

## 8.0 FEMIS GIS Database

The FEMIS spatial data resides on the UNIX server and on each PC that is running FEMIS. The master copy of the spatial database resides on the server and contains the static GIS themes, the FEMIS ArcView GIS project file (FEMISGIS.APR), the GIS initialization file (FEMISGIS.INI), two map symbol files (MARKERDF.AVP and OBJ\_TYPE.LUT), several bitmap (.BMP) files that provide images for special-purpose buttons on the custom ArcView GIS interface, and initial versions of the dynamic GIS themes. When FEMIS is first installed on each PC, the spatial database files for the relevant CSEPP hazard site are copied from the server to the \FEMIS\GIS\<<SITE CODE> directory and associated subdirectories on the PC. During subsequent FEMIS version upgrades, selected spatial data files may be copied to a PC as necessary to apply changes or additions to the spatial data.

The following paragraphs discuss the components of the spatial database and the methods used to maintain, configure, customize, backup, and troubleshoot the spatial database.

### 8.1 Spatial Data Description

The FEMIS spatial database is made up of a number of themes or layers. Each theme contains data (location information and descriptive attributes) representing a collection of geographic objects of a particular type (e.g., roads, political boundaries, meteorological towers, and emergency planning zones). The spatial database also contains a customized ArcView GIS project file, an initialization file that tells ArcView GIS what themes are to be loaded into the project file and how to display them, and an optional legend file associated with each theme that provides additional information on how to display the theme's data on the map. For detailed descriptions of the individual FEMIS spatial data themes, please refer to Section 3.3, Building Spatial Data, in the *FEMIS Data Management Guide*.

### 8.2 Spatial Data Maintenance

The static spatial data themes are built from various data sources. These themes normally change infrequently, and such changes are made either by regenerating the entire theme from new or updated data sources or by making minor editing changes in the existing theme data. For detailed information on how to maintain or upgrade the static data themes, please refer to Section 5.0, Managing Spatial Data, in the *FEMIS Data Management Guide*.

As FEMIS is being run, the data in the relational database that corresponds to the dynamic spatial data themes (e.g., facilities) may be altered by users that have the appropriate FEMIS privileges. As necessary during its operation, FEMIS automatically regenerates the spatial data files for these dynamic themes on each PC based on the current data in the relational database. No additional action by your System or Database Administrator is necessary to maintain these themes under normal circumstances.

## 8.3 CSEPP Zone Editor

The CSEPP Zone Editor allows sites to make modifications to the GIS Emergency Planning Zone Theme. Changes are made in the GIS Zone theme, and then the Oracle database information is updated. The final step is distribution of the new GIS Zone theme. Changes to the zones could make existing Risk Areas invalid. You may want to delete existing Risk Areas before using the Zone Editor. The Zone Editor can only be applied to CSEPP zones. If changes are required for other hazard “zone” themes, contact PNNL for assistance.

Each step is described in the following sections. Prior to beginning zone editing, please contact PNNL for an updated script to be used in Section 8.3.2, Updating the FEMIS Database.

### 8.3.1 GIS Operations

Zone editing in the GIS uses four zone menu options under the ArcView GIS Edit menu. This capability is only available if the user has GIS Full Access privileges. In the beginning, only the Start Zone Editing option is visible in the Edit menu. The other three options are enabled only if a NewZones.shp theme is added to the view.

#### Step 1: Start Zone Editing

Ensure you have GIS Full Access privileges. Log in to FEMIS and start the GIS from the FEMIS Map button on the toolbar. If you have GIS Full Access privileges, the f button will be enabled. Press the f button on the ArcView GIS toolbar to change to the full GIS capability. Under the Edit menu option, select the Start Zone Editing option. The theme NewZones.shp is added to the current view. If NewZones.shp does not exist in the zone directory, FEMIS will create it by copying the existing zone theme to the file NewZones.shp.

#### Step 2: Edit the NewZones.shp Theme

When the NewZones.shp is loaded, edit it using standard ArcView GIS editing functionality. Name and zone ID can also be modified in Step 3 using the Change Zone Attributes menu option.

#### Step 3: Execute the Change Zone Attributes Option

Before allowing any changes, this option checks the NewZones theme structure to make sure it complies with the rules below. You can review this structure in the GIS by activating the Zone theme in the GIS and clicking the Table button. After edits have been made, the Zone Editor will provide warning messages if your structure is not consistent with the rules below. Do not change the existing order of the fields.

- All FEMIS required fields are of type CHAR except for zone\_id, which is numeric.
- The shape field should contain the value polygon.
- The zone\_id field should be numbers of less than 10 digits.

- The Type field should be 8 characters or less.
- The Zone field should be 30 characters or less.
- The Par\_Pad field should be 20 characters or less.
- The Risk\_Area field should be 20 characters or less.
- The Objecttype field should be identical to the Type field in both structure and entries.
- The Objectname field should be identical to Zone field in both structure and entries.
- Each zone must have a unique ID and name.
- Additional fields are also permissible and should be added at the end of the existing list of fields.

This Change Zone Attributes option lets the user modify the zone name and type for all selected zones. You may run the script several times, if needed. The name and ID changes are immediate. If you make an error, you can repeat the operation with the correct information. If necessary, you can delete the NewZones.shp file and begin again.

#### **Step 4: Create Text Files Listing Zone Attribute Changes**

Under the ArcView GIS Edit menu, select the Promote Zone Attribute Changes to DB option. This option creates the input files needed to promote the changes to the database as described in Section 8.3.2, Updating the FEMIS Database. The two files created are ZONENAMECHANGES.TXT and ZONETYPECHANGES.TXT. These files will be written in the GIS home directory (specified as the GISDirPC in the FEMIS.INI file). The option creates the files by comparing the old and new zone shape files and writing the changes to the aforementioned two files.

Before performing any comparisons, this option checks whether the zone IDs and names are unique. If not, the user will be notified and no comparisons will be performed. The user will need to return to Steps 2 or 3 to make zone names and IDs unique.

The format of the ZONETYPECHANGES.TXT is as follows:

```
|ID|old_type|new_type|class_id|subclass_id
```

There will be one record in the ZONETYPECHANGES.TXT file for each renamed or added zone.

- Renamed zones will have all fields. The old\_type may be the same as the new type if there was only a zone name change.
- New zones have a null old\_type and the appropriate zone type in the new\_type field.

The format of the ZONENAMECHANGES.TXT is as follows:

```
|ID|old_name|new_name|zone_type|class_id|subclass_id|zone_num|eoc_name|
```

There will be one record in the ZONENAMECHANGES.TXT file for each deleted, renamed, or added zone. Except as noted below, none of the fields should contain null values.

- Deleted zones will appear as the first records in the ZONENAMECHANGES.TXT file. For deleted zones, the new\_name is null. The deleted IDs will not be listed in the Type file.
- Renamed zones records will follow the deleted zone information in the text file. For name changes, the record lists the zone ID, the old zone name, new zone name, and zone type.
- New zones will list the zone number, have a null old\_name, and the EOC with primary responsibility for the zone.

The number of changed records is reported in an interactive message to the user. If an error occurs, use the ERRORLOG.TXT file in the GIS home directory to troubleshoot the problem.

### **Step 5: Create Text File Listing Facility-Zone Relationship Changes**

Under the Edit menu option in ArcView GIS, select the Promote Point-In-Zone Changes to DB option. This option creates the file FACWITHZONECHANGES.TXT. FACWITHZONECHANGES.TXT is the input file needed to make changes to the zone-facility relationship in the Oracle database. The file will be written in the GIS home directory (specified as the GISTopDirPC in the FEMIS.INI file).

The format of the FACWITHZONECHANGES.TXT file is as follows:

```
|facility_name|eoc_name|old__zone_name|new_zone_name|
```

The file contains a record for every facility that has been affected by the zone changes.

- If a facility used to be inside a zone's boundary but now falls outside any zone boundaries, the new\_zone\_name will be set to null.
- If a facility used to be outside zone boundaries but is now within a zone, the old\_zone\_name will be null.
- If a zone change changes the zone in which a facility is located, all fields will contain data.

Before performing any comparisons, this process will check whether the zone IDs and names are unique. If not, the user will be notified and no comparisons will be performed. The user will need to return to Step 3 to make zone names and IDs unique.

The number of changed records and the list of changes are also reported to the user in an interactive message.

### **Step 6: Examine the Text Files and Make Corrections (if necessary)**

It is essential that the .TXT files are correct to avoid corrupting the Oracle database. Review the files using a text editor to make sure the following conditions are met.

Ensure that each file ends with a carriage return.

Null values are not allowed in the first field (ID) in any of these files. The other parameters must be compatible with the format of the fields in the database. For example, for zone name changes, the `old_name` and `new_name` must be 30 characters or less and must begin with alpha character.

For the `ZONETYPECHANGES.TXT` file, nulls are only allowed for the following conditions. All other nulls should be replaced with the appropriate information.

- `old_type` is null for new zones.

For the `ZONENAMECHANGES.TXT` file, nulls are only allowed for the following conditions. All other nulls should be replaced with the appropriate information.

- `old_zone_name` is null for new zone records.
- `new_zone_name` is null for deleted zones.
- `zone_type` may be null for deleted zones.
- `Class_id` and `Subclass_id` may be null for renamed zones and deleted zones.
- `eoc_name` may be null for renamed or deleted zones. Ensure it is the `eoc_name` rather than the `eoc_code`.

For the `FACWITHZONECHANGES.TXT` file, ensure there are no null fields and that the `eoc_name` field contains the `eoc_name` rather than the `eoc_code`. (In certain cases, the GIS cannot determine the `eoc_name`, so inserts the `eoc_code` instead.) Use the editor to replace the `eoc_code` with the `eoc_name`.

### 8.3.2 Updating the FEMIS Database

When the GIS editing has been completed, follow the steps below to update the FEMIS database. The steps assume the user is familiar with text editing and updating the Oracle database and using SQL scripts.

1. Ensure the `/home/femis/database/zonedt` directory exists. If zone editing has been done before, the directory will exist; you may want to rename or move the existing `*.txt` and `*.sql` files to preserve the previously edited files. If this directory does not exist, create it.
2. Move the three output files created in Section 8.3.1, GIS Operations, from the PC to the UNIX server into the `/home/femis/database/zonedt` directory. Copy the `zone_edit_db.sh` file from the `/home/femis/database/dba` directory to the `/home/femis/database/zonedt` directory. After copying the file, check the file privileges for execute and change if necessary.

3. Execute the UNIX shell script named `zone_edit_db.sh`. The script will check on environment variables and for the presence of the `eoclist.dat` and `eocnum.dat` files in the `/home/femis/etc` directory.

If all conditions are met, the script will read the three `*.txt` input files and produce one output file, which contains the actual script to modify the database. The output file is named `zone_edit_change.sql`. Review this file to ensure all changes have been included by comparing it to the `*.txt` files.

4. Check to see if you know all of the Oracle EOC database passwords, and reset them to the default values if required. (See Section 12.2.2, Password Management for the Relational Database, for instructions.)
5. Commit the database changes by running the output script using the SQL\*Plus tool. The script will ask the user to enter the exercise number for the data that is being edited. Normally this is 0 for operational data. The user enters the exercise number and the Enter key to input the value.

If there are no error messages, the user continues by pressing the Enter key. If any errors are noted, stop the process using `Ctrl+C`, fix the problems, and rerun the script until it is error free.

To do this step, login to UNIX as `femis`, move to the `zonedt` directory, start `sqlplus`, and run the script as follows:

```
% su – femis
% cd /home/femis/database/zonedt
% sqlplus
SQL> @zone_edit_change.sql
SQL> {a series of outputs will be displayed, look for any errors}
SQL> exit
>
```

6. Reset the Oracle database passwords to their more secure values, if they were modified in Step 4. (See Section 12.2.2, Password Management for the Relational Database, for instruction.)

### 8.3.3 Distributing the New Zone File

To complete the zone editing process, rename `NewZones.shp` shape files to the old zone theme name (e.g., `<sitecode>_ez.shp`). (These files are both located in the `<GIS DRIVE>\FEMIS\GIS\<SITE>\ZONE` directory on the PC used to do the GIS editing). Copy it to the GIS directory of all the PCs in all EOCs replacing the old theme. The `FUPDATE` utility described in Section 15.2, `FUPDATE.BAT`, in the *FEMIS Installation Guide* may be used. Also replace the zone shapefile on the master copy of the spatial database which resides on the server so future installs will use the updated zone file.

## 8.4 GIS Configuration

When you install FEMIS using the full GIS installation option, the complete GIS directory structure and all data files referenced by the selected FEMISGIS.INI file (see the following paragraph) are copied from the server to the FEMIS\GIS\

You will be given an option to choose from among several versions of the FEMISGIS.INI file. The FEMISGIS.INI file specifies primarily the spatial themes that are to be installed and used to build the operational ArcView GIS APR file for use with FEMIS. For most CSEPP sites, three choices will be available: small, medium, and large.

A small, or minimum, FEMISGIS.INI file installs only the theme files that are essential for running FEMIS (e.g., zone boundaries, igloos, and facilities) or to provide a minimum map background for location reference (e.g., state and county boundaries, major roads, and populated place names). The mid-size FEMISGIS.INI file includes most of the themes, but does not include large image files and other large nonessential themes (e.g., contour lines and streams). A large, or maximum, FEMISGIS.INI file installs all of the currently available GIS themes for the site.

To have the most complete GIS, choose the largest FEMISGIS.INI option that will comfortably fit within the available memory space on your hard drive. However, additional themes may negatively impact the speed of GIS response. The setup program will provide information on the space required to install each option and the amount of space available on your hard drive. To create a custom GIS configuration that is different from any of the three optional predefined configurations (FEMISGIS.INI files), you will need to copy the largest FEMISGIS.INI file to your PC and then edit it according to the instructions in Section 8.5, Customizing the FEMIS Map.

Upon completion of the GIS data installation, the \FEMIS\GIS subdirectory will contain the FEMPTY.APR and one or more <SITE CODE> subdirectories. Each \FEMIS\GIS\

### 8.4.1 Symbol Lookup Table

The symbol lookup table is located in the <GIS INSTALL DRIVE>\FEMIS\GIS\<SITE CODE>\LOOKUP directory under the file name OBJ\_TYPE.LUT. The lookup table specifies the symbols to be used to create the theme legends.

Each line consists of seven entries separated by vertical bars as delimiters. Lines that begin with a single quote are comment lines and will be ignored by FEMIS. Blank lines are also ignored.

The first five fields are numbers corresponding to a symbol type, color, size, background color, and outline color. These numbers reference symbol attributes from within the active symbol palettes in ArcView GIS. The fourth and fifth fields are only used in polygonal themes. The sixth entry specifies the theme type or object category, and the last entry specifies the theme subtype or classification label. The symbol type and color numbers designate the order in which the symbols are listed in the FEMIS GIS pallet window using 0 for the first element. The symbol size is measured in “points” (1/72 of an inch). In polygonal themes, the “size” number is used to set the outline width. If the classification label is missing, it should be set to none.

An example of the lookup table is listed below. From the facility entries, we can see that school facilities are represented with the 89th symbol, colored with the 46th color, and measure 12/72 of an inch. To customize the lookup table, use the GIS Configuration Editor (see Section 8.5.3) or edit the file using a text editor.

'Symbol number	Foreground color	Symbol size	Background Color	Outline Color	Object Category	Classification Label
6	16	2	0	14	zone	Depot
7	16	2	0	14	zone	IRZ
9	16	2	0	14	zone	PAZ
8	1	2	0	4	county	OR
8	1	2	0	44	county	WA
0	8	2			road	Primary
0	8	1			road	Secondary
1	7	1			road	Local
.						
26	46	10			tcp	Access
26	51	10			tcp	Traffic
26	50	10			tcp	Traffic/Access
26	51	10			tcp	#NULL#
.						
125	51	10			facility	airport
89	46	12			facility	school
96	46	14			facility	shelter
.						
.						

## 8.4.2 Symbol Defaults

The MARKERDF.AVP file contains the symbols loaded in the default FEMIS symbol palette. You may change these symbols using the generic ArcView GIS palette window functionality. You may use any of the other symbols provided by ArcView GIS in the C:\ESRI\AV\_GIS30\ARCVIEW\SYMBOLS directory. You may also import symbols from ARC/INFO or icons in raster format. If you delete or change the sequence of the existing symbols, then some of the FEMIS GIS “look and feel” will change. For example, if you change the 42nd symbol from a cross hair (⊕) to an asterisk (\*), then the object (e.g., facility) locations in the FEMIS GIS will be depicted with an asterisk instead of the familiar cross hair. You may add new symbols at the end of the palette and use the symbol lookup table (Section 8.4.1, Symbol Lookup Table) to refer to the new symbols.

## 8.5 Customizing the FEMIS Map

You can customize the content and appearance of the FEMIS map by editing the original FEMISGIS.INI file or any of the alternate INI files to create a custom FEMISGIS.INI file that can then be used to create a custom APR. The GIS Configuration Editor, described in Section 8.5.3, can help you edit the FEMISGIS.INI file and the lookup table. You can add new themes; delete existing themes; change the minimum or maximum scale display thresholds; modify the type, color, and size of line or point map features; change the legend names; designate the label (and if applicable, classification fields); specify the default classification fields; designate an alternative directory (and if needed, an alternate drive) for the data source of non-point themes; and control which themes are visible by default when the GIS is first started. A detailed description of the fields in the FEMISGIS.INI file is in Section 8.5.1, Customizing the FEMISGIS.INI File. You can also import your own symbols from other ArcView GIS, ARC/INFO, or raster icons by changing the symbol lookup table and the FEMIS default palette as described in Section 8.4.1, Symbol Lookup Table.

If you customize your FEMIS Map, please keep track of the changes to ensure they can be retained during future FEMIS or GIS upgrades.

### 8.5.1 Customizing the FEMISGIS.INI File

The FEMISGIS.INI file contains data required to initialize GIS parameters that generate the FEMISGIS.APR and to ensure proper GIS contents each time the FEMIS GIS is invoked by the FEMIS application. An example of the FEMISGIS.INI file is shown at the end of Section 3.0, FEMIS GIS Migration and Configuration, in the *FEMIS Installation Guide*. The contents of the FEMISGIS.INI file are discussed below.

The FEMISGIS.INI file is automatically updated anytime you define a new dynamic theme or modify an existing one. If you have an abnormal termination of the FEMIS or the GIS, the dynamic themes section of the FEMISGIS.INI file may be corrupted. To restore the file, you can delete all of the theme entries below the facilities theme. These entries are for the user-defined themes, and they will be regenerated the next time you start FEMIS.

Blank lines are ignored in the FEMISGIS.INI. Lines with a single quote in the first column are recognized as comment lines and are ignored. Vertical bars delimit the data fields in the FEMISGIS.INI. No data value should contain a vertical bar. String values do not need to be quoted.

The [FEMIS\_VERSION] section specifies the FEMIS version for which this .INI file can be used. The next line specifies the size of the themes in the current .INI file. Valid size values are small, medium, or large.

The [SITE\_CODE] section specifies the CSEPP site code that the GIS data describes. This parameter should be identical to the corresponding site code in the FEMIS.INI file, otherwise the GIS will not work.

The [DEFAULT\_HAZARD\_THEME] specifies the theme that is to be used for the “zone” theme for the current hazard. Zone themes within FEMIS are used to create risk areas and protective action decisions. Each hazard has a zone theme specified for use with that hazard.

The [PROJECTION\_PARAMETERS] section specifies the UTM (Universal Transverse Mercator) projection and coordinate system parameters required for the site. The parameters shown in the example are for UTM Zone 16 (appropriate for Alabama).

The [AREA\_OF\_INTEREST] section specifies a geographic area of interest. The area of interest for FEMIS has been set as a rectangle that starts at the origin (lower left corner) of -126.00 degrees longitude and 23.00 degrees latitude and spans 58 degrees longitude (first size parameter) and 27 degrees latitude (second size parameter). This covers the continental United States. The area of interest is specified to minimize the consequences of ill-defined data points. In certain circumstances, the user is given the opportunity to define the longitude and latitude where an event has occurred. The FEMIS GIS does not allow the specification of plumes or threat wedges that originate outside the area of interest.

The theme parameters sections specify the configuration for the themes to be loaded in the FEMIS GIS. The two sections are: [STATIC\_THEMES] and [DYNAMIC\_THEMES]. The dynamic theme flag is determined based on the section in which the theme is listed. Parameters for each theme are discussed below. The same information is included as comments in the FEMISGIS.INI file itself. It has been omitted from the example to conserve space.

- Theme – Indicates the theme name in the FEMIS Database.
- FEMIS Access – For feature themes, this column contains a Yes or No to indicate whether the theme is in the FEMIS object table. For image themes, this column contains None or the name of an image catalog to be created. If the name of an image catalog is listed, the image catalog should be described in one of the theme parameter entries of this ini file.
- Type – The Type column must contain one of the following valid types: Image, lmgCat, point, line, or polygon.
- LoadFlag – This column indicates whether to load the theme (Yes) or not to load the theme (No).

- Status – Indicates the visibility of the theme when forming the APR.
- DisplayOrder – Indicates the order in which themes will appear in the GIS Table of Contents. The theme indicated by the smallest number will appear at the top of the table of contents and will be loaded last (on top of all the other themes). The display order may be negative.
- Label Field – Indicates the field name to be used as the default labeling field.
- Object Category – Indicates the FEMIS theme category. The value must be one of the types listed in the \HOME\LOOKUP\OBJ\_TYPE.LUT file. Currently, valid values are zone, county, igloo, facility, tcp, road, and siren. If the value is None then the classification field should also be set to none and the default legend field should be set to simple, indicating the theme may not be classified using the lookup tables.
- Default Legend – Indicates whether a simple or classified legend is used. Valid values are simple, none, and classify. Simple indicates a simple legend that uses one symbol to depict all the theme data. None is used for image themes for which a classify legend does not apply.
- Classification Field – Indicates the field to be used to classify the legend. If the classified legend does not exist it will be created.
- Min Scale – Indicates the minimum scale denominator at which a theme will be displayed.
- Max Scale – Indicates the maximum scale denominator at which a theme will be displayed.
- Legend Name – Indicates the name to be used in the legend in the View table of contents.
- Customize – For Dynamic themes, Yes indicates the current symbol parameters listed in later columns of this record should be used and should not be overwritten when this dynamic theme is updated. No indicates the symbol parameters in this record should be overwritten with values from the FEMIS Oracle database when this dynamic theme is updated. Customization is not applicable for static themes so the field should contain N/A for static themes.
- Symbol – Indicates the symbol to be used in a simple classification.
- Color – Indicates the foreground color for theme symbols, if they can be colored.
- Size – Indicates the symbol size.
- BackGround Color – Indicates the background color for polygonal symbols.
- Outline Color – Indicates the outline color of polygonal symbols.

- Path – Indicates the location of the file for the theme. The path is appended to the GIS home directory specified in the FEMIS.INI file for the GIS data under the keyword FemisgisTopDirPC.
- Alternate Prefix – Indicates a location other than the one specified in the FEMIS.INI file should be appended to the path. The script that loads themes appends the path to this prefix to locate and read an alternate source directory. This can be used to access data located somewhere other than your PC hard drive. Any auxiliary files will be written using the home prefix.

## 8.5.2 Altering the Default FEMIS Map

To alter the default appearance of the FEMIS map, use the Use at Startup option for FEMIS GIS ViewMarks (see the FEMIS Help). For more extensive changes, complete the following steps:

1. Copy or rename the original \FEMIS\GIS\<SITE CODE>\FEMISGIS.INI file to another name (e.g., FGISORIG.INI) so you can retrieve it and use it later, if necessary. Do the same with the original APR (e.g., copy and rename it to \FEMIS\GIS\<SITE CODE>\FGISORIG.APR). Then make another copy of the original INI file or one of the alternate INI files. Use the GIS Configuration Editor or manually edit the copy to
  - a) Exclude themes, remove (or comment out using a single quote in the first column) lines defining existing themes that you want to exclude, or specify No in the load flag.
  - b) Add lines to define new themes.
  - c) Modify the appropriate parameters of existing themes as desired.
2. Run ArcView GIS using the empty project file, \FEMIS\GIS\FEMPTY.APR, by double clicking on the file name in the Windows NT Explorer. When the APR has finished loading, it will contain the FEMIS static themes indicated in the FEMISGIS.INI files and will create the FEMISGIS.APR file in the GIS home directory (\FEMIS\<SITE CODE>\GIS). When the FEMIS application loads the FEMISGIS.APR, the changes made to the dynamic themes will be depicted.
3. Examine the theme legends to see that the correct set of themes was loaded and the correct ones are visible. The dynamic themes will not appear in the legend at this time. These themes are loaded when FEMIS activates the FEMISGIS.APR. Then examine each theme to see that it displays correctly (check the checkbox in the legend to make visible the themes that are invisible by default). If some themes are not displayed correctly, recheck the INI file. If necessary, exit ArcView GIS, edit the INI file to make corrections, and then repeat Steps 2 and 3.
4. Exit ArcView GIS. Use Windows Explorer to set the FEMISGIS.APR file access properties to Read-only. The FEMISGIS.INI and FEMISGIS.APR files you just created will be used each time the FEMIS GIS is started.

### 8.5.3 GIS Configuration Editor

The GIS Configuration Editor is a stand-alone program that provides an easy to use interface for modifying the FEMISGIS.INI and OBJ\_TYPE.LUT files.

**Note:** Make a backup copy of the FEMISGIS.INI and OBJ\_TYPE.LUT files so that you can recover from an unsatisfactory editing session.

The [SITE\_CODE], [DEFAULT\_HAZARD\_THEME], [PROJECTION\_PARAMETERS], and [AREA\_OF\_INTEREST] sections of the FEMISGIS.INI file can be modified on the main window. The [STATIC\_THEMES] and [DYNAMIC\_THEMES] sections are displayed in a spreadsheet on the main window. Lines with a single quotation mark in the first column are recognized as comment lines and are ignored.

To modify an individual spreadsheet entry, select the row and click the Details button or double-click on the row. The GIS will be started and a details window will be displayed for that row. All the fields are described in Section 8.5.1, Customizing the FEMISGIS.INI File. The symbol parameters for shape, color, and size can be entered using the text boxes or by clicking the Map button and selecting a symbol from the palette. The GIS can be used to preview the symbols and determine the appropriate symbol parameters.

If the Map button is pressed, the GIS will be brought to the foreground with the ArcView GIS palette active.

Use the ArcView GIS palette to modify the color, shape, or fill pattern, and the size of the drawn symbol. When satisfied with the symbol appearance, click the Return Symbol Parameters button. The appropriate numbers for the symbol, color, shape, or fill pattern, and the size will be returned to the Details window. The size is measured in 1/72 of an inch. For lines, it designates width. For polygons, the size is used for the width of the outline.

The Legend Symbol tab is used to add, edit, or delete entries from the OBJ\_TYPE.LUT file. The symbol parameters for shape, color, and size can be entered by using the text boxes or by clicking the Map button. The GIS can be used to preview the symbols and determine the appropriate symbol parameters.

If dynamic themes or the OBJ\_TYPE.LUT file have been modified and saved, close the GIS and restart to implement the changes. For static themes, once the changes have been saved to the FEMISGIS.INI file, follow the instructions found in Section 8.5.2, Altering the Default FEMIS Map, to alter the default FEMIS map.

### 8.5.4 Theme Projection Utility

FEMIS uses the projected theme data in Universal Transverse Mercator (UTM) coordinate system in order to avoid re-projecting geographic coordinates each time the view is refreshed. To include new themes in FEMIS, they should be converted to UTM. The Theme Projection Utility converts feature

themes in geographic coordinates to UTM coordinates for the desired CSEPP site. Image themes, which are required to be in projected coordinates, are skipped by the Theme Projection Utility. Image themes not already in UTM would need to be modified using other software such as ARC/INFO.

When you open PROJECTION\_UTILITY.APR, ArcView GIS will start, and a window containing two Views will display. View1, the work area, is on the left side; and View2, where the results are depicted, is on the right side.

The Theme Projection Utility assumes that the input themes are in geographic coordinates and will let you select themes from a list of existing shape files in View1 so they can be exported as projected shape files using the currently specified projection in View1. The exported files are added to View2.

To use the Theme Projection Utility, complete the following steps:

1. Double-click on the PROJECTION\_UTILITY.APR (usually located in your C:\FEMIS\GIS directory).
2. Click View → Properties → Projection.
3. Select the Standard radio button, and Geographic will display in the Type field.
4. Load the themes you want to project. Click the + (Add Theme) button.
5. Click the Export Projected item under Utilities, and click OK on the brief information window that displays.
6. Select the desired CSEPP site from the list, and click OK.
7. Make any necessary adjustments to the UTM projection parameters for the selected site, and click OK.
8. Navigate to the desired directory or accept the default (usually C:\TEMP), and click OK.
9. Select the themes you want to export from the list of the themes in View1, and click OK.

If the name of the theme being converted already exists in the selected directory, a temporary name will be suggested for the converted theme. Click OK to accept the temporary theme name.

The conversion process will start and the status bar will indicate the progress of conversion. The new theme(s) will be loaded in View2 so you can visually verify the results. You may want to load some of your other themes, like raster images, to check how well the projected coordinate match the existing themes.

10. Click Exit under the File menu to close the PROJECTION\_UTILITY.APR file. Click No on the message about saving changes to this file.

## 8.6 Backup Procedures

The installation directory for the spatial data on the UNIX server is /home/femis/gis. This current operational GIS data is copied to the PCs when FEMIS is installed or upgraded. It is recommended that a tar tape of this directory be made each time a new version of FEMIS is received. The tape should be labeled FEMIS GIS Data with the date and FEMIS version number included. If the GIS data on the server should become corrupted or deleted, the spatial data can be restored from the backup tar tape without having to perform a reinstallation of FEMIS on the server.

If a site customization of the spatial data and/or the APR and INI files is to be done, the original GIS data directory should first be copied to another directory (e.g., /home/femis/data/v<x.y>/gis, where <x.y> is the FEMIS version number associated with the released data. A second tar tape of the GIS directory should be made following the completion of the GIS customization.

## 8.7 GIS Database Troubleshooting

A number of factors can cause errors in loading or displaying the spatial data themes or undesirable display behavior or appearance. Some of the more common problems are listed below, along with some suggestions for finding and correcting the problems.

### **Displayed Themes Shrink or Disappear**

Zoom to All Themes may cause displayed themes to shrink to a very small portion of the display screen, or to disappear entirely. This is typically caused by themes having one or more objects with “improper” latitude/longitude coordinates, e.g., (0,0) or any point that is far from the “area of interest” surrounding the hazard site. For most of the point themes, you can check the attribute table associated with the theme (activate the theme legend and click the Table button on the ArcView GIS button bar). Search the latitude and longitude columns for values that are noticeably different from the majority of objects in the theme. Attempt to verify the correct coordinates for points that are suspected to be outside the area of interest.

### **Improperly Defined Themes**

Error messages similar to Unable to Access Theme or Index Out of Range may occur when attempting to access the GIS. These errors are most often caused by improperly defined themes, such as an empty theme (a theme with zero map objects). Check the text file (.EVT file) associated with all dynamic point themes to make sure each theme contains at least one data line in addition to the header (column names) line.

### **Loading Theme Data Classification Errors**

Classification errors may occur when attempting to load theme data into an empty APR. They can occur on themes with legends that classify and display the map objects based on a column in the theme’s attribute table (e.g., zones are classified and displayed by zone type: Depot, PAZ, IRZ.). The error could be caused by the wrong field name being designated as the classification field in the FEMISGIS.INI file. Check the attribute table for the offending theme in the APR.

The error could also be caused by a new data value for the classification column that was not included in the values defined in the theme's legend (.LEG) file. Regenerate the FEMISGIS.APR from the empty APR using the process described in Section 8.5, Customizing the FEMIS Map. Make sure that all the entries in the classification field are included in the \FEMIS\GIS\

### **Delayed Refresh During Zooming**

Display refresh delays may occur during zooming. For example, the GIS may take an inordinate amount of time to refresh the map display when zooming into a very small area of the map. These lengthy delays can usually be attributed to one or more of the larger themes (map images or vector themes with a large amount of data) that does not have an appropriate lower display limit. To check the display limits of a theme, activate the theme legend, select Properties under the Theme menu, and then click Display. The minimum scale should never be less than 10 for themes with a large amount of data, such as roads, streams, census block boundaries, or raster map images. A larger minimum scale (e.g., 100) may help to reduce the zoom-in redisplay time significantly.

### **Inappropriate Scale of Raster Map Images**

The appearance of raster map images may be degraded and may detract from the viewing of other themes if displayed at an inappropriate scale factor. Follow the procedure described in Delayed Refresh During Zooming above to check the display limits of a map image theme and set the limits to appropriate values for the map scale at which the original scanned map was created. If the image is allowed to be viewed at scales that are too small compared to the map's base scale (e.g., 1:200,000 for a 1:24,000 scale quad sheet map), the image will appear too small to be readable and will clutter the display. If the image is allowed to be viewed at scales that are too large (e.g., 1:1,000 for a 1:24,000 scale map), the individual pixels of the digitized map will be enlarged so much as to give the portion of the map being viewed a "blocky" and unfocused appearance. The best scale range will vary depending on the resolution and quality of the scanned image. A general guideline is that the scale value (denominator of the scale ratio, e.g., 24000 for a scale of 1:24,000) should have its minimum set to about 20 percent of the map's base scale value (e.g., around 5000 for the 1:24,000 example), and its maximum set equal to or slightly larger than the base scale value (e.g., around 30000 for the 1:24,000 example). A greater range may be used if the map image is of very high resolution and quality.

### **Automatic Update of FEMISGIS.INI File**

The FEMISGIS.INI file is automatically updated each time you define a new dynamic theme or modify an existing one. If FEMIS or the FEMIS GIS terminate abnormally, the dynamic theme section of the FEMISGIS.INI file may be corrupted. This can be fixed by deleting all the theme entries in the FEMISGIS.INI below the Facilities theme entry and then restarting FEMIS. The entries below Facilities in the FEMISGIS.INI are for the user-defined themes and are regenerated from the Oracle database the next time you start FEMIS.