copies in case any problems occur during the install.

When the "Install..." option is selected, the software will warn you that the install view process completely overwrites the view. It will then display the standard open file dialog from which you may select the view which you want to install by locating the "env" file within the view directory. (Press "Cancel" if you want to abort the install process.) Once you have selected a view, the program will read the information contained in the view to determine its format and will display the install view configuration dialog.

Each database path in the view must be updated. To change these paths, perform the following steps

1) Click on a database path you want to change.

2) Click on "Modify Database Path". The open file dialog will appear from which you may locate the matching database on your file system by locating a Database Header Table (DHT) or Library Attribute Table (LAT) from within the database directory.

After all database paths have been updated click "Install". Next, the symbol set path must be selected by locating a ".sym" file from within the symbol set directory (ex. "markers.sym").

The view will be installed and you will be asked if you want to load the installed view

Symbology

A view's symbology file includes the symbol and color identifiers that VPFVIEW uses to represent a theme when it draws the theme's coverage data. The current symbology file name is always displayed in the map window status bar beside the name of the view. When a view is created, a default symbology file named default.sym is created for it and is loaded with the view every time the view is loaded. When you first load a view, this is the symbology file name that you will see displayed in the map window. The available options under the symbology menu include Save, Save As Default, Save As..., Load..., Add CGM Symbol..., and Refresh All Symbols.

Note: Since point symbols are coded with special formatting to allow multi-colored symbols, the color of a point symbol is not saved with a symbology file.

Save...

The "Save" option will save any changes you have made to the symbology set that is currently in use. (The name of the current symbology file is always displayed in the bottom right corner of the map window.) When this option is selected, a warning dialog will appear and ask you to confirm that you wish to proceed, since the current symbology file will be overwritten.

Save As Default

The "Save As Default..." option will save any changes you have made to the symbology file that is currently in use to the file "default.sym". ("default.sym" will then become the current symbology file and displayed in the bottom right corner of the map window.) When this option is selected, a warning dialog will appear and ask you to confirm that you wish to proceed.

Save As...

The "Save As..." option allows you to save any changes you have made to the symbology file currently in use as a new file. When this option is selected, a standard file save dialog will be displayed prompting you to enter the name and location for the new symbology file (the extension ".sym" will automatically be added). The new symbology file can be recalled for use with the view at a later time, such as when the default symbol set is loaded with the view in your next VPFVIEW session. The ability to save various symbology files is also useful when more than one person will be using the same view, but different symbology is required or preferred.

Load...

Use the "Load..." option to load a previously saved symbology file. When this option is selected, a standard open file dialog is displayed, prompting you to locate a symbology file to load. One of the available files should be default.sym. Select a symbology file name from the list, and click "Open." The program will load it and update both the map window display and the feature selection window. If you want to exit without changing symbology files, click "Cancel."

Add CGM Symbol...

Use the "Add CGM Symbol..." to add one or more Clear-Text CGM (Computer Graphics Metafile) formatted symbols to a VPFVIEW symbol set. This menu option invokes the CGM dialog from which you may add new symbols to the markers.sym file for a particular symbol set. Note that this operation makes permanent changes to the VPFVIEW symbol set.

Refresh All Symbols

Use the "Refresh All Symbols" option to reload all symbols and refresh the current symbology. The software presently allows you to modify the color of the multi-colored point symbols. However, the color of the entire symbol is modified. This operation will reset the changes you have made to the color of any marker symbols and will update both the map and all themes in the feature selection window.

Feature Selection List

The Feature Selection List Menu contains several options for loading and saving feature selection lists. A feature selection list contains the set of all themes which you have chosen to display in the map window. The current feature selection list is maintained internally by the application and is only updated when you press the draw or apply buttons in the feature selection window. These options are helpful if you frequently display the same features because, by default, the Feature Selection List is reset with all themes turned off each time the selected view is changed. If you save a feature selection list to a file called "default.fsl", this will automatically be loaded when you load the view. The available options in this menu include "Save As..." and "Load..."

Save As...

Save the current set of selected themes with the "Save As..." option. In the standard save file dialog, enter a

name for the selected theme list (the extension ".fsl" will automatically be added), and click "Save." If the file is named default.fsl, it will be loaded automatically when the view is loaded and any selected themes will be displayed for the default study area. To exit without saving a feature selection list, click "Cancel."

Load...

Load a previously saved set of themes by selecting the "Load..." option. The standard open file dialog will appear. It displays the names of the feature selection list files that are available in the current view. Select a file by clicking on its name, then click "Open". When the file is loaded, the themes in the feature selection window are updated, but the map is not redrawn until you press the draw button in the feature selection window. To exit without loading a file, click "Cancel."

Image

The "Image" menu allows the user to save the contents of the map window to a user-specified bitmap file or to display a bitmap. This menu contains two options, "Load" and "Save", with further options for supporting the Microsoft Windows Bitmap (BMP) and Apple Macintosh PICT image formats. Please note that PICT is only supported on the Macintosh due to limitations in the XVT development toolkit. Image loading is handled differently depending upon the program mode.

When you load an image in the one window mode, it is displayed in the map window and the main menu is inaccessible. The label on the stop button in the map window is changed to "Restore", and you must press this button to restore normal program operation.

When you load an image in the three window mode, it is displayed in its own window. You may have a maximum of ten images loaded at any one time.

Save

Select the "Save" option, then select either a Windows Bitmap or Macintosh PICT file. You will be presented with the standard save file dialog from which you may select the name and directory for the saved image. You may save this image in any directory/folder on your system provided that VPFVIEW has write permission at that location. Once you have selected the name and location, the software will save the image. This image may be inserted into other applications, word processing documents, or loaded and displayed within VPFVIEW.

Load

Select the "Load" option, then select an image format from the displayed menu. You will be presented with the standard open file dialog from which you may select an image in the format you have chosen. The program will then load that image and display it. The manner in which the image is displayed varies depending upon the current operating mode.

In the one window mode, the program will save the current program state including the map window display

and show the image in place of the map. The main menu will be inaccessible and the stop button on the map window will read "Restore" instead of "Stop". You will need to press this button to return to normal program operation.

In the three window mode, the program will display the image in its own separate window. You may have up to ten images loaded at any given moment. The program will alert you if you have the maximum number loaded and attempt to load another image.

Hardcopy...

The "Hardcopy..." option of the file menu allows you to create a vector-based encapsulated Postscript plot file of the current display. The Hardcopy dialog provides the setup and print facility for generating an encapsulated Postscript output of the contents shown in the Map window. The user is responsible for printing this file to a Postscript Level 1 printer (Level 2 for color). The "Hardcopy" dialog contains several options which you may choose to include or not on the plot using the check boxes. The options are as follows:

• Legend (A legend consists of the symbology
   descriptions of all themes found in the output)
 North Arrow
 Projection Name
 Scale Bar
 Lat-Lon Grid
 Color (gray scale or color Postscript - When checked, the
   output will be in color. To print color, your printer
   must be Postscript Level 2 capable. Otherwise, it must
   be Postscript Level 1 capable.

The Title edit box allows you to type in a title for the output. If left blank, no title will appear.

You should also enter the page width and height (in inches) in the respective input fields. The recommended minimum page size is 8.5 by 11 inches; the maximum page size should not exceed the maximum page size of your output device.

Click "Continue" and the standard save file dialog will ask you for a path and filename for the hardcopy file.

To dismiss the "Hardcopy" window without taking any action, select "Cancel."
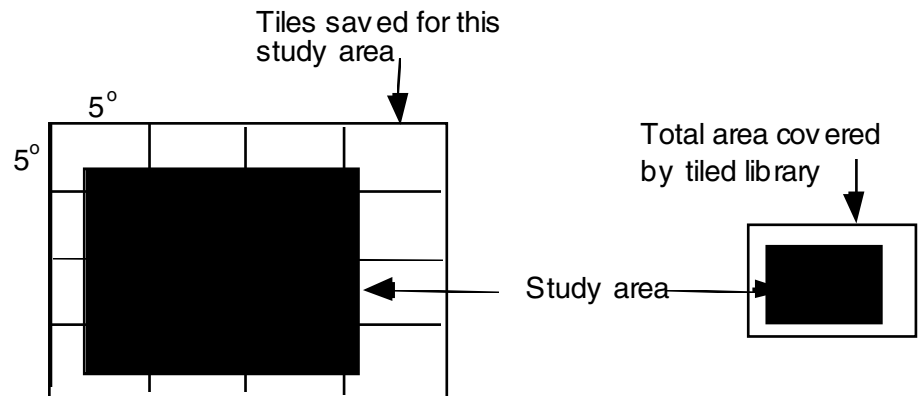
Save Selected Data

Selecting the "Save Selected Data" option enables you to save selected coverages of a library being used to generate your current display. The saved data will include all coverages that you have selected from the library for the study area shown. When the option is selected, the Save Selected Data dialog appears.

The "Save Selected Data" option requires that you specify a database path name and library name, which allows you to save the current study area in a different database or library. Be aware that the "Selected Data" option results in the creation of a new VPF database containing hundreds or perhaps thousands of files, and as a result may be a lengthy process. In addition, a significant amount of disk space may be necessary to accommodate the saved data. There is a "Check disk space first?" option you may choose to check, but it is time consuming and is not an accurate assessment of the disk space required. (Note: an error dialog will appear only if there is *not* adequate disk space.)

Although the area for which data are saved resembles the display area, it is not precisely the same as the display area. To understand exactly what the subset will include, you need to know certain things about the organization of VPF databases. The fully detailed libraries within a VPF database may be subdivided into geographic areas or tiles of a predetermined size (the size of a single tile will differ from one database to another). The "Save Selected Data" option saves data by complete tile, not by display area (Figure 5-4). This option will save the data for an entire tile even if your study area overlaps only part of a tile or if the study area is contained entirely within a single tile. However, the "Save Selected Data" option will not work for untiled data. When you are ready to proceed, select

"Save". To dismiss the window without taking any
action select "Cancel".

Figure 5-4. Relationship between study areas and tiles

Tiles saved for this
study area

5°

5°

Total area covered
by tiled library

Study area

The "Selected Data" option saves data for complete tiles, not just the study
area or partial tiles.

Exit   The "Exit" option exits the application.
                                  .

VPF Contents menu

Database   The "Database" menu option reveals the path names of the
                                  databases in the current view. Selecting one of the path names
                                  will activate the Database Contents window for displaying
                                  textual information about a database. The left-hand column in
                                  the pop-up window lists one or more file names which can be
                                  selected. The contents of the selected file will be displayed in
                                  the right-hand section of the window.

                                  These files (known as "VPF database metadata tables")
                                  may include such information as the name of the
                                  database, the data source, the publisher of the data, the
                                  number of media volumes required for database
                                  distribution, the geographic extent of the database, and

the available database documentation. The information
list may contain two parts: first, the attributes and their
definitions (e.g., XMIN Westernmost longitude),
followed by another list of the same attributes and their
contents (e.g., XMIN: —61.500000).

When you are finished viewing the files, dismiss the
window by pressing the close button.

Library

The "Library" menu option reveals the path names of the
databases in the current view. Selecting one of the path names
will activate the Library Contents window for displaying textual
information about the libraries in a database.

Select a database path name to display information about the
libraries it contains. The left-hand column in the pop-up window
contains a scrolling list of the libraries in the selected database as
well as a list of filenames. The contents of the selected file will
be displayed in the right-hand section of the window.

These files (known as "VPF library metadata tables")
may include such information as a list of the coverages
within the library, data quality, and geographic reference
(e.g., the datum and projection used). The information
list may contain two parts: first, the attributes and their
definitions, followed by another list of the same attributes
and their contents.

Data Dictionary...   The "Data Dictionary" option provides on-line information about the attributes and codes used for the selected database. When this option is selected, the path names of the databases in the current view are displayed. Select a database to activate the Data Dictionary window with the name of the selected database. Scrolling lists of the libraries, coverages, and feature classes in the database will be displayed along with the data dictionary information

Select the library, coverage, and feature class in which you are interested. Metadata information will be displayed that lists the name of the coverage, the attributes associated with that feature class, and, where applicable, any attribute codes and their meanings.

Place Name Index...   VPFVIEW has the ability to locate all places within the library or libraries in the current view that begin with a specified string of characters. (A gazetteer coverage must be present in the library, however.) By selecting the "Place Name Index..." option you will activate the Place Name Index dialog in which you can type a place name. The characters you type may represent a complete name or part of one, but the search will look for names that *begin* with the characters you have entered. For example, if you typed "Mex," the search would locate "Mexico," "Mexico City," and "Mexicali," but not "Gulf of Mexico." After you enter the desired place name, click "Locate." (If you wish to exit without making a search, click "Cancel.")

Each of the matching names in the place name index coverages for the libraries in the view will be displayed in the Library Reference window (or Map window if using one window mode), and can be selected for attribute display or for changing the map location.

When the search is completed, the "Place Names" window will pop up that lists the search results on the left. The places will also be located on the map in the Library Reference window. If you are interested in further information about a specific name on the list, select it from the list. Information such as the latitude and longitude of the place, the country in which it is located, and so on will be shown in the box on the right

side of the window (the exact information given will depend on the information in the selected database). If you click "Set Study Area," the highlighted outline in the Library Reference window will be positioned to incorporate the selected place, and the display will be redrawn. When you are finished viewing the selected list of place names, click "Cancel."

Spatial Query

In the one window mode the spatial query capability is listed under the VPF contents menu. A spatial query is a search by geographic coordinates for any features lying at or near the specified coordinate. The results are displayed in the Spatial Query window. When this option is selected, the Spatial Query dialog pops up.

The "Spatial Query" option allows you to find out information about the attributes associated with a feature you have identified. (You may be more familiar with other terms for the spatial query function such as "identify".) This function is especially useful because it allows you to see the attributes of a particular feature that are not indicated by the display. For example, an airport symbol on the map indicates only that an airport is located at that point. By querying that airport feature, however, other attributes that are contained in the database, such as the name of the airport, the length of its runway, and so on, can be viewed on the screen.

Feature Selection menu (one window mode)

Note: The "Feature Selection" menu appears only in one window mode.

Choosing "Select..." brings up the Feature Selection window. See Section 8 "Using the Feature Selection window" for more information.

Map Utilities menu (one window mode)

Note: The "Map Utilities" menu appears only in one window mode. The options under this menu perform the same functions that are available in the three window mode's Map window and Library Reference window. They are outlined here:

Zoom/Pan

The Zoom/Pan menu under the Map Utilities menu, contains options for moving about or zeroing in on a specific study area from either the coverage map or library reference displays. The available options include Coverage Map and Reference Map.

The Coverage Map Display option allows you to zoom into the coverage map display. When selected, the mouse cursor will be moved to the center of the map window and a red box will be displayed which follows the movement of the mouse cursor. This box displays the bounding rectangle of the study area and the zoom level. By using the mouse buttons and/or keyboard, you can zoom further into a specific area or slide the study area. Press the '**i**' key to zoom **i**n, the '**o**' key to zoom **o**ut, and click the mouse button to finalize the selection.

The Reference Map Display option allows to select a new study area from the library reference map display. When you select this option, the library reference map will be displayed in the map window and the mouse will be moved to the center of the map window. A red box will be displayed which follows the movement of the mouse cursor. The initial size of this box represents that of the study area. By using the mouse buttons and/or keyboard, you can pan over to a new study area and select a new zoom level.

For more information on Zoom/Pan operations see Section 7, "Using the Map window.

Coverage Map Distance

The "Coverage Map Distance" option allows you to measure approximate real-world distances from one location to another on the Coverage Map. For more information on how to use this function see Section 7, "Using the Map window".

Coverage Map Properties... When the "Coverage Map Properties..." option is selected, the Map Display Properties dialog appears. This window lets you specify the appearance of the Map display. It contains controls for selecting the map center, projection, scale bar, and lat/lon grid. In addition, it displays the extent of the current view. For more information on this feature see Section 7, "Using the Map window".

Reference Map Properties... When the "Reference Map Properties..." option is selected, the Reference Map Properties dialog appears. This window lets you set the display parameters of the Library Reference Map. For more information on this feature see Section 6, "Using the Library Reference window".

Text Report menu

The "Text Report" menu gives you the option of
generating two types of pre-defined text reports. The
generated reports are displayed in the Report window
from which you may save the report as a text file or print
it to a printer (or Postscript file).

Area Content Summary

The Area Content Summary option generates summary reports of
the feature classes and features present in the current map
display area for either the currently selected themes or all of the
themes in the view
.

Selected Features

The "Selected Features" report shows the feature classes,
features, and feature count for themes in the current selection set
within the current display area.

All Features

The "All Features" report shows feature classes, features,
and feature count for all features in the view within the
current display area (i.e., for all themes in all database
libraries).

Feature Location List

The "Feature Location List" option generates a list of either the
point locations of a particular theme, or the bounding rectangles
for a theme's primitives, depending upon the type of primitives
that make up the theme. The Theme Description list box is used
to specify a theme for a Feature Location Report. This report
lists the geographic location of all instances of a particular theme
found in the extents of the Map window.

The "Close" button cancels the report creation process.

The Database List contains the names of the databases in
the current view. You may select one of these databases
to access the themes for the libraries and coverages
contained therein.

The Library List contains the names of the libraries in the current database. You may select one of these libraries to access the themes for the coverages contained therein.

The Theme Description list box displays the descriptions for each theme available in the current selected coverage. **Double-click** on one of these to build a Feature Location Report on that particular theme.

Saving or Printing Text Reports When the text report is displayed, an option menu replaces the VPFVIEW main menu . You may elect to save the text report to a file by selecting the "Save As..." option from this menu. The save file dialog will appear where you can enter the location and file name for the report file. Or, you may elect to print the report. Select the "Print..." option to activate the "Print Report" window where you can select an output device and print the report.

.

Windows menu

This menu lists each open window in the program by the title listed in its border. Selecting any of the windows listed here will bring that window to the top of the window stacking order and give that window focus.

Help menu

VPFVIEW is equipped with on-line help. Click on the contents option to see help specific to VPFVIEW.

Section 6

Using the Library Reference window
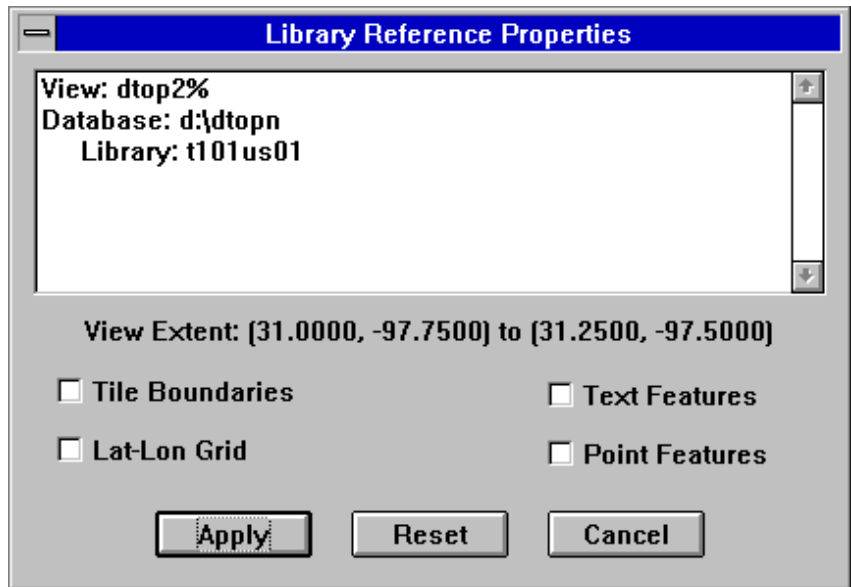
The Library Reference window

displays an outline map of the total extent of the selected library or libraries and a rectangle (the extent box) that represents the area being displayed in the Map window. The extent box, and, in turn, the display, can be moved or resized using the window's "Zoom/Pan" button, and the geographic coordinates of the center of the extent box are displayed. A latitude-longitude grid, tile boundaries, text, and reference points may be added to the Library Reference Display through the Reference Map Properties dialog by pressing "Properties ...".

*This window is only seen in the three window mode. In the one window mode, the Library Reference window will be shown in the Map window when necessary, such as when picking an initial area of interest or when performing a zoom on the Reference Map.

Note: In this section, "click on..." means to click on an object using the mouse button. For more information on using buttons, windows, and dialogs, see page 3-5 *Fundamental VPFVIEW operations*.

Properties...

The "Properties..." button displays the Reference Map Properties dialog from which you may set the display parameters of the Library Reference window.

The **Reference Map Properties** dialog displays the names of the databases and libraries in the current view along with the geographic extents of the view. In addition it lets you select several options concerning how the reference map appears when it is displayed in the Library Reference window.

The **Tile Boundaries** checkbox determines whether or not tile boundaries will be displayed on the reference map. When checked, tile boundaries will be displayed on the reference map.

The **Lat/Lon Grid** checkbox determines whether or not a lat/lon grid will be displayed on the reference map. When checked, the grid will be displayed.

.

The **Text Features** checkbox determines whether or not any text features contained in the reference coverage of each library will be shown on the reference map. When checked, they will appear.

The **Point Features** checkbox determines whether or not any point features contained in the reference coverage of each library will be shown on the reference map. When checked, they will appear.

The **"**Apply" button sets the changes you have made, and redraws the Library Reference window, if necessary.

The "Cancel" button closes the dialog and cancels any changes you have made.

The "Reset" button restores the display parameters to their system defaults. You must press the Apply button to reset the reference map.

Zoom/Pan

The "**Zoom/Pan**" button has three functions. You can move the extent box to a different location on the library map, and you can enlarge or reduce the size of the rectangle. You can perform these functions separately or in combination by clicking on the "Zoom/Pan" button, then

■ To pan: slide the mouse until the extent box is in the desired location.

■ To zoom **i**n: press the **<i>** key. Each time you press, the extent box is slightly reduced.

■ To zoom **o**ut: press the **<o>** key. Each time you press, the extent box is slightly enlarged.

When you are finished zooming and panning, click the mouse button. This will end the zoom/pan process and cause the display in the Map window to be redrawn with the new extent. If you want to revert to the original location and extent, you may escape zoom/pan mode by pressing the <Escape> key (this only works *before* you select with the mouse button).

The **Lat/Lon Display** shows the current geographic cursor location in degrees, minutes, and seconds as you move the cursor over the drawing region.

The **Status Bar** displays information to you when you are performing a zoom/pan operation in the Library Reference window. Otherwise, this area is blank.

Section 7   *Using the Map window*

The large Map window is the main

graphic display window in VPFVIEW. In it are drawn
the selected features for the geographic area outlined by
the extent box in the Library Reference window. The
Map window contains one or more controls, a Lat/Lon
display, and a Status Bar at the bottom. The functionality
and use of the controls are described in this section.

Note: In this section, "click on..." means to click on an
object using the mouse button. For more information on
using buttons, windows, and dialogs, see page 3-5
Fundamental VPFVIEW operations.

Lat/Lon Display

The Lat/Lon Display shows the current geographic cursor
location in degrees, minutes, and seconds as you move
the cursor over the drawing region.

Status Bar

The Status Bar displays the security level and name of the
current view. If no view is loaded, it shows a ready
message. When the software is performing an operation,
it will display any pertinent information.

Properties...

When the "Properties..." button is activated, the Map Display Properties dialog appears. This window lets you specify the appearance of the Map window. It contains controls for selecting the map center, projection, scale bar, and lat/lon grid. In addition, it displays the extent of the current view. These options are described below.

Scale Bar (display and units options)

The **Scalebar** checkbox determines whether or not the map will display a scale bar. When checked, the scale bar will be displayed.

The **Scalebar Units** list specifies whether the scale bar will display its measurement in terms of miles, nautical miles, or kilometers.

Lat—Lon Grid

The **Lat/Lon Grid** checkbox determines whether or not a lat/lon grid will be displayed on the map. When checked, the grid will be displayed.

Distance

The **Distance Units** list specifies whether map distance measurements will be made in terms of miles, nautical miles, or kilometers. Distances are approximate; the accuracy varies by dataset and projection.

Projection

The **Projection** list displays the current map projection and lets you change it to any of the projections supported by VPFVIEW.

When multiple libraries stored in different projections are accessed by a view, VPFVIEW automatically converts them to a common projection for display (usually geographic coordinates in decimal degrees). You can still use the "Projection" option to select a different projection.

VPFVIEW currently supports seven projections, which are as follows:

■ None (Decimal Degrees)
■ Azimuthal Equal Distance
■ Lambert Conformal Conic (one standard parallel)
■ Mercator
■ Transverse Mercator
■ Plate—Carrée
■ UPS

Be aware that some regions of the world may not be suitable for screen display when projected into one of these projections (e.g., the Transverse Mercator projection is not appropriate for polar regions). See the reference cited in Appendix B for additional information about projections and their uses.

Map Extent and Map Center

The **Map Extent** displays the latitude-longitude coordinates of the corners of current map display.

Map Center contains the coordinates of the current map center.

The **Center Latitude** edit boxes display the current geographic center latitude of the map, and allow you to change the center latitude.

The **Center Longitude** edit boxes display the current geographic center longitude of the map, and allow you to change the center longitude.

The "Apply" button sets the changes you have made, and redraws the Map window, if necessary.

The "Cancel" button closes the dialog and cancels any changes you have made.

The "Reset" button restores the display parameters to their system defaults. You must press the "Apply" button to reset the map.

Zoom

The "Zoom" button displays the zoom box on the Map which lets you further zoom into the selected viewing area When the "Zoom" button is selected, an extent box with a crosshair appears in the window.

■ To pan: slide the mouse until the extent box is in the desired location.

■ To zoom **i**n: press the **<i>** key. Each time you press, the extent box is slightly reduced.

■ To zoom **o**ut: press the **<o>** key. Each time you press, the extent box is slightly enlarged.

When the extent box is in the desired location, click with the mouse button to make your selection. The newly selected area will be drawn in the Map window. If you want to get out of the "Zoom" mode without making a selection, press the <escape> key. Once you have zoomed into a smaller region, you may only zoom back out by using the zoom/pan functionality on the Library Reference window.

Spatial Query

The "Spatial Query" button (in one window mode, this feature is located under the "VPF Contents" menu in the Main Window) allows you to find out information about the attributes associated with a feature you have identified. (You may be more familiar with other terms for the spatial query function such as "identify.") This function is especially useful because it allows you to see the attributes of a particular feature that are not indicated by the display. For example, an airport symbol on the map indicates only that an airport is located at that point. By querying that airport feature, however, other attributes that are contained in the database, such as the name of the airport, the length of its runway, and so on, can be viewed on the screen.

When more than one feature type (i.e., point, line, or area) is displayed, clicking on the "Spatial Query" button pops up the Spatial Query dialog which prompts you to select specific feature types for inquiry. You can select one, two, or all three feature types. After you have selected the desired feature types, click "Continue". A crosshair will appear in the display window. Move the crosshair until it rests on the feature you are interested in querying, and click. Features will be selected according to the following criteria:

Table 7-1. Feature selection criteria in a spatial query.

Feature	Selection criteria
Area	All polygons that contain the crosshair
Line	The line that is closest to the coordinates of the crosshair
Point	The point that is closest to the coordinates of the crosshair

Note that you can use the coordinates at the top of the window to place the crosshair on an exact location. The selected feature(s) will be identified on the display by a bounding rectangle (for an area or a line) or a circle (for a point) that contains the extent of the feature(s). The identification number of the feature(s) will also be displayed, as will a small point that indicates the location that was queried. The attributes from the data dictionary that are associated with the selected feature(s) will be shown in the Spatial Query window. If you decide not to make a query, you can press the <escape> key to exit the "Spatial Query" mode at any time.

> * ***Tip:*** *Be aware that if you have changed the symbology for any selected themes, they must be redrawn before a spatial query can be performed on them.*

Distance

The "Distance" button (available in three window mode) allows you to measure approximate real-world distances from one location to another on the Map window. (In one window mode this feature is available under the map utilities menu.) Remember that distances are approximate and the values will vary by dataset and type of projection. The unit of measure is either miles (the default) or kilometers. (You can change the unit of measure in the "Properties..." window.) When pressed, the cursor moves to the center of the map, and you are prompted to select the first point. From that time until you press the <Escape> key, the Map window Status Bar displays the Great Circle distance (defined in Appendix A) between each segment and the total distance each time you press the mouse button. To exit the "Distance" mode and get the final distance calculation, press the <escape> key.

Stop and Restore

The "Stop" button cancels out of a drawing operation. It is only accessible at that time, and is grayed out otherwise.

In the one window mode, the Map window is also used to display an image which you have loaded. To prevent the image from interfering with the normal operation of the program, the "Stop" button is also used to restore the drawing window after you finish viewing the image. When an image is displayed in the Map window, the button reads "RESTORE", and all other program controls and menu bars are grayed out, requiring you to press this button to restore normal program operation.

Section 8

Using the Feature Selection window

The Feature Selection window contains

tools for the creation and display of themes. The themes are displayed in the Map window, and are also used for most other operations in the program including spatial queries and hardcopy output. Within the Feature Selection window you can control whether or not a theme is selected or displayed, and the color and symbol which is used to display each type of feature. At the top of the window are menus for choosing the database, library, and coverage. The window also includes a legend panel showing the available themes within the selected coverage, the symbols assigned to each theme, and a check box for selecting a theme. At the bottom of the window are several command buttons. The functions of the components in the Feature Selection window are described in this section.

Note: In this section, "click on..." means to click on an object using the mouse button.

Database, Library, and Coverage lists

The Database List contains the names of all the databases available in the current view, and the name of the selected database. The Library List contains the names of all the libraries available within the current database, and the Coverage List contains the names of all the coverages available within the current library. The themes available for the selected coverage will be shown in the legend panel along with the associated symbology.

Legend panel

When a view is first loaded or created, VPFVIEW displays at least one theme for every feature class that is represented in a coverage. The default themes are equivalent to the feature classes. For example, a Political Boundaries coverage might contain lines and areas. By default, two themes would be available: Political Boundaries lines and Political Boundaries areas. Also, the symbology set that was specified when the view was created (or the default set) is used every time a view is loaded.

Check Boxes show which themes are selected (checked) or deselected (unchecked). You may set the status for a check box by clicking on it. Only those themes whose check boxes are checked will be selected and/or displayed when you press the Apply and/or Draw buttons.

Image Symbols show the current symbology for each theme. Clicking on a symbol invokes the Symbol Editor window from which you may change the symbology of that particular theme. Theme Controls show the textual description of each theme. Clicking on the text of any theme invokes the Theme Properties window from which you may view all the details of a theme as well as modifying, adding, and deleting themes from the current view.

Apply, Draw, Reset, New Theme, All, None, Close

The "Apply" button updates the feature selection list held internal to the program with any changes you made to the list of selected and deselected features.

The "Draw" button performs the same operation as the Apply button, but also draws any selected features found in the viewing area in the Map window.

The "Reset" button sets the selected and deselected features list to its previous settings (this means the settings held internal to the program just after you last pressed the Apply and/or Draw buttons).

The "New Theme..." button invokes the Theme Properties window with the current selected database, library, and coverage, allowing you to create a new theme in the current view.

The "All" button selects all the themes in the current coverage by checking their check boxes. This does not set the internal list of selected themes.

The "None" button deselects all themes in the current coverage by clearing the check state of their check boxes. This does not set the internal list of selected themes.

The "Close" button closes out the Feature Selection window, canceling any changes you made since last pressing the Apply and/or Draw buttons. This button is only available in the one window mode.

** **Tip:** It is important to consider the order in which you select themes because it affects the sequence in which themes are drawn in the display window. Feature classes–from any coverage–are always drawn in the following order: areas, lines, points, text. Within each feature class, themes are drawn in the order in which they were selected (i.e., the first theme selected is drawn first, and so on).*

Symbology

The graphic next to the theme name shows the symbology currently assigned to the theme. You can change the color and/or symbol by clicking on the graphic to bring up the Symbol Editor window.

The Symbol Editor window displays the symbology for a particular theme and provides symbology modification capabilities. The window contains a set of four list box control sets for each of the different feature display types: Points, Lines, Areas, and Text. Each control set consists of a list of available symbols and colors. The current selected symbol and color are shown via a black box surrounding them. Only one set will be active at any particular time corresponding the feature display type of the selected theme.

Please Note: The symbology for Point symbols is somewhat different from the rest. Point symbols are multi-colored, so the

color list may not show any selected color. If you decide to set a color for a Point symbol, you will change the entire Point symbol to that color. In addition, you will not be able to restore the original color scheme except through the Refresh Symbology menu item under Symbology in the File menu. When changing a Point color symbol, you will be warned if you press the Apply button.

The Symbol Control List displays the available symbols for a particular feature display type. A black rectangle is drawn around the current selected symbol in the list. You may select a new symbol by clicking on the desired symbol.

The Color Control List displays the available colors for a particular feature display type. A black rectangle is drawn around the current selected color in the list. You may select a new color by clicking on the desired color.

The "Apply" button applies any changes you have made to the symbology for the selected theme. Both the Feature Selection window and the Theme Properties window are updated.

The "Reset" button restores the color and symbol for the current theme to its current internal settings. This ONLY applies to the Symbol Editor window and DOES NOT have any affect on the actual symbology for the selected theme.

The "Close" button closes the Symbol Editor window. If you have not applied your changes to the current theme symbology, they will be lost.

The Symbology window can also be accessed from the Theme Properties window which is used to create or modify themes. The "New Theme..." button is described later in this section, as well as in Section 4. When the Theme Properties window is activated in this manner, only the name (i.e., description), logical expression, and symbol tools are functional.

Symbology sets can be saved and recalled for use at a later time; the "Symbology" option is discussed in Section 5, "Using the VPFVIEW window." You can load a previously created symbology set automatically when you create a view, or after a view is loaded.

> ** **Warning:** The changes you have made to the symbology must be saved before exiting the program or the original symbology will be restored upon program exit. See Chapter 5, Symbology, for a discussion on saving your changes.*

If you wish to perform a spatial query on themes after you have changed their symbology, you must first redraw the display by selecting "Draw."

The theme name

The themes for a coverage are listed in the legend panel in the order in which they were created. An existing theme can be modified or deleted through the Theme Properties window, which can be accessed by clicking on the theme name. These tools are discussed under the "New Theme..." button, below.

New Theme...

By default, VPFVIEW creates one theme for every feature class present in every coverage. You can create new themes by clicking on the "New Theme..." button located at the bottom of the Feature Selection window. This will activate the Theme Properties window. Please see Section 2, "VPF database terms" for an explanation of the concept of themes.

The Theme Properties window allows the user to enter a name (description) for the theme; access the data dictionary to view attributes and codes; define the theme by building a logical expression; choose symbology for the theme; and perform other related functions. An example of the process of creating a new theme can be found in Section 4, "Working with VPFVIEW." Below, the tools in the Theme Properties window are described in order of their position in the window.

Description

The Theme Description edit box displays the description for the current theme. This edit control also allows you to modify the description. The words you enter here will be used to identify the theme in the legend panel of the Theme Properties window.

.

Expression

A theme can be defined by a logical expression The Theme Expression edit box displays the logical expression for the current theme. This text edit also allows you to modify the expression. Expressions may be simple or compound. To be valid, a logical expression must adhere to the format that follows.

<attribute name> <logical operator> <value>

Examples:

TYPE=3

hgt >= 46 AND hgt< 60

The expression must begin with the name of an attribute (i.e., the field name of the attribute, not the definition) in the selected feature class. This part of the expression is not case-sensitive, so you may type upper or lowercase letters, or a combination of the two.

The logical operator can be one of the following characters or character pairs:

Character	Meaning
=	equals
<	less than
>	greater than
<=	less than or equal to
>=	greater than or equal to
<>	not equal to

The value can be any valid value that the attribute field may contain. This part of the expression *is* case-sensitive, so if the field contains a "W," meaning "West," for example, you must type an uppercase letter. Character values should not be enclosed in quotation marks.

If more than one logical clause is required to define the desired theme, the clauses can be connected by either "AND" or "OR" to build a compound logical expression. When VPFVIEW selects records from the database, clauses are evaluated from left to right; therefore, you cannot group by parentheses as you could in a spreadsheet.

Connector	Meaning
AND	Both of the connected clauses must be true
OR	Only one of the clauses must be true

Separating the different parts of an expression by a space makes the single expression more readable, but spaces are not required within a clause. Spaces *are* required before and after the connectors.

Valid attribute names and attribute values can be found in the on-line data dictionary, which can be accessed from the Theme Properties window with the "Dictionary..." button. The use of "Dictionary..." button is explained below.

An asterisk (*) on the Expression line selects all of the features in the feature class.

Database, Library

You can select any database and library available in the current view. The Database List and Library List display the database and library for the current theme. When creating a new theme, you may change the database or library for the new theme using these controls. When viewing or modifying an existing theme, these controls are grayed out.

Coverage

You can create a new theme for any coverage from the currently selected library. The Coverage List displays the coverage for the current theme. When creating a new theme, you may change the coverage for the new theme using this control. When viewing or modifying an existing theme, this control is grayed out.

Feature Class

You can create a theme for any feature class within the currently selected coverage. The Feature Class List displays the feature class for the current theme. When creating a new theme, you may change the feature class for the new theme using this control. When viewing or modifying an existing theme, this control is grayed out.

Symbol

The Theme Symbol Control displays the symbology for the theme. You may change it by clicking on the symbol, at which time, the Symbol Editor window is invoked. Please note that if you change the symbology for a theme, and then close this window without applying your changes to the current theme, the symbology for the theme IS NOT set. The tools in the Symbology Editor window are described previously in this section under "Legend Panel–Symbology."

Apply

Clicking on the "Apply" button saves the specified theme properties. Once you have entered a theme name, expression, selected the symbology, and so on, you should click "Apply." A few moments after you apply, the new theme will finish being generated and should appear at the bottom of the list of themes in the selected coverage.

Reset

The "Reset" button restores the properties of the current theme to their previous settings. However, this DOES NOT include its symbology. Once that has been changed, it can only be reset manually through the Symbol Editor window.

Dictionary...

The "Data Dictionary..." button invokes the Data Dictionary window, which provides on-line information about the attributes and codes used for the selected database. The window provides a list of the available libraries, coverages, and features classes for the selected database, and a scrollable text box showing the

attributes for the selected library, coverage, and feature class. To use this window:

1) Select a library

2) Select a coverage

3) Select a feature class to view its attribution

This window automatically updates itself whenever you make new selections from any of the lists. When finished using the Data Dictionary, close the window by pressing the Close button. This function is helpful during the process of building a logical expression to define a theme.

New

The "New" button resets the Theme Properties window for a new theme. This includes default settings for the symbology and a blank description and expression. The database, library, coverage, and feature class lists will use the defaults with which the Theme Properties window was invoked from the Feature Selection window. This button is grayed out when you are editing a new theme.

Delete

The "Delete" button deletes the current theme from the view. You are asked for confirmation before it is deleted. This button is grayed out when you are editing a new theme. Note: if you delete the only theme in the view that represents a particular coverage feature class (e.g., Roads text), and you save the view, then later reload it, the theme will be displayed again. Whenever a view is loaded, VPFVIEW displays at least one theme for every feature class by default.

Next and Previous

The "Next" and "Previous" buttons allow you to "scroll" through the other themes in the view and see their properties. Themes are listed in order of creation, so the newest theme will be at the end of the list. If you click "Previous" until you are at the first theme in the list, the "Previous" button will appear gray. Likewise, the "Next" button will be gray when you are at the last theme.

Close

The "Close" button closes the window.
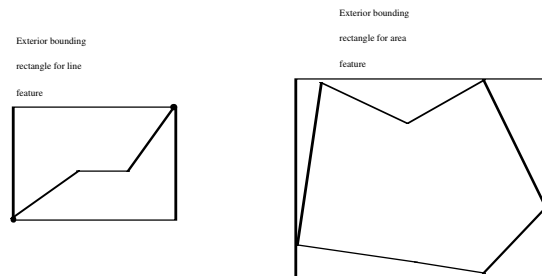
Appendix A   *Terminology*

Acronyms

CD—ROM	Compact Disc — Read Only Memory
CGM	Computer Graphics Metafile
DMA	Defense Mapping Agency
DIGEST	Digital Geographic Information Exchange Standard
GIS	Geographic Information System
MB	Megabyte
NFS	Network File System
OS	Operating System
PC	Personal Computer
RAM	Random Access Memory
SCSI	Small Computer Standard Interface
VPF	Vector Product Format
VRF	Vector Relational Format

Terms

Area/polygon–An area feature defined by the series of lines making up its boundary.

Attribute–A characteristic of a map feature. For example, the attributes of a stream might include width or hydrographic category (e.g., perennial or intermittent).

Bounding rectangle–The smallest rectangle that completely surrounds a line or area feature. Also referred to as minimum bounding rectangle.

Exterior bounding

rectangle for line

feature

Exterior bounding

rectangle for area

feature

Coverage–A collection of feature classes.

Feature–An object on a map (i.e., a geographic entity) that is represented by a point, line, or area and has an associated attribute.

Feature class–A set of related features (points, lines, areas, or some combination) with a common set of attributes. A feature class that contains only one kind of primitive (e.g., lines) is called a simple feature class; a feature class that contains two or more types of primitives is called a complex feature class. Text is a third type of feature class.

Feature selection set–A collection of themes selected by the user for a particular view.

Great circle distance–A segment that represents the shortest distance between two points on the surface of the earth.

Library reference coverage–A default map display for each library in the VPF database. It contains predefined features and is used to select a study area within a library.

Line–A set of ordered coordinates that represents the shape of a feature too narrow to be displayed as an area digitized at the map scale.

Macintosh PICT–A standard format supported by Apple Macintosh computers for storing images.

Point–A single x,y coordinate that represents a feature too small to be displayed as a line or area.

PostScript file format–A file format used by certain printers.

Primitive–The graphic representation of a feature; a point, line, or polygon.

Symbology–A unique collection of colors and styles (point, line, and area symbols) used to graphically represent themes within a view.

Theme–A collection of features with a combination of attributes specified by a thematic query expression.

View–A directory containing files that tell VPFView where the data is located on the users systems and the collection of themes and associated symbology.

Windows Bitmap (.bmp)–A standard format for storing bit-mapped images of any size with any number of colors.

Appendix B   References

For information about the UNIX operating system, see

> Thomas, Rebecca and Jean Yates. c. 1982. *A User Guide to the UNIX System.* Berkeley: Osborne/McGraw-Hill, Inc.*

For information about DOS, see

> DeVoney, Chris. c. 1986. *Using PC DOS*, Que Corporation, Indianapolis, IN.*

For information about projections, see

> Snyder, John P., 1987. *Map Projections–A Working Manual.* USGS Professional Paper 1395.

For information about the VPF data model used in VPF databases, see

> MIL-STD-2407, *Military Standard–Vector Product Format*, available from the Defense Printing Service, 700 Robbins Ave. (Bldg. 4D), Philadelphia, PA 19111-5094.

and

> *Digital Geographic Information Exchange Standard*, Edition 1.1, Fall 1992, available from the Canadian Directorate of Geographic Operations, National Defense Headquarters (NDHQ), 101 Colonel By Drive, Ottawa, Ontario, Canada K1A OK2.

For information about the development of Vector Product Format and the early history of the Digital

Chart of the World and Vector Smart Map databases, see

Development of the Digital Chart of the World, available from the US Department of Commerce, National Technical Information Service, 5285 Port Royal Rd., Springfield, VA 22161.

---

* Reference of these materials does not constitute an endorsement by DMA.

Appendix C   Hardware/software requirements

For the VPFVIEW Version 2.1 software to function correctly with any database implemented in VPF, VPFVIEW must be installed on a system containing the minimum system requirements specified below:

IBM PCs and Compatibles (32-Bit Application)

Please note that this program does not make any system dependent calls with respect to color palettes, so if you experience trouble, please make sure that you have the most current version of the graphics drivers for your chip and/or graphics card. Microsoft maintains a bulletin board containing the latest drivers available to them, or you can contact your graphics card manufacturer directly. Also note that although this program will function in a 16-color Windows/95/NT graphics mode, most of the colors will be dithered, and due to the way in which the software implements its graphics primitives, you will most likely get a color other than the dithered one you chose. This program really requires a 256-color mode or better to view the entire set of colors.

VPFVIEW for Windows/95/NT was developed in a Win32 environment under Windows NT. The program runs under Windows NT, Windows 95, and Windows 3.1 or later. If you are running Windows 3.1 or later, you must install the Win32s libraries (version 1.25 or later) to run this program because VPFVIEW is now a 32-Bit application. If the Win32s libraries were not distributed with the application, you may download them freely from Microsoft's ftp site at ftp.microsoft.com from the directory Softlib.

The minimum system configurations are as follows:

Windows NT 3.1/3.5:

* IBM PC Compatible with an Intel 80386DX-25MHz
  processor
* 16MB memory (20 preferred)
* Approx. 10MB free hard drive space
* 256-color VGA graphics adapter
* CD-ROM drive meeting the MPC Multimedia standard
* Postscript output device (for printing hardcopy output) -
  optional

Windows 95:

* IBM PC Compatible with an Intel 80386DX-25MHz
  processor
* 8MB memory (12 preferred)
* Approx. 10MB free hard drive space
* 16-color VGA graphics adapter (256-color SVGA
  adapter preferred)
* CD-ROM drive meeting the MPC Multimedia standard
* Postscript output device (for printing hardcopy output) -
  optional

     The Windows 95 version does not handle the
changing of color and/or screen resolutions on-the-fly. If
you want to see the changes reflected in the application,
restart the application.

Windows 3.1 or later:

* IBM PC Compatible with an Intel 80386DX-25MHz
  processor
* 4MB memory (8 preferred)
* Approx. 10MB free hard drive space
* 16-color VGA graphics adapter (256-color SVGA
  adapter preferred)
* CD-ROM drive meeting the MPC Multimedia standard
* MS-DOS 5.0 or later
* Win32s version 1.25 or later - system must operate in
  enhanced mode to use
* Postscript output device (for printing hardcopy output) -
  optional

IBM PCs and Compatibles (16-Bit Application)

Please note that this program does not make any system
dependent calls with respect to color palettes, so if you
experience trouble, please make sure that you have the
most current version of the graphics drivers for your chip
and/or graphics card. Microsoft maintains a bulletin
board containing the latest drivers available to them, or
you can contact your graphics card manufacturer directly.
Also note that although this program will function in a
16-color Windows graphics mode, most of the colors will
be dithered, and that due to the way in which the software
implements its graphics primitives, you will most likely
get a color other than the dithered one you chose. This
program really requires a 256-color mode or better to
view the entire set of colors.

VPFVIEW for Windows 3.1 was developed in a 16-bit
environment under Windows for Workgroups 3.11. The
program runs under Windows NT and Windows 3.1 or
later. It does not run correctly under Windows 95
because of changes in the handling of printers between
Windows 3.1 and Windows 95 (an XVT problem crashes
the program when it attempts to display the report
window).

The minimum system configurations are as follows:

Windows NT 3.1/3.5:

* IBM PC Compatible with an Intel 80386DX-25MHz
   processor
* 16MB memory (20 preferred)
* Approx. 5MB free hard drive space
* 256-color VGA graphics adapter
* CD-ROM drive meeting the MPC Multimedia standard
* Postscript output device (for printing hardcopy output) -
   optional

Windows 3.1 or later

* IBM PC Compatible with an Intel 80386DX-25MHz
   processor

* 4MB memory (8 preferred)
* Approx. 10MB free hard drive space
* 16-color VGA graphics adapter (256-color SVGA
  adapter preferred)
* CD-ROM drive meeting the MPC Multimedia standard
* MS-DOS 5.0 or later
* Postscript output device (for printing hardcopy output) -
  optional

Sun SPARCstations (SunOs)

VPFVIEW for SunOs was developed on a Sun Sparc 1
running Motif 1.1 and SunOs 4.1.3. Please note that the
program was compiled statically under Motif, so it should
work fine under both Motif and OpenLook. However, it
has only been thoroughly tested under Motif. The
minimum system configuration is as follows:

* Sun SPARCstation or compatibles
* SunOs 4.1.1 or later
* Motif 1.1 or OpenLook Window Manager
* 8MB memory
* Approx. 10MB free hard drive space
* 256-color graphics adapter
* Sun CD-ROM drive
* Postscript output device (for printing output) - optional

Sun SPARCstations (Solaris)

VPFVIEW for Solaris was developed on a Sun Sparc 2
running Motif 1.2.4 and Solaris 2.4. Please note that the
program was compiled statically under Motif, so it should
work fine under both Motif and OpenLook. However, it
has only been thoroughly tested under Motif. The
minimum system configuration is as follows:

* Sun SPARCstation or compatibles
* Solaris 2.1 or later
* Motif 1.2 or OpenLook Window Manager
* 8MB memory
* Approx. 10MB free hard drive space
* 256-color graphics adapter
* Sun CD-ROM drive

* Postscript output device (for printing output) - optional

Apple Macintosh 68k-based machines

VPFVIEW for Macintosh was developed on a Macintosh Quadra 850AV under System 7.5. Please note that you may experience trouble with color palettes if you switch back and forth between this application and others or if you change color resolutions on the fly. This is an XVT problem. The minimum system configuration is as follows:

* Apple Macintosh 68020/68030/68040/PPC
* System 7.1 or later
* 8MB memory (12 preferred)
* Approx. 5MB free hard drive space
* CD-ROM drive
* Postscript output device (for printing output) - optional

Appendix D   VPFVIEW files and subdirectories

VPFVIEW defines certain file structures for its own use, in addition to the VPF database tables and file structures. VPFVIEW structures are stored in the application directory and other user-defined workspaces. This appendix summarizes these structures and gives additional details about the required formats for some of these files.

■ The *vpfview* file executes and initializes the VPFVIEW application.

■ The *symbols* subdirectory contains symbol set files.

■ Subdirectories having a % suffix (e.g., *noamer%*) are views. These subdirectories contain the following files:

- The *env* file contains the corresponding databases, library names, and symbol path for the view.

- The *themes* file contains the selection set (or theme) definitions for the view.

- The *default.sym* file is the default symbology for the view.

- Other files with a *.sym* extension are user-created symbologies for the view.

- Files with an *.fsl* extension are user-created feature selection sets for the view.

- Files with an *.rpt* extension are report formatting files.

■ Other files in the workspace may include plot files in Encapsulated PostScript format (these files usually have

an *.eps* extension), image files in the Windows Bitmap
format (files with a *.bmp* extension), and report files (files
with a *.txt* extension)

Views

A view is implemented as a directory on a hard disk that
contains information to allow user-definable displays of the
stored VPF data. A view contains at least three text files that
define the data source display environment (*env*, *themes*, and
default.sym) and a series of selection set files that store the
results of queries to speed the display of data. A view may
also contain feature selection set files (*.fsl*). The files in a
view directory are as follows:

env

The *env* file is an ASCII file containing the databases and
libraries that the view is associated with and the path to a
symbol set. The first line conains a format delimter. Each
database is on its own line. Following each database is a
number representing the number of libraries in the database,
followed by the library names. Each line ends in a carriage
return. The last line contains the path to a symbol set
directory. The format of the file is as follows:

{format delimiter}<cr>
({database1 path}<cr>
({number of libraries for database1}<cr>
{library1 name}<cr>
{library2 name}<cr>
...
{libraryn name}<cr>)
...
{databasen path}<cr>
{number of libraries for databasen}<cr>
{library1 name}<cr>
{library2 name}<cr>
...
{libraryn name}<cr>)
{symbol set path}<eof>

themes

The *themes* file is one that defines each theme in the view. A theme is a subset of the features in a feature class, based upon a logical selection expression. A theme record consists of six text strings each terminated in the file by a carriage return. The first line of the record is a text description of the theme that will appear on the feature selection menu. The next lines are the names of the database, library, coverage, and feature class, respectively, with which the theme is associated. The last line of the record is the logical selection expression to be applied to the feature class's feature table. Every set of six lines describes a theme.

```
{description}<cr>
{database path}<cr>
{library name}<cr>
{coverage name}<cr>
{feature class}<cr>
{expression}<cr>
...nthemes...
<eof>
```

Selection set files - cndnnnnn endnnnnn edgnnnnn facnnnnn txtnnnnn (.til)

Given that each theme contains a logical expression that defines a subset of rows in a feature table, the first time that a particular theme is drawn for a given tile, VPFVIEW stores a bit representation of the related primitives that represent the features for the theme in the given tile. A selection set file's name starts with the appropriate primitive type name - 'cnd', 'end', 'edg', 'fac', or 'txt', followed by the theme number (starting with 0) that it is associated with, left padded with zeros to take up 5 places. For example, if the third theme defined in the themes file was associated with a simple area feature class, its corresponding selection set file would be 'fac00002'. If a particular theme represented a selection against a complex feature class, any of the appropriate selection set files would be defined. If the complex feature contained both entity nodes and edges, the theme (say number 10) would have an 'end00010' and 'edg00010' file. Each selection set file is a binary file composed of multiple entries, one per tile, whose first number is the number of rows represented in the tile. It is a 4 byte integer. After that, it is essentially a stream of bits with each bit representing a row number in the primitive table for the associated tile. If the bit is a 0 (off) the row is not in the selection set; otherwise it is. The bit

numbers exactly match the row IDs in the table; therefore, bit number 0 is unused, since row IDs all start at 1.

Associated with each primitive selection set file is an index file with the same name, but with an extension of '.til'. The index file is a binary file with an entry for each tile in the library. Each entry in the index is a byte offset to the position in the selection set file at which the appropriate bit representation of the selection set is stored for that tile.

These selection set files and indexes allow VPFVIEW to very quickly determine which primitives make up a given theme without having to perform the relates between the primitive and feature tables and apply the theme's selection expression to each feature row, after the initial draw. These files store the results of this complex and time-consuming operation after the initial draw for each tile. If for any reason a theme's selection set file is missing in the course of the program, or a particular tile is not contained in the selection set file, VPFVIEW will apply the theme's logical to the table, set up appropriate relates, and then save the results in the selection set file for future use.

*.sym

A file ending in .*sym* is an ASCII file that contains the symbology for each theme in the view. A view may contain different symbology sets. A file named default.sym must be present in the view directory, and is loaded upon view initialization. Each theme's symbology is stored as a line of text containing a total of seven space-delimited integer values. The values are defined as follows:

{point symbol} {line color} {line symbol} {area color} {area symbol} {text color} {text symbol}<cr>
...nthemes...
<eof>

where the color numbers define a displayable color ID from the Xcolors.rgb file contained in the symbol set directory, and the symbol numbers point to a symbol definition in the respective symbol definition files located in the symbol set directory. The color for point symbols is a part of the point symbol definition so is not indexed.

*.fsl

A feature selection list file ends in *.fsl*. This is a binary file containing a list of theme numbers to be automatically selected when the file is loaded. If a file named *default.fsl* is present in the view, it will be loaded upon initialization. Each theme number in the file is stored as a four-byte binary integer in the host platform's internal storage representation.

{byte1 byte2 byte3 byte4} ...number of themes in fsl... <eof>
    (first theme number)

Symbol Definition Files

The allowable symbols in VPFVIEW v2.1 are defined by the files in the *symbols* directory which usually resides in the directory containing the executable. Other custom symbol set directories may be set up and referenced by a view, but they must match this format exactly. These files contain symbol attribute information for defining each of the symbols available to display lines, areas, point markers, and annotation on a map display. When these files are loaded, each symbol can then be referred to by its record number in its respective symbol definition table. The files present are *lines.sym*, *areas.sym*, *markers.sym*, and *text.sym*. Each file is a standard ASCII text file.

lines.sym:

{width} {style} [{attributes...}]<cr>

- *width* is the width of the line in pixels. Zero (0) indicates the hardware dependent fast line drawing algorithm.
- *style* is one of the following numbers:

0 - SolidLine	9 - MarkerLine
1 - LineOnOffDash	10 - SawToothLine
2 - LineDoubleDash	11 - DragonToothLine
3 - TickLine	12 - MarkerDashLine
4 - TickDashLine	13 - MarkerOnOffLine
5 - DoubleTickLine	14 - CrossDotLine
6 - AltDoubleTickLine	15 - DotLine
7 - UpperTickLine	16 - DoubleLine
8 - LowerTickLine	17 - DoubleDashLine

Please refer to Figure D-2 for the specifications of each line style. If *style* is SolidLine, no other attributes appear on the line; otherwise, the attribute list varies with the style. Each attribute is an ASCII integer value, except for "filename", which is a valid system specific file name, assumed to be in the same directory unless a full path is specified. The attribute lists for the line styles are given below.

LineOnOffDash
{dashlistlength} {dashlist...}
- *dashlistlength* is the number of dashes in the dash list.
- *dashlist* is the dash list used to set the line dash style as defined in the X11 Xlib Programming Manual. The dash list specifies a pattern of pixels on and pixels off. For example, if the dash list is (2, 3, 4, 5), the line will be drawn with 2 pixels on, then 3 pixels off, then 4 pixels on, and 5 pixels off. The pattern would then repeat starting with 2 pixels on, and so on. The open space of the pattern leaves the existing background displayed.

LineDoubleDash
{dashlistlength} {dashlist...}
- *dashlistlength* is the number of dashes in the dash list.
- *dashlist* is the dash list used to set the line dash style as defined in the X11 Xlib Programming Manual. The dash list works the same as LineOnOffDash, except that the open space

of the dash pattern is filled in with the current background color.

TickLine
{height} {distance}
- *height* is the height in pixels of the perpendicular ticks.
- *distance* is the distance in pixels between the ticks.

TickDashLine
{height} {distance} {gap}
- *height* is the height in pixels of the perpendicular ticks.
- *distance* is the length in pixels of the solid part of the dash. It should be an odd number so the vertical tick can be placed directly in the center of the dash.
- *gap* is the gap in pixels between the dash lines.

DoubleTickLine
{height} {distance} {gap}
- *height* is the height in pixels of the perpendicular ticks.
- *distance* is the distance in pixels between the ticks.
- *gap* is the gap in pixels between the double ticks.

AltDoubleTickLine
{height} {distance} {gap}
- *height* is the height in pixels of the perpendicular ticks.
- *distance* is the distance in pixels between the ticks.
- *gap* is the gap in pixels between the double ticks.

UpperTickLine
{height} {distance}
- *height* is the height in pixels of the perpendicular ticks.
- *distance* is the distance in pixels between the ticks.

LowerTickLine

{height} {distance}
- *height* is the height in pixels of the perpendicular ticks.
- *distance* is the distance in pixels between the ticks.

MarkerLine

{filename} {justification}
- *filename* is the name of an existing VPFVIEW v2.1 marker file, as defined for the markers.sym file with only one marker.
- *justification* specifies that marker to be placed on the top (1) of the line, in the center (0) of the line, or on the bottom (—1) of the line.

SawToothLine

{height} {distance}
- *height* is the height in pixels of a spike either above or below the center line.
- *distance* is the distance in pixels between an upper spike and the next lower spike in a saw tooth.

DragonToothLine

{height} {distance} {gap}
- *height* is the height in pixels of the perpendicular tooth indentations.
- *distance* is the number of pixels of the straight part of the line.
- *gap* is the gap between the straight parts of the line and defines the width of the base of the tooth indentations.

MarkerDashLine

{distance} {gap} {filename} {justification}
- *distance* is the number of pixels of the solid part of the dashed line.
- *gap* is the gap in pixels between the solid dash lines. It must be wide enough to accommodate the specified marker. Any open space in the line dash is filled with the current background color before drawing the marker symbols.
- *filename* is the name of an existing VPFVIEW v2.1 marker file, as defined for the markers.sym file with only one marker.
- *justification* specifies that marker to be placed on the top (1) of the line, in the center (0) of the line, or on the bottom (—1) of the line.

MarkerOnOffLine

{distance} {gap} {filename} {justification}

- *distance* is the number of pixels of the solid part of the dashed line.
- *gap* is the gap in pixels between the solid dashes. It must be wide enough to accommodate the specified marker. Any open space in the line dash is left transparent.
- *filename* is the name of an existing VPFVIEW CGM marker file, as defined for the markers.sym file with only one marker.
- *justification* specifies that the marker is to be placed on the top (1) of the line, in the center (0) of the line, or on the bottom (—1) of the line.

CrossDotLine

{distance} {height} {radius}
- *distance* is the distance in pixels between the centers of the cross dots.
- *height* is the height in pixels away from the line to the center of each cross dot.
- *radius* is the radius in pixels of both cross dots.

DotLine

{distance} {radius}
- *distance* is the distance in pixels between the centers of the dots.
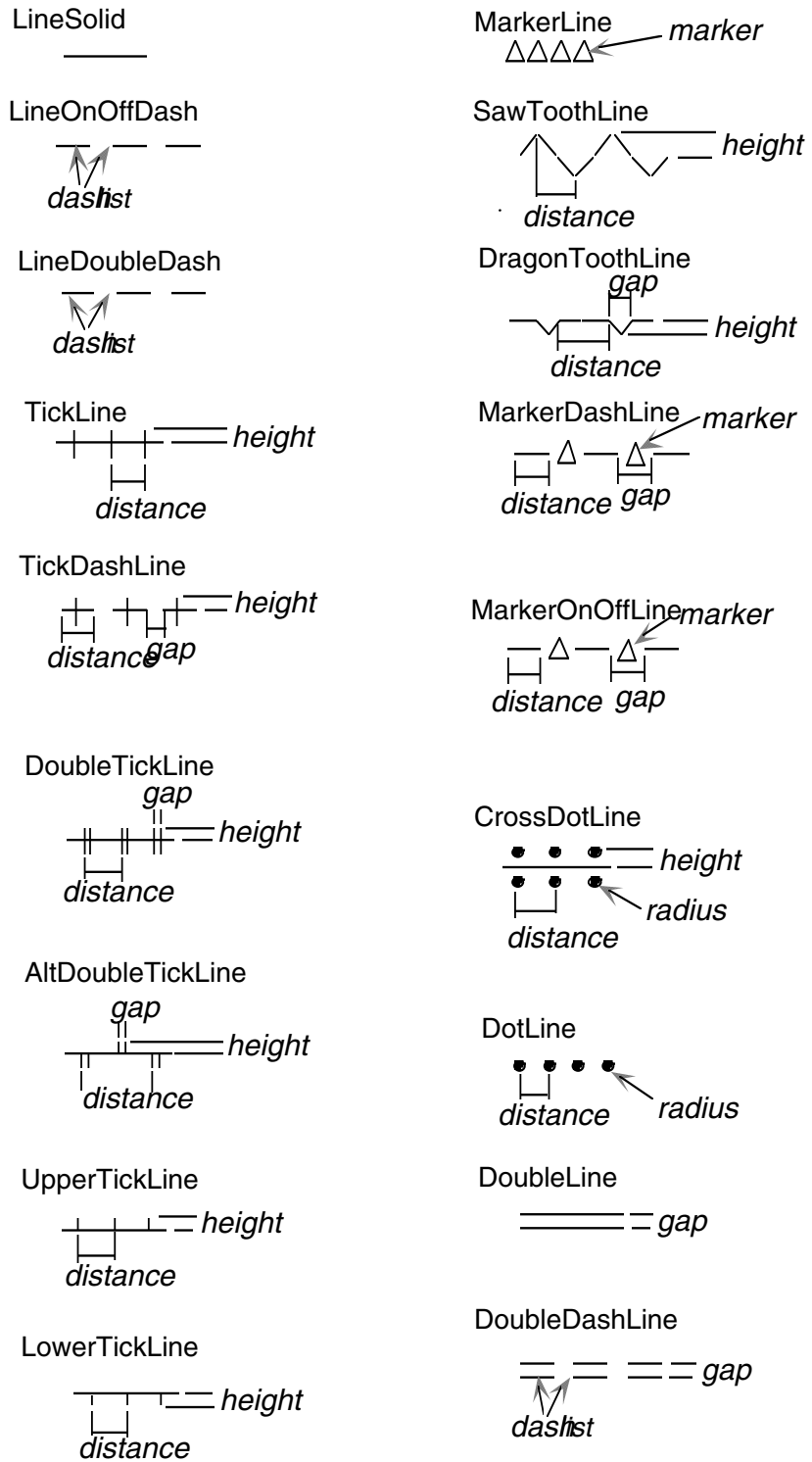- *radius* is the radius in pixels of the dots.

DoubleLine

{gap}
- *gap* is the distance in pixels between the line segments.

DoubleDashLine

{gap} {dashlistlength} {dashlist...}
- *gap* is the distance in pixels between the line segments.
- *dashlistlength* is the number of dashes in the dash list.
- *dashlist* is the dash list used to set the line dash style as defined in the X11 Xlib Programming Manual.

Figure D-2. VPFVIEW-Supported line style attributes.

LineSolid

LineOnOffDash

dashlist

LineDoubleDash

dashlist

TickLine

height

distance

TickDashLine

height

distance *gap*

DoubleTickLine

gap

height

distance

AltDoubleTickLine

gap

height

distance

UpperTickLine

height

distance

LowerTickLine

height

distance

MarkerLine

marker

SawToothLine

height

distance

DragonToothLine

gap

height

distance

MarkerDashLine

marker

distance *gap*

MarkerOnOffLine *marker*

distance *gap*

CrossDotLine

height

radius

distance

DotLine

radius

distance

DoubleLine

gap

DoubleDashLine

gap

dashlist

areas.sym:

{style} [{stipple filename}] {outline width} {outlinestyle}
[{outlineattributes}]

- *style* is a polygon fill style defined in "polyfill.h":

   0 - FILL SOLID
   1 - FILL TRANSPARENT
   2 - FILL OPAQUE

- *stipple filename* is the name of a file containing a UNIX
  Pixmap structure if style is not solid. If the style is solid, this
  entry will not appear on the line.
- *outline width* is the line width in pixels of the polygon outline.
  —1 signifies no outline and the end of the input line.
- *outline style* is the style of the polygon outline. It takes the
  same values as style in lines.sym above. If this is 0
  (SolidLine), it is the end of the input line; otherwise, it has the
  same attribute values present based upon the line style as in
  the lines.sym file above.

markers.sym

{id} {number of primitives} [{xhot}] [{yhot}]
{primitive type}
{primitive attributes}

- *id* is the marker ID number.
- *number of primitives* is the number of primitives (rectangles,
  circles, polygons, and polylines) which make up the marker
  symbol.
- *xhot* and *yhot* are optional hot spot identifiers that specify an
  alternate center for the symbol. If the default center is to be
  used, these numbers are not present.
- *primitive type* is an identifier for a particular primitive within
  a marker symbol. It can be one of the following values:

   0= **circle**
   1= **rectangle**
   2= **polygon**
   3= **polyline**

The attributes for each primitive type follow this identifier, and there must be a series of these for each marker symbol corresponding to the number of primitives within that symbol. The attributes are as follows:

circle

{filled}
{color number}
{center x} {center y}
{radius}

filled is a boolean value indicating whether or not the circle should be filled in (1) or left   transparent (0) with only an outline.

color number is an index to a color specified in the xcolors.rgb file which resides in the   symbols directory.

center x and *center y* represent the center coordinate offsets in pixels within the marker   symbol for the center of the circle.

radius is the radius of the circle in pixels.

rectangle

{filled}
{color number}
{x0} {y0}
{x1} {y1}

filled is a boolean value indicating whether or not the rectangle should be filled in (1) or left transparent (0) with only an outline.

color number is an index to a color specified in the xcolors.rgb file which resides in the   symbols directory.

x0 and *y0* are the upper left corner coordinate offsets in pixels within the marker symbol.

x1 and *y1* are the lower right corner coordinate offsets in pixels within the marker symbol.

polygon

{filled}
{color number}
{number of points}
{points...}

filled is a boolean value indicating whether or not the polygon should be filled in (1) or left   transparent (0) with only an outline.

color number is an index to a color specified in the xcolors.rgb file which resides in the   symbols directory.

number of points is the total number of points in the polygon (the number of (x, y) pairs is
half this value)

points is a list of points marking the outside boundary of the polygon. Each line in the file consists of an (x, y) pair.

polyline

{color number}
{number of points}
{points...}

color number is an index to a color specified in the xcolors.rgb file which resides in the   symbols directory.

number of points is the total number of points in the polyline (the number of (x, y) pairs is
half this value)

points is a list of points marking the polyline. Each line in the file consists of an (x, y) pair.

text.sym

{font name}

- *font name* is simply a text string specifying the name and parameters of a text font in the X11 font naming convention.

Xcolors.rgb

{red} {green} {blue} {name}

Each combination of red, green, and blue integer values defines a 24-bit color value which is allocated within an 8-bit palette. There can only be a maximum of 256 of these values (236 under Microsoft Windows and Windows NT), and ten colors are already reserved by XVT. The name is a one word text name of the color.

versinfo.dat

The format of the symbology markers has changed drastically since the original VPFVIEW-UNIX version 1.1.1 was released. Since there is no easy way to determine the format of the symbology set on-the-fly, it was necessary to create a version information file. When the user specifies a new symbology set path, the program looks for this file which contains a text string and the creation date for the VPFVIEW v2.1 symbology. Any symbology set which does not contain this file with the specific string will be refused by the program. The current text string and creation date are as follows: