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Freeway is a drive time generator which can be used to produce:

- polygons representing the area which can be driven from a specified point within a specified amount of time under specific traffic conditions either one at a time or for an entire dBase table
- point-to-point drive times between a single origin and single destination point
- tables of drive times between a set of one or more origins and a set of one or more destinations

There are two separate means of accessing the Freeway software library, including:

- FWY32.EXE, a polygon generation utility which works without a mapping and creates polygons in either MID/MIF (MapInfo Import Format) or BNA (Atlas GIS ASCII format).

- FREEWAY.MBX, a MapInfo (version 4.0 or higher) application which allows interactive polygon generation.
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METHODOLOGY AND DATA SOURCES

Freeway uses a precompiled grid environment which is a compressed representation of the street network. A detailed grid (approximately 500 feet in size) is used for drive times up to 30 minutes while a generalized grid (approximately ½ mile in size) is used for larger drive times, although it is possible to force Freeway to use a specific grid size for any particular problem. Urban/rural differentiation was accomplished by aggregating census tracts with more than 60% urban population, then buffering the results (2 miles). The goal was not to replicate the Census Bureau's definitions of urban/rural, but rather to identify those areas where significant urban traffic congestion is likely.

Coverage	Vintage	Source	Config Value	Filename	Product
US	Aug 2015	TIGER '15 1st Release	US	Tt15us0<n>	Freeway 2015 US
US	June 2012	OpenStreetMap	OU	Ot12us0<n>	Freeway 2012 US Premium OSM
US	Dec 2013	TIGER '13 2nd Release	US	Tt12us0<n>	Freeway 2013 US
Canada	Sept 2012	StatsCan	CA	Tt12ca0<n>	Freeway 2012 Canada
Wyoming	Dec 2009	TIGER '09 1st Release	WY	Tt09wy0<n>	Freeway Demo
US	2008 Q4	NavTeq	PU	Nt09us0<n>	Freeway Premium
Canada	2008 Q4	NavTeq	PC	Nt09ca0<n>	Freeway Canada Premium
Wyoming	2008 Q4	NavTeq	PW	Nt09wy0<n>	Freeway Premium Demo
UK & Ireland	2007 Q1	NavTeq	PE	Nt07ui0<n>	Freeway UK and Ireland Premium

Road linkages are divided into six categories, as follows:

Rural local	local roads in small towns and minor roads outside of small towns
Rural arterial	state and US highways outside of urban areas
Rural freeway	state, US, and Interstate multi-lane divided highways located outside of designated urban areas
Urban local	residential streets and minor roads within urban areas
Urban arterial	multi-lane major roads within designated urban areas
Urban freeway	multilane, divided, limited access highways located within urban areas

The default speed settings on rural linkages are somewhat higher than those for the corresponding urban linkages in order to account for the higher levels of traffic congestion within urban areas.   The default speed settings are identified later in this section.

Freeway 2015 Release Notes

The TIGER version of Freeway has been updated to the 2015 release, and with it have come a number of changes:

- The underlying database format has been modified to improve performance.   Older versions of the database will not work with the new DLL, and the new DLL will not work with older versions of the database.   The database size has been slightly increased in order to eliminate the computational burden of record decompression, resulting in significant performance gains. Performance gains are in the order of 25-40% depending upon the use of the memory and progress monitor.

  There are no API level changes required, as all modifications are at a low level and the interface has not been affected.

- The system installs with two separate versions of the DLL.   The first, fwy32v.dll (verbose) contains the same progress monitoring information as previous versions, while the second, fwy32q.dll (quiet), does not monitor memory nor does it track progress during polygon generation.   On installation, the fwy32.dll file is in fact the fwy32q version.   This can be easily changed from a command prompt window by copying fwy32v.dll to fwy32.dll and allowing the overwrite.   We recommend using the quiet version unless there is a compelling reason to use the monitor functions, as performance is substantially better.

- The urban/rural definition has been changed and now reflects the Census Bureau "Urbanized Areas" definitions, utilizing the cartographic layer from the TIGER system.   This will ensure synchronization over time.

- The MapInfo program freeway.mbx works on 32 bit versions of MapInfo only and will not work using the 64 bit version.

We are no longer installing using the Windows preferred system of using the Program Files directory, as this caused innumerable problems when using the Mapinfo MBX interface.   Instead, the system is installed to C:\FREEWAY by default.   This can be changed, however, you will likely need to manually edit the freeway.cfg file prior to running the MBX within MapInfo.

We strongly recommend that you uninstall any existing versions prior to installing the new version.

INSTALLATION AND CONFIGURATION

A standard setup program is used to install Freeway.   The program allows you to selectively install various components and to optionally install the databases to your hard disk.   If you do not choose to install the databases to the hard disk, the CD-ROM must be present in order to run the software.

You can choose to either leave the data on the installation CD-ROM or copy it to the local disk. Performance on the CD-ROM is adequate on 8X or faster CD-ROM drives.   The total file space required on the hard disk is approximately 120 megabytes.

FREEWAY USER SETTINGS

A number of options are available to control the style and detail of the resulting drive time polygons.

DETAIL LEVEL

Determines the level of detail of the database to be used. Three options are available:

- *System selected*
  This is the default setting.   For drive times under 30 minutes, the detail file is used, otherwise the generalized file is used

- *Force Detail*
  Forces the use of the detail file regardless of the drive time

- *Force Generalized*
  Forces the user of the generalized file regardless of the drive time

The use of the detail mode file for large drive times may result in "out of memory" errors, especially under Windows 3.1.   Under Windows 95, the operating system imposes a limit of 128MB of memory use for any particular task.   For large problems, the use of the detail mode is not recommended, as performance is hampered once the memory use exceeds physical memory significantly.

CONTOUR MODE

Determines whether complex polygons can be generated.   The default is to generate only the main polygon without any embedded "islands".   However, the system can be configured to display internal areas which are unreachable (such as a large urban park, or a lake).   Simple polygons may be easier to interpret for a map reader, but less precise.   The diagrams below show the differences for a typical polygon in a mountainous area:
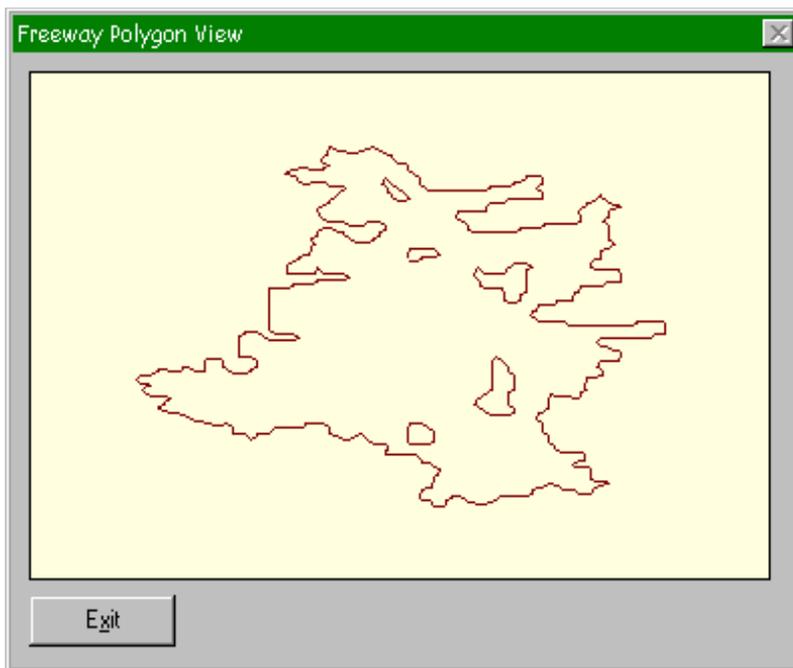
At left is a typical polygon with internal areas displayed. Note the five areas within the drive time polygon which are unreachable.   In this particular case, four of the five contain no roads and the fifth is a reservoir.
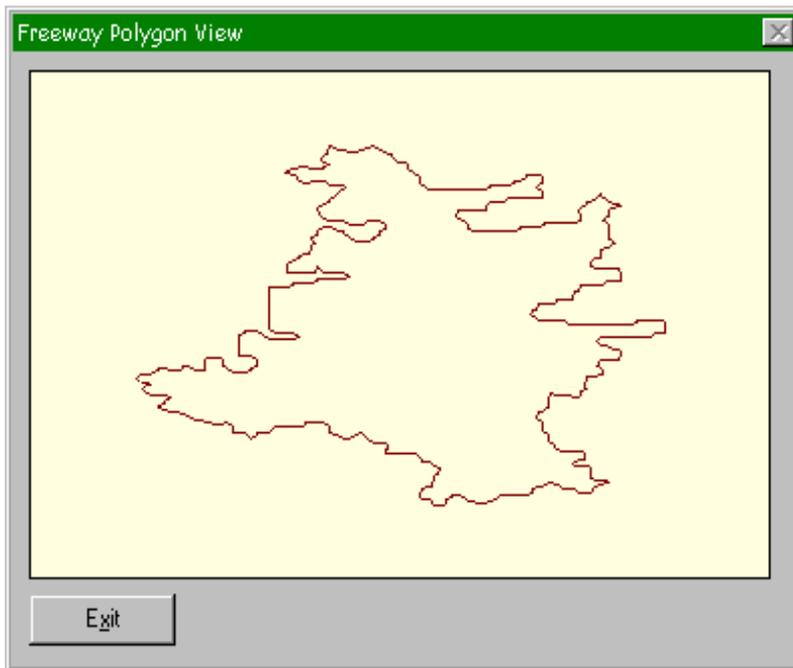
In this view, the embedded unreachable areas are not displayed. For purposes of obtaining trade area demographics, this is likely the preferred means, as there is not guarantee that the block or block group centroids do not fall within the unreachable areas.

TRAFFIC CONDITIONS

Freeway permits the drive time to be calculated under any one of four traffic condition sets. The following are available:

> *Normal*
> Non-rush hour traffic conditions. Assumes traffic flows at or near the likely posted speed limits in urban areas.
>
> *Moderate*
> Rush hour traffic conditions in most small to mid size urban areas, or the "background" traffic level in most major metropolitan areas
>
> *Heavy*
> Rush hour in major metropolitan areas
>
> *Custom*
> Allows the user to set the traffic conditions

The speed conditions reflect the expected travel speed over a link of a specific type and location, not the actual speed limit. The following table shows the default link speeds for each traffic condition type:

Link Type	Normal	Moderate	Heavy	Custom
Urban Local	25	25	20	25
Urban Arterial	40	35	30	35
Urban Freeway	55	50	40	50
Rural Local	35	30	30	35
Rural Arterial	50	50	50	50
Rural Freeway	65	65	65	65

Note that the end-user can alter the Custom travel speeds by selecting "Options/Custom Speed" from the main interface.

CONNECTION TYPE

In order to allow for both minor geocoding errors and for deficiencies in the TIGER street network files, Freeway is configured to automatically attach the geocoded site to the street network in one of three ways:

Strict
The site must be directly connected to the network within the cell in which it is located.

Normal
The site will be connected to its immediately adjacent neighbor cells using the slowest travel time indicated in the current Traffic setting.

Relaxed
Connect the site up to five cells away to connect to the network. In detail mode, this is approximately ½ mile while in generalized mode, this is 2½ miles. The relaxed mode is recommended only when the normal setting has failed to generate a desirable result.

COUNTRY

Freeway is available for both the United States and Canada. The Country code should be set to either US or CA as appropriate.

FWY32.EXE –Freeway Polygon Generator

This application is a stand-alone polygon generation utility which can be used to create polygons in either MID/MIF (MapInfo) or BNA (Atlas GIS) formats for importing into any of several mapping packages which can import files of these two types.

It consists of a simple interface which allows the user to enter in the coordinates of the site, the drive time, and the output style. The main view appears below.
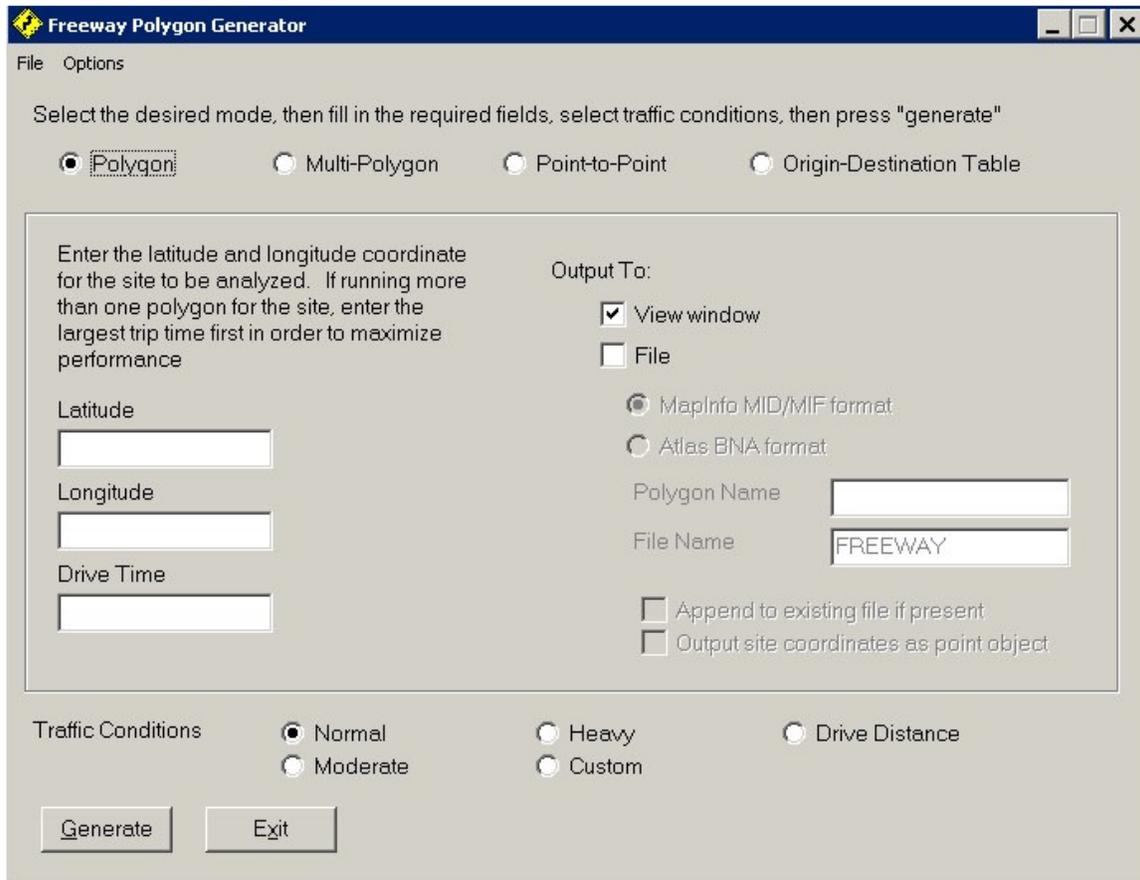
File Menu
Version	displays the current freeway.dll version number
Exit	exits the program

Options Menu
Configure	displays the configuration dialog (see below)
Custom Speed	displays the custom traffic conditions dialog (see below)
About	shows an about box for the application

On the main dialog form, the "output to:" section has a number of options.   First, the polygon can be simply displayed on a view window or can be written to a file.   Note that the view does not contain any other cartographic information.

If output is to a file, the following options are available:

File Type
Can be MID/MIF (MapInfo) or BNA (Atlas GIS) formats.   These can be readily imported into most major desktop mapping environments

Polygon Name
Sets the feature name for later reference.

File Name
Sets the output file name.   Output will be written to the directory specified in the Configuration dialog.

Append Option
If an output file with the name chosen exists, Fwy can be forced to either overwrite the file or append to it as appropriate. This allows for multiple polygon generation within a single layer.

Site Option
If checked, Fwy will output the site coordinates as a separate feature in the file. Note that some mapping environments will not permit both point and polygon data within the same layer.

Once the coordinates and drive time are entered, and the output options selected, press [Generate] to create the polygon. Upon completion, a message will appear indicating that the polygon was completed if output is to a file.

Note that if you are generating multiple polygons for a single site, it is most efficient to start with the largest drive time and work down. For example, if you wanted to produce a map showing drive times from a site in one minute intervals, you would first enter the largest interval desired and work down in one minute intervals. This allows the system to avoid rereading the databases each time and greatly improves performance.
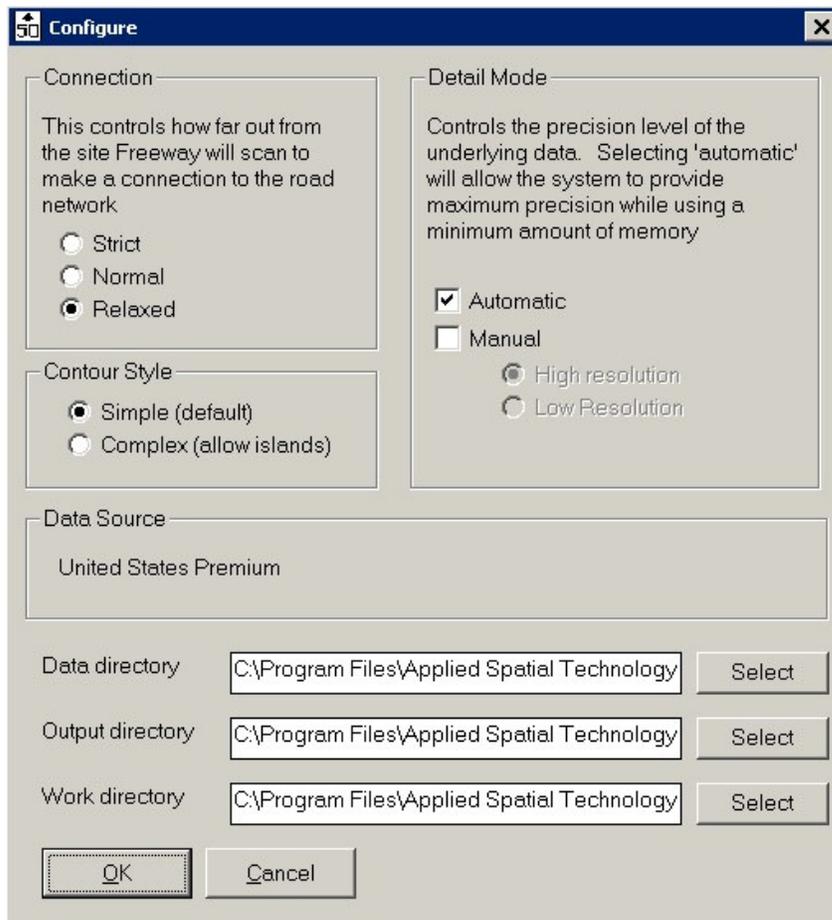
Configuration Dialog

This dialog allows the user to select the desired Freeway settings. See the introductory section for interpretation of these settings.

Note that the data directory must be set appropriately in order for the system to locate its data. The "Select" commands at the right of the directory path can be used to locate necessary files and select the appropriate directory.

Note that version 2.1 adds a dialog setting for country, in which either Canada or the United States may be selected.

Custom Speed Settings

Set the speeds for each type of road link. The defaults are listed beside each link type.

Link Type	Speed
Rural Local (25)	35
Rural Highway (50)	50
Rural Freeway (65)	65
Urban Local (25)	25
Urban Arterial (40)	35
Urban Freeway (55)	50

OK   Defaults

Custom Traffic Settings

From the "Options" menu, select Custom Speed. Enter the desired speed settings on the form to modify the custom settings. These changes are saved to the initialization file.

MULTI-POLYGON MODE

The multi-polygon mode is used to process an entire group of records.
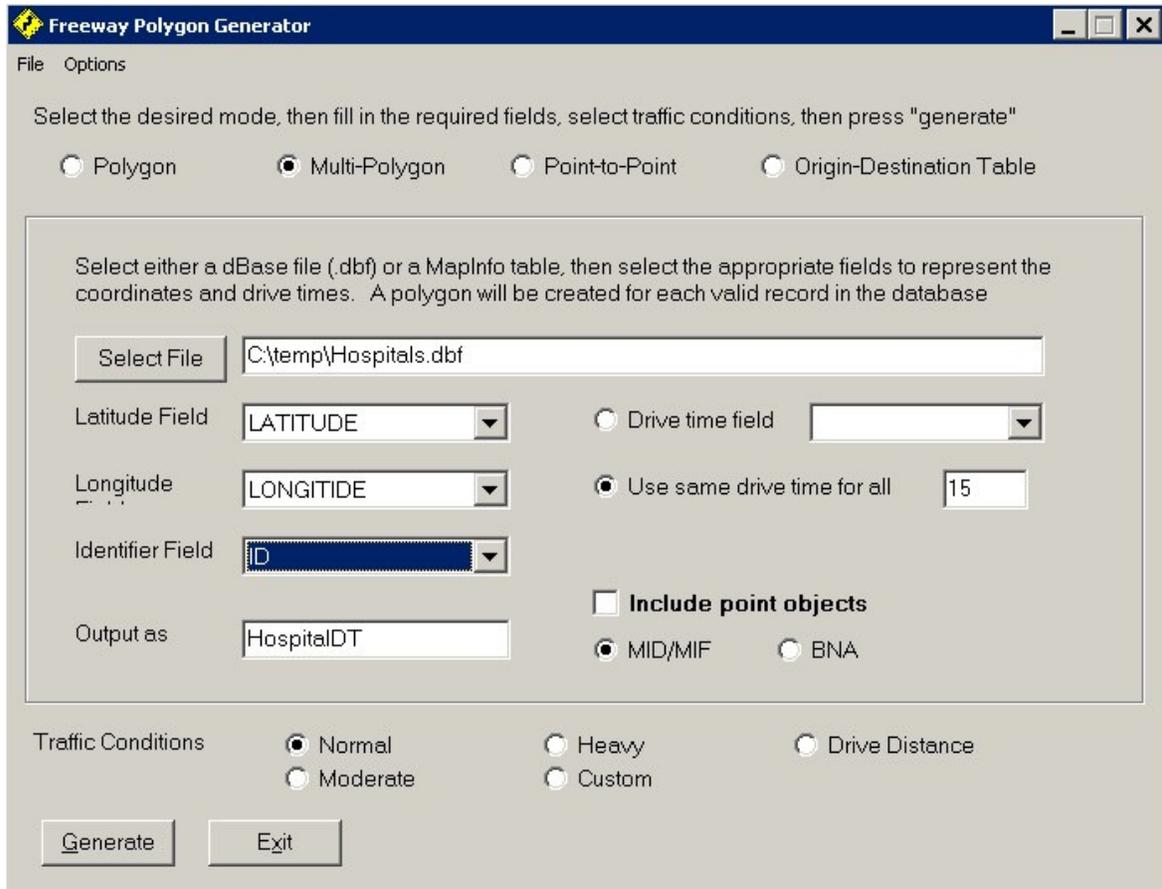
Choose a file using the "Select File" command button.   If the system can determine which fields contain latitude and longitude coordinates, these fields will be automatically filled in.   The "Identifier" field is used to relate the resulting polygons back to the original file.

You must enter an output file name.   The output will be stored in the output directory as specified in the options dialog box.

You may choose to generate the same drive time for each record in the file or to use the value of a specified field for this purpose (allowing each record to be given a different drive time).   Output can be either as MID/MIF or BNA format.

TABLE MODE

Table mode is used to generate an origin-destination table by processing an orgin dBase file and a destination dBase file.   The resulting dBase table will contain a record for each origin-destination pair and will include both drive time and drive distance.   Please note that time to construct this table may be large if the spatial extent of either the origin or destination file is large.

When selecting the input files, you must indicate which field contains the latitude, longitude, and a unique ID field.
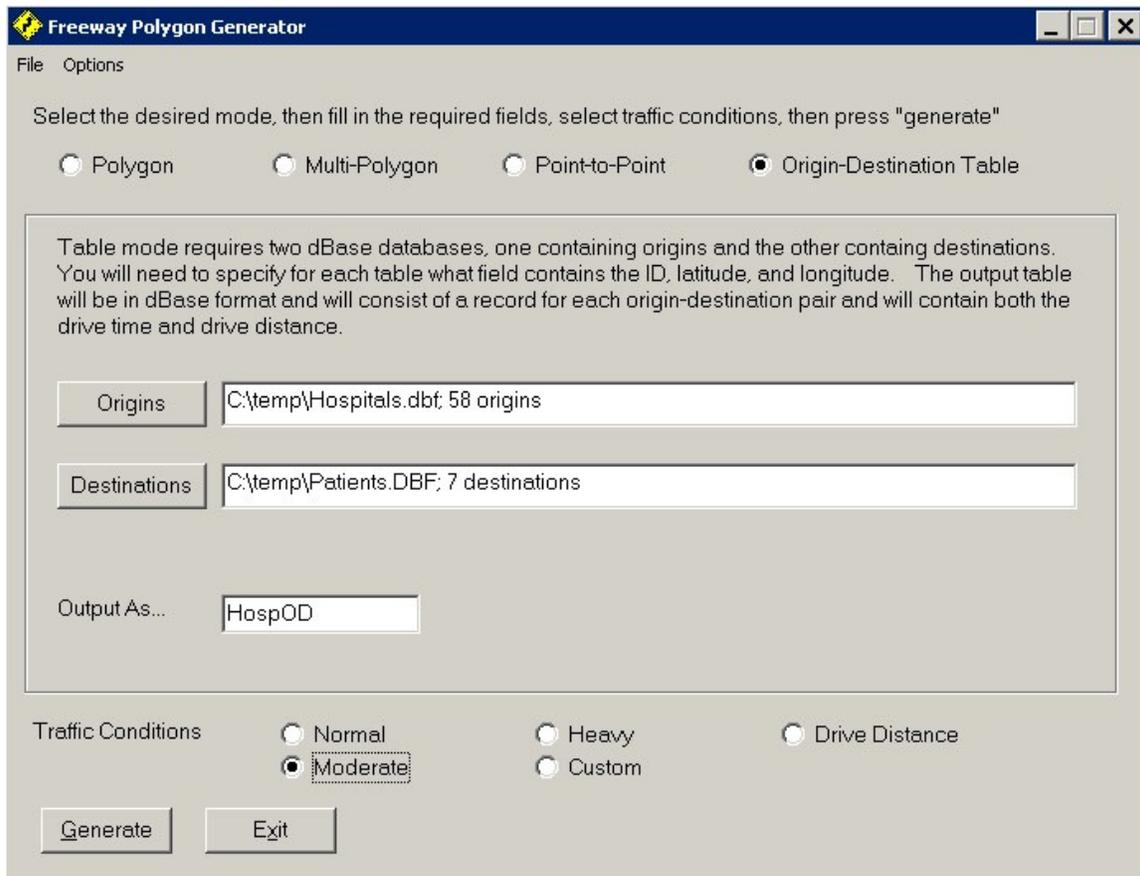
FREEWAY MAPINFO INTERFACE

A direct MapInfo interface is available by running Freeway.mbx from the File | Run MapBasic Application option of the MapInfo menu.   This application installs itself on the main menu and attaches a custom toolbar to the interface.   This application is available for MapInfo version 4.0 or higher running under either Windows 3.1 or Windows 95.   The application is currently not supported under Windows NT.

The Freeway interface to MapInfo is shown below:
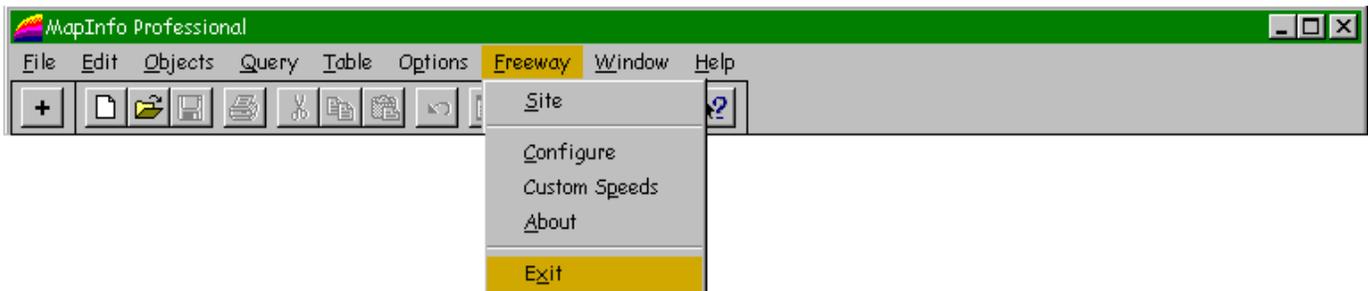
The + at left is the button bar installed by Freeway.   Normally, this will appear at the right of any MapInfo button bars already present.

In most cases, a Freeway polygon will be generated by selecting the + button on the button bar and clicking on the desired site.   This will invoke the site dialog with the coordinates filled in.   Enter a drive time in minutes and select traffic conditions.   In addition, you will want to provide a name for the resulting polygon

and choose an output layer into which the polygon will be added.   Note that Freeway will create a new layer if you so desire.   The site dialog is shown below:
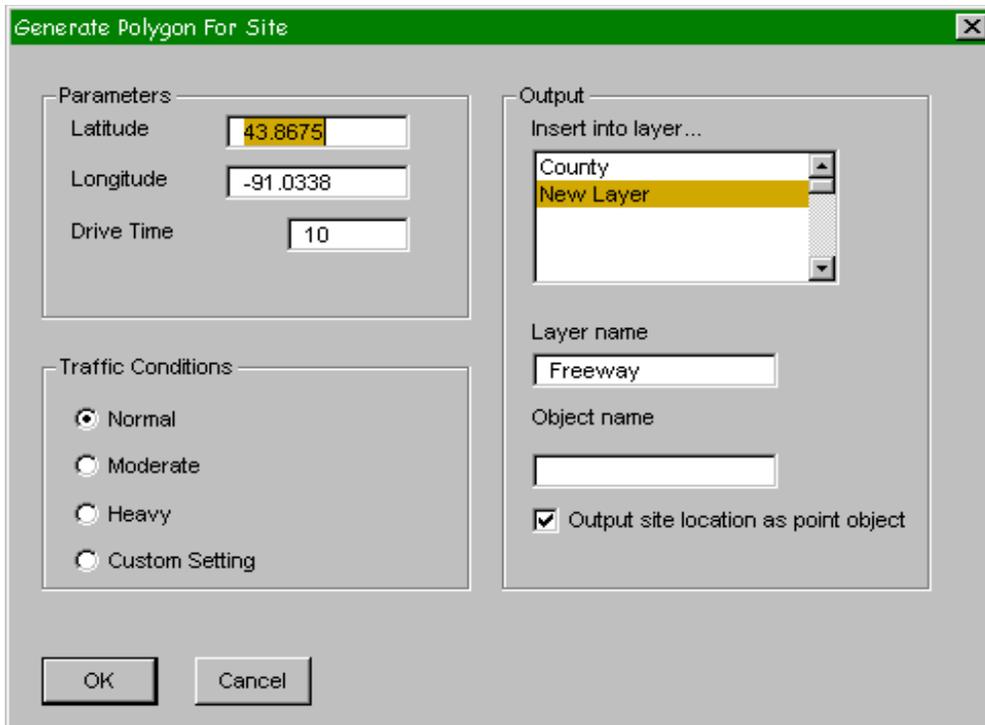
Note that if you select "New Layer", you should choose a layer name in the text box below the layer selection list.   If you check the "output site location as point object" box, Freeway will insert two objects into the layer – the polygon and the site from which it was generated.

Once you select "OK", Freeway will assemble an origin-destination matrix from its databases, and then generate a polygon using that information.   MapInfo will then be instructed to import the resulting polygon into the chosen layer.   The view is automatically adjusted to show the new polygon.

The main configuration form is selected from the Freeway menu and appears as below.   The databases directory is the location of the databases.   The output directory should be either a temporary files directory or a location accessible to MapInfo.   The temporary directory is used for temporary storage in some cases. Any files created there will be destroyed by Freeway upon completion of its tasks.
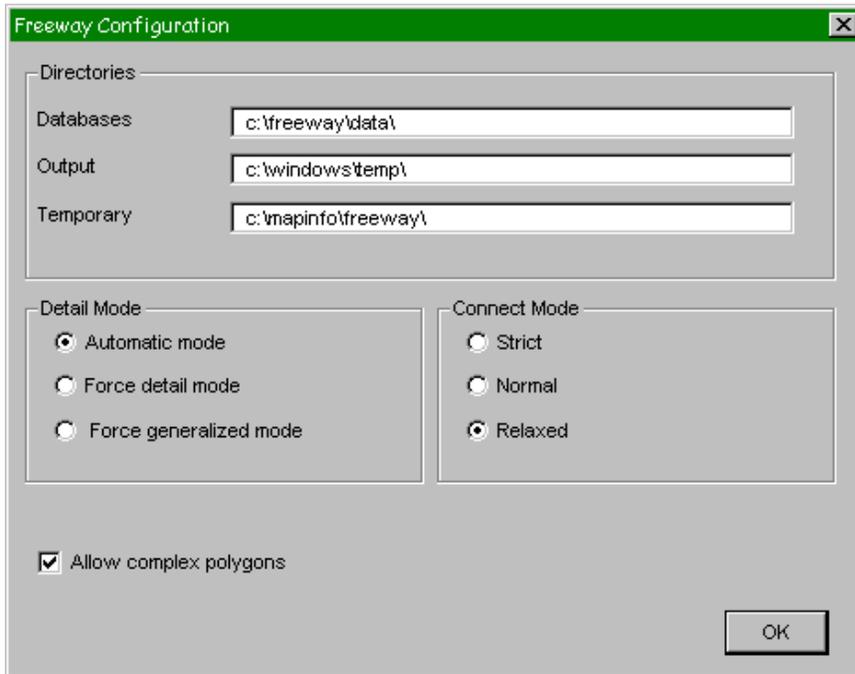
Note that version 2.1 adds a country setting to the above dialog.

The speed setting dialog is shown below and is self-explanatory.
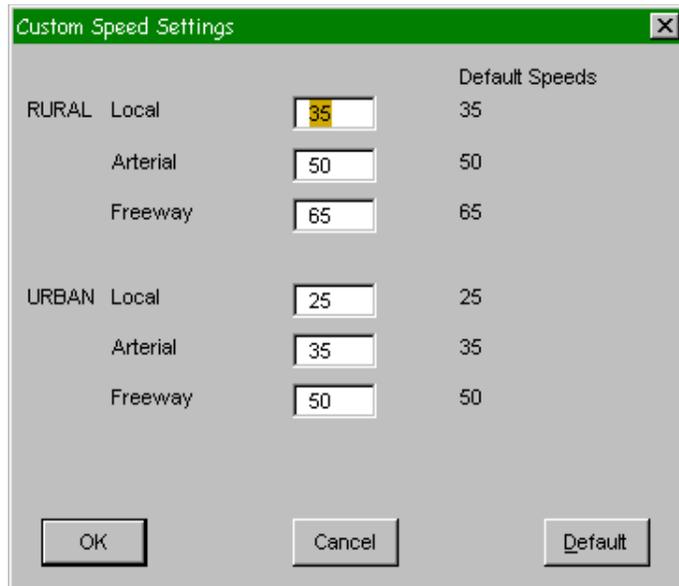
Customer and Technical Support

Customer and technical support is available directly from your Freeway reseller.