
Route and Landmark Selection Tool (RULST): User's Manual

**Decision and Information
Sciences Division
Argonne National Laboratory**



Operated by The University of Chicago,
under Contract W-31-109-Eng-38, for the

United States Department of Energy

Argonne National Laboratory, with facilities in the states of Illinois and Idaho, is owned by the United States Government and operated by The University of Chicago under the provisions of a contract with the U.S. Department of Energy.

DISCLAIMER

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor The University of Chicago, nor any of their employees or officers, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of document authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof, Argonne National Laboratory, or The University of Chicago.

Available electronically at <http://www.doe.gov/bridge>

Available for a processing fee to U.S. Department of Energy and its contractors, in paper, from:

U.S. Department of Energy
Office of Scientific and Technical Information
P.O. Box 62
Oak Ridge, TN 37831-0062
phone: (865) 576-8401
fax: (865) 576-5728
email: reports@adonis.osti.gov

ANL/DIS/02-2

Route and Landmark Selection Tool (RULST): User's Manual

by M.A. Widing

Decision and Information Sciences Division
Argonne National Laboratory, 9700 South Cass Avenue, Argonne, Illinois 60439

March 2002

Prepared for Military Traffic Management Command Transportation Engineering Agency

NOTICE

This technical memorandum is an information product of Argonne's Decision and Information Sciences Division (DIS). It presents results of ongoing work or work that is more limited in scope and depth than that described in formal reports issued by DIS. This memorandum has undergone internal technical review and has been edited according to DIS's quality assurance requirements. In contrast to a formal technical report, this memorandum has not been externally peer reviewed.

For more information on the division's scientific and engineering activities, contact:

Director, Decision and Information Sciences Division
Argonne National Laboratory
Argonne, Illinois 60439
Telephone (630) 252-5464
<http://www.dis.anl.gov>

Publishing support services were provided by Argonne's Information and Publishing Division (for more information, see IPD's home page: <http://www.ipd.anl.gov>).



This report is printed on recycled paper.

Contents

NOTATION	iv
OVERVIEW.....	1
MAIN WINDOW.....	2
FILE AND DATA HANDLING.....	4
GIS CAPABILITIES.....	9
EDITING DATA OBJECTS.....	13
NODES.....	14
LINKS	15
ROUTES	17
LANDMARKS.....	20
RESOURCES.....	28
MULTIPLE OBJECT DELETION.....	29
HELP INFORMATION.....	31
TUTORIAL.....	32
INDEX	35

Notation

DTED	Digital Terrain Elevation Data
GIS	geographical information system
ID	identifier
MTMCTEA	Military Traffic Management Command Transportation Engineering Agency
NIMA	National Imagery and Mapping Agency
PORTSIM	Port Simulation
RPF	Raster Product Format
RULST	Route and Landmark Selection Tool
TRANSCAP	Transportation System Capability
WVS	World Vector Shoreline

Route and Landmark Selection Tool (RULST): User's Manual

OVERVIEW

The Route and Landmark Selection Tool (RULST) is a software program designed to assist military planners in defining geographical objects, such as routes, landmarks, spurs, and yards, at a given facility.

Argonne National Laboratory is currently developing a prototype of this tool for use by the Military Traffic Management Command Transportation Engineering Agency (MTMCTEA). The primary objective of RULST is to populate database tables of facility objects for use in MTMCTEA models.

Purpose

RULST defines facility data for use in models such as Port Simulation (PORTSIM) and Transportation System Capability (TRANSCAP), which simulate the transportation of equipment through ports and military installations. The main purpose of RULST is to allow you to specify the relationships between landmarks and routes. The nodes, links, and landmarks that describe a facility are often predefined on the basis of the layout of the physical site.

To simulate the movement of items through a facility, you need to know how these landmarks are connected by routes. Routes need to be defined along the physical links in the facility. To tie a route to a landmark, you define points in the landmark where a route enters or exits that landmark. After defining the “entry/exit points” for a landmark, you can specify them as either the origin or the destination of a route. A transportation model can then simulate item movement and animate the results.

Design

Through a graphical user interface, RULST displays the layout of a facility and allows you to create and edit objects. Elements of the facility, such as gates and berths, are represented as objects on a map. RULST provides simple geographical information system (GIS) capabilities, such as displaying overlays and zooming in on a map. In addition, the system contains user interface windows for specifying the relationships between the objects in a facility. After you have defined a facility through these windows, RULST performs checks on the data before writing to the database.

System Requirements

The RULST system is written in the programming language Java (Version 1.3) and runs on both Sun systems under UNIX and PC systems

under Windows 95/NT. The data used by RULST can be stored in an Oracle database management system, an MS ACCESS database, or flat files.

MAIN WINDOW

The main window of RULST consists of a view of the facility in the center of the window bordered by a menubar, status messages, and a map toolbar at the top, and a toolbar of object list buttons on the left (Figure 1). Many options are available from both the menubar and the toolbar.

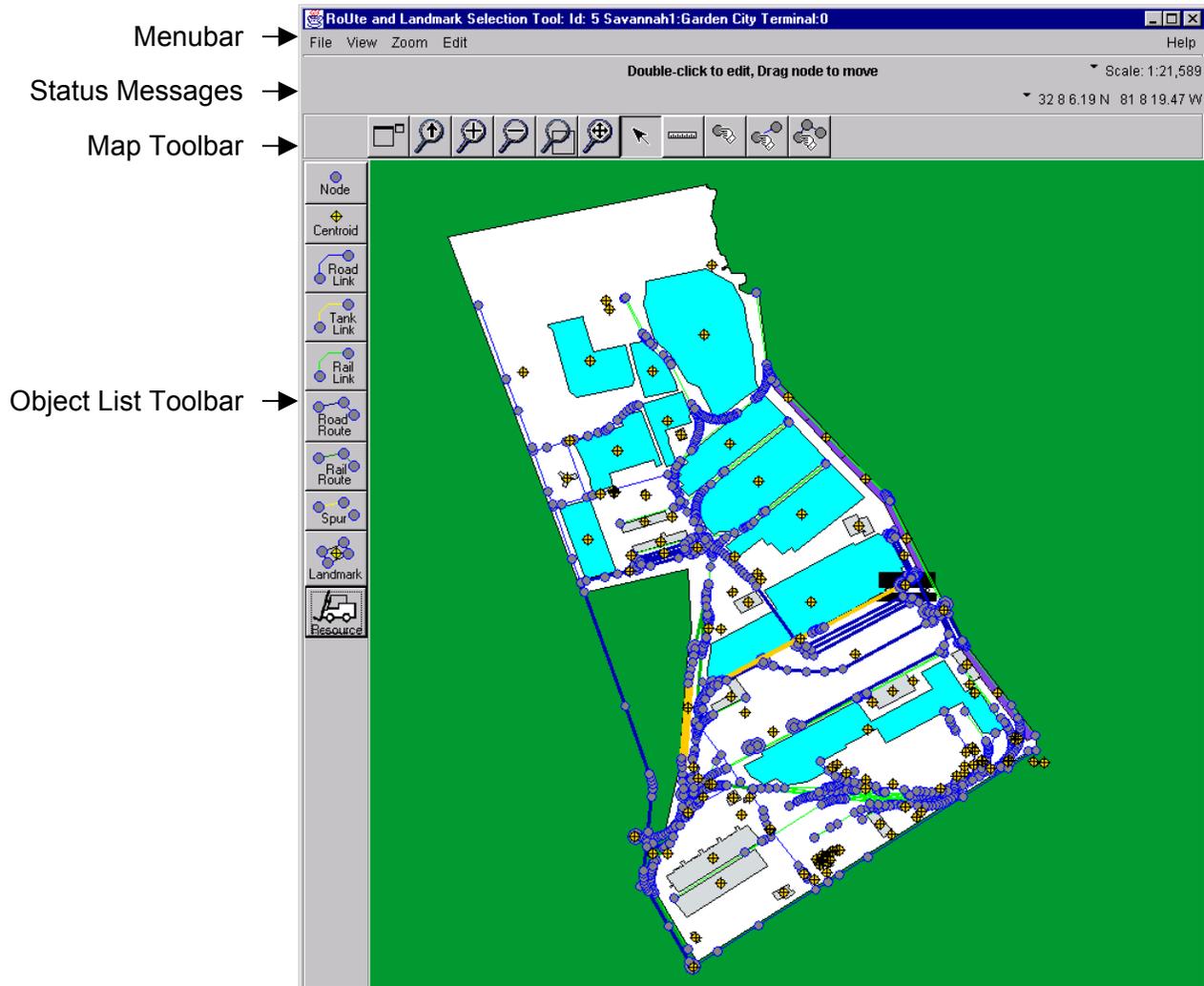


Figure 1 RULST Main Window

Tip: The status messages at the top of the window give information such as the current scale of the map view, the coordinates of the mouse pointer, and help prompts. Help is also available for many buttons and text entry fields through tool tip messages.

Main Menus

RULST contains five menus: **File**, **View**, **Zoom**, **Edit**, and **Help**. Figure 2 shows these pull-down menus, and the table below gives a brief description of each menu.

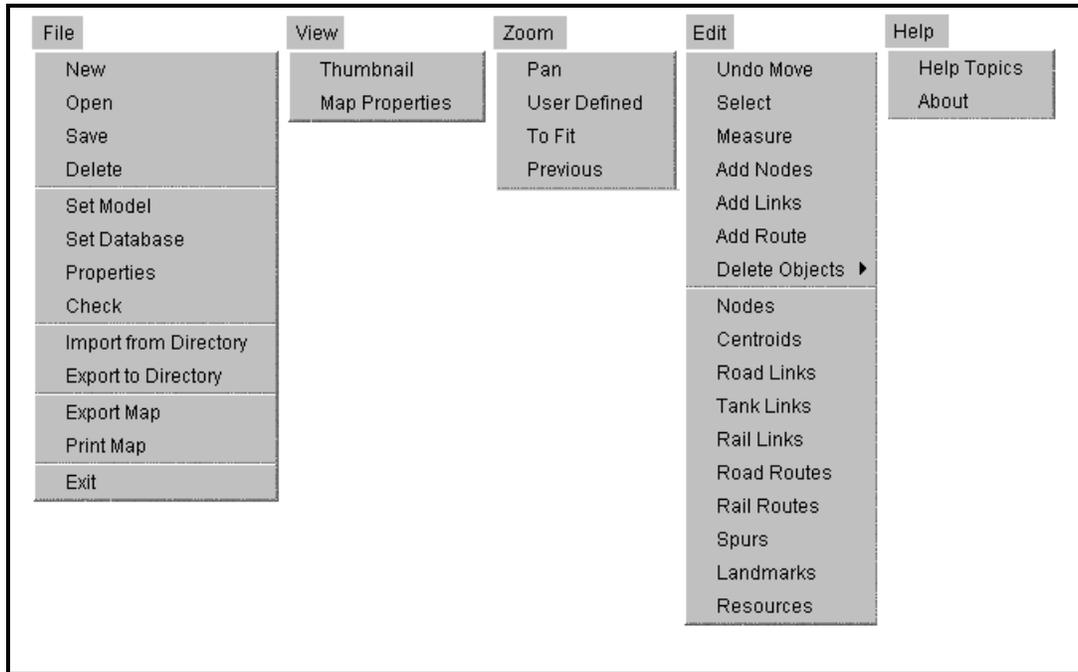


Figure 2 Menus

RULST Menus and Descriptions	
File	Performs such actions as opening a data set and exporting to files.
View	Changes the map backgrounds and overlays that are shown.
Zoom	Changes the map view to reflect different zoom scales.
Edit	Edits the lists of facility objects such as nodes and landmarks.
Help	Displays help through an HTML browser.

FILE AND DATA HANDLING

Creating a Data Set

With RULST, you can either create a new facility model or open data for an existing facility. The **File:New** option clears all lists of objects and allows you to define a facility from scratch. If a baseline data set is available, you can load it from an Oracle database that contains data either from a previous RULST use or from the MTMCTEA GIS.

Setting the Database

If the location of the database differs from the default configuration, use the **Set Database** window to specify the desired location (Figure 3). You can also set the location values by using command line parameters when bringing up RULST.

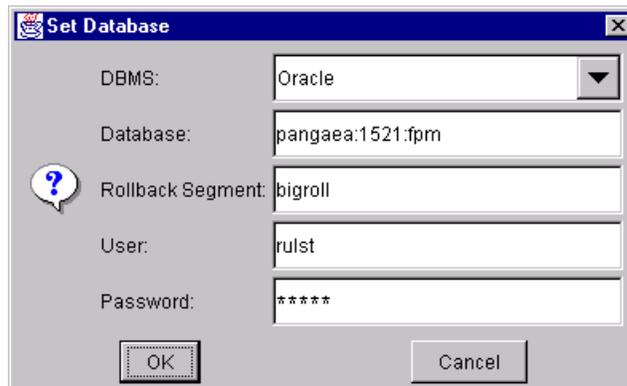


Figure 3 Set Database Window

Setting the Model

To specify the transportation model for which you are defining data, use the **Set Transportation Model** window (Figure 4). You can also set the model by using a command line parameter when bringing up RULST. This option changes which data attributes are visible, what range of values is allowed, and what default values are used to initialize new objects. The types of objects that can be added will also change depending on the target model. To create a generic facility with no specific intended model, select **All** from the choice menu.

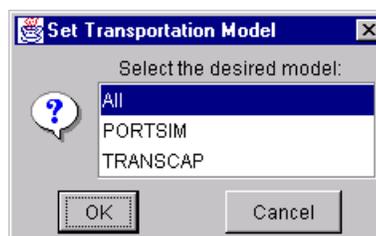


Figure 4 Set Transportation Model Window

Tip: You must specify the transportation model before loading a data set or creating a new data object; otherwise, the default values may be incorrect for that model.

*Opening a
Data Set*

To view existing data sets, use the **File:Open** option to invoke the **Open** window (Figure 5). To view a brief description of a data set, click on a facility name in this window. To load the highlighted data set, click on **OK**. RULST then clears out all previous overlays of data, closes any list or edit windows, and loads the new data.

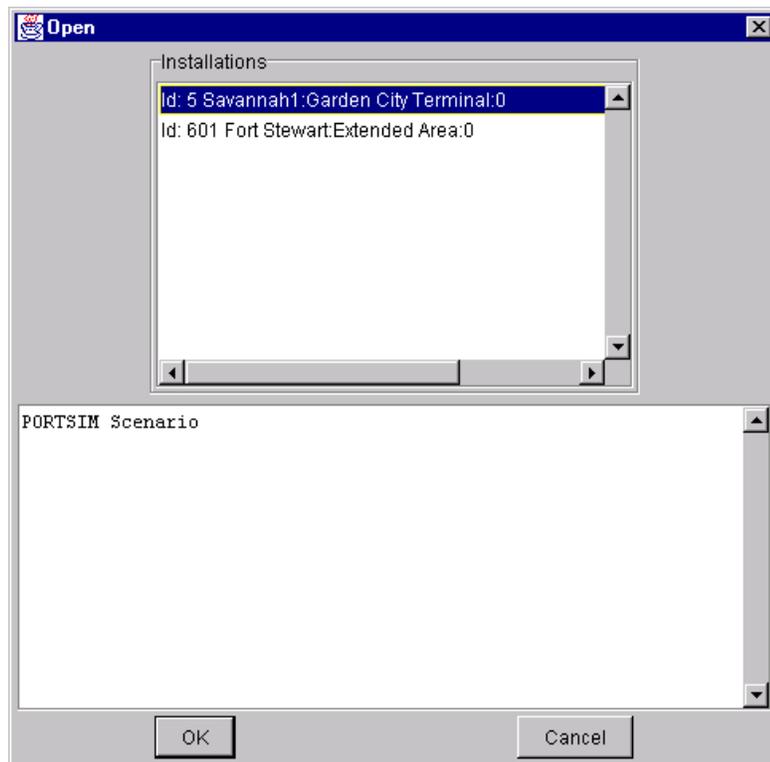


Figure 5 Open Window

*Saving a
Data Set*

After completing modifications to a particular data set, you can save it back to the Oracle database with the **File:Save** option. Before saving the data, RULST automatically runs a series of preliminary checks. You can also trigger these checks with the **File:Check** option. After verifying that the data set is valid, RULST opens the **Save** window (Figure 6).

To overwrite an existing data set, click on the name of the old data set in the scrolling list and then click on **OK**. To save the revised data set as a new facility, click on the **Save As** button in the **Save** window. This window gives you the option of altering various properties of the data set, such as its name, coordinate system used, and associated background images and overlays (Figures 7–10).

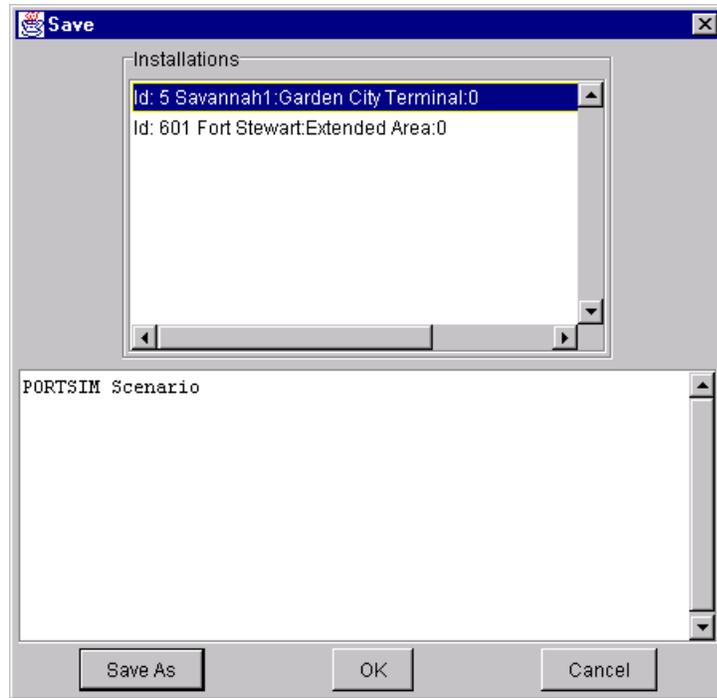


Figure 6 Save Window

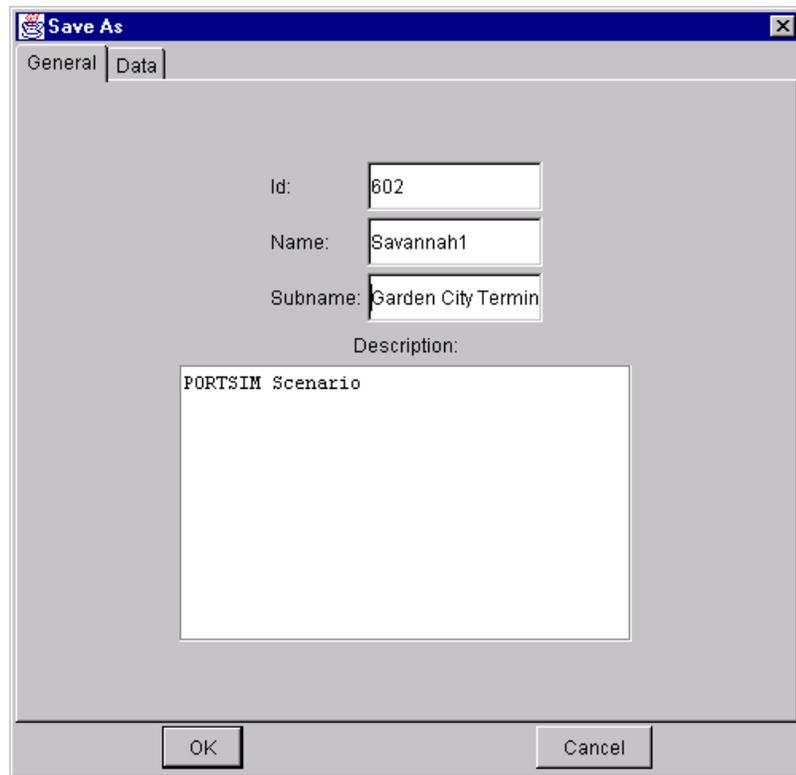


Figure 7 Save As Window: General Panel

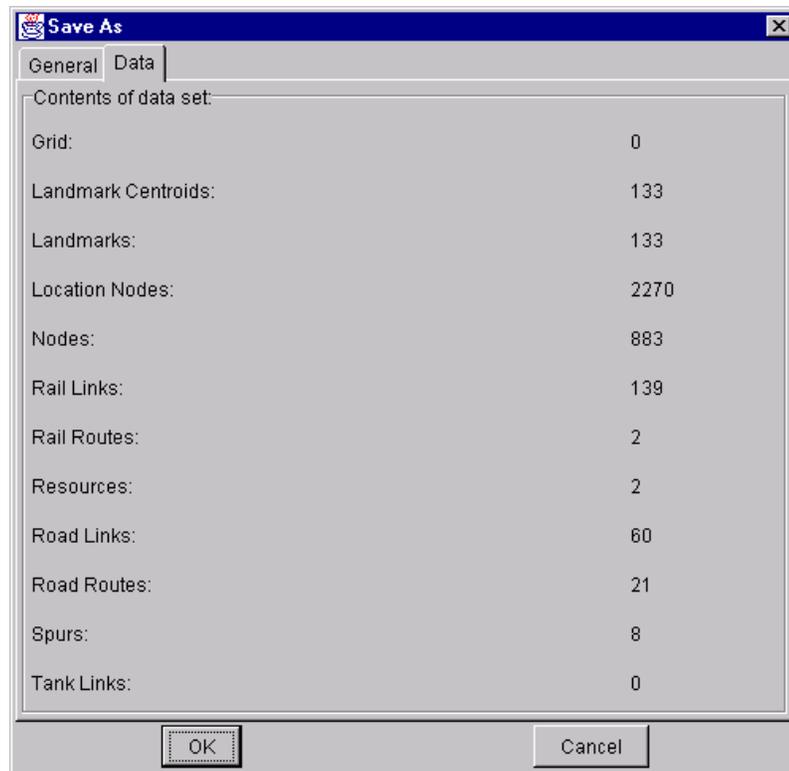


Figure 8 Save As Window: Data Panel

*Accessing
Properties
of a Data Set*

You can access the properties of a data set shown in Figures 7 and 8 at any time through the **File:Properties** option. The **General** panel contains such information as identifier (ID), name, and subname of the facility data set. Each facility in the database has a unique ID. If you specify a duplicate ID for a facility, the old data set with that ID is then overwritten with the new data. The other general data items do not need to be unique. The **Data** panel lists the number of objects of each type in the facility.

*Deleting
a Data Set*

To delete an existing data set, use the **File:Delete** option to open the **Delete** window (Figure 9). Select the desired data set in the facility list and click on **OK**. A confirmation window opens to help you avoid accidentally deleting baseline or other required data.

*Importing and
Exporting Data
Files*

To use ASCII files rather than an Oracle database as a data source, use the **File:Import** and **File:Export** options. These options allow you to make backup copies of data or use a machine without Oracle access. The **Import from Directory** and **Export from Directory** windows display directory structures and allow you specify a new or existing directory to store data files (Figure 10). You can quickly load a data set into RULST from these ASCII files and save it back to the database at a later time.

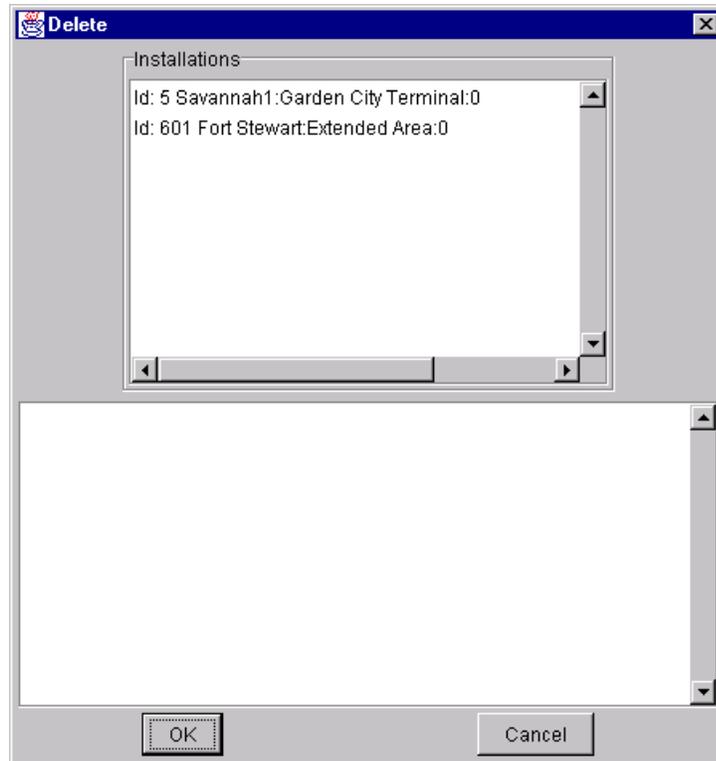


Figure 9 Delete Window

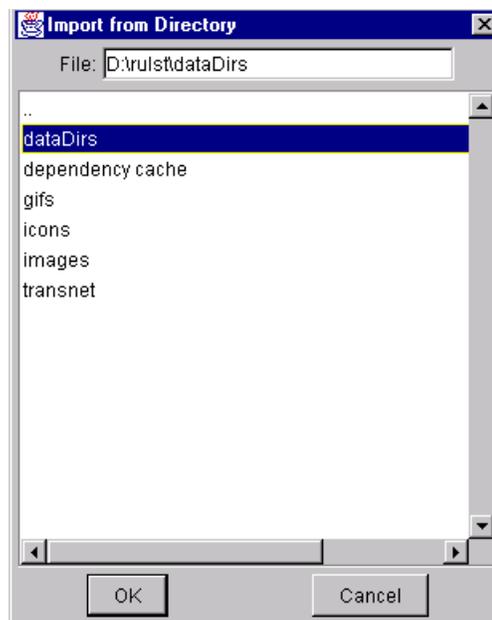


Figure 10 Import Window

*Exporting and
Printing Maps*

You can save the current map view to a GIF file or print it from the **File** menu. RULST uses Java printing capability to display an appropriate print dialog for the machine platform being used, with options such as printer destination or name of a postscript output file.

GIS CAPABILITIES

RULST operates like a standard mapping system in that it shows overlays of information over a background map. You can zoom in on the map to either view the display at a different scale or view the entire map at once with the **Thumbnail View** window (Figure 11). A red box in the **Thumbnail View** indicates the current map view. Click on the new location in the **Thumbnail View** to pan the map view to that location.

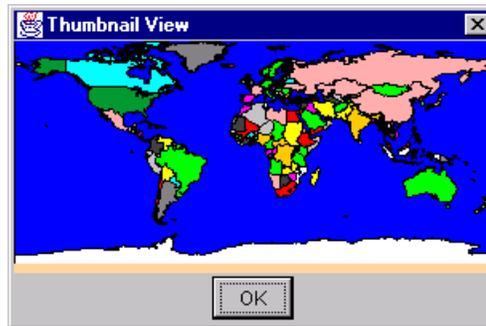


Figure 11 Thumbnail View Window

Tip: The **Thumbnail View** provides a good way to orient yourself when working with the map, so you may want to leave it open at the side of the screen. The current scale and view area of the map are automatically updated in the **Thumbnail View** when you zoom in.

RULST represents the different geographical objects in a facility by displaying a series of overlays over a background. To change which overlays are currently visible, use the **Properties:Overlays** option (Figure 12). In some cases, you may want to change the ordering of these overlays. For example, a link may be hidden by a route at the same location.

To specify the ordering of that overlay with respect to the other overlays, highlight an overlay in the list and press one of the **Arrow** buttons. Click on the **OK** or the **Apply** button and the change will take place.

Changing Backgrounds

The background may consist of a composite of various images created from several different sources. The sources available are specified by using command line parameters when starting RULST. Most map sources come from the National Imagery and Mapping Agency (NIMA), which provides government agencies with a wide variety of map products. When RULST first starts, it shows the default background, which contains solid polygons representing different countries using World Vector Shoreline (WVS) data. If you have Raster Product Format (RPF) data,

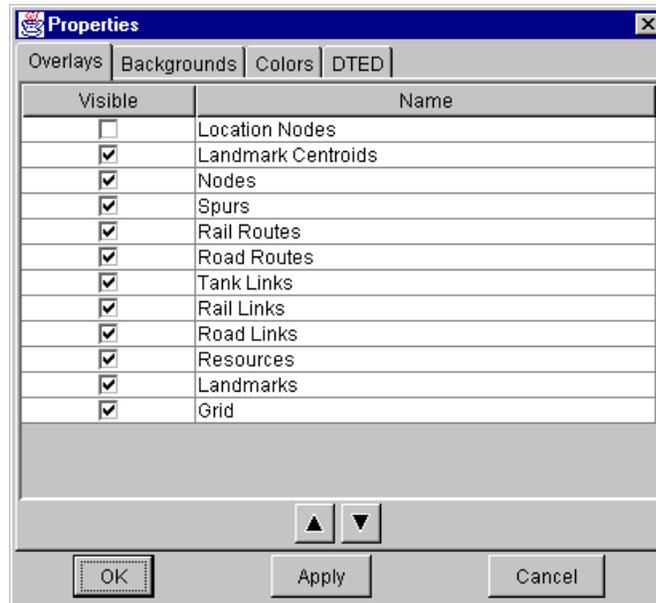


Figure 12 Properties: Overlays Window

you can display these raster images as backgrounds as well. If you have a raster image file from some other source, you can show it as a map background by creating a header file that contains the geographic boundaries of the image.

Using Digital Terrain Elevation Data (DTED), you can view the elevation at the mouse cursor position next to the running coordinates. You can also view a sun-angle shaded relief image or contour image created from DTED.

To specify which backgrounds are currently visible, use the **Properties:Background** option (Figure 13). Selected backgrounds will display only when the map is zoomed in close enough and the view is at an area where coverage for that background exists. A map that is too small will be displayed as a polygonal outline of the area covered by the map. Select the transparency for each background by using the choice in the corresponding row. To specify the ordering of a background with respect to other ones, highlight the background name in the table and press one of the **Arrow** buttons. Click on the **OK** or the **Apply** button and the change will take place.

*Changing the
WVS Colors*

To specify the colors used in the WVS background, use the **Properties: Colors** option (Figure 14). Use the button menu to pick the new color for the indicated country. Click on the **OK** or the **Apply** button and the change will take place.

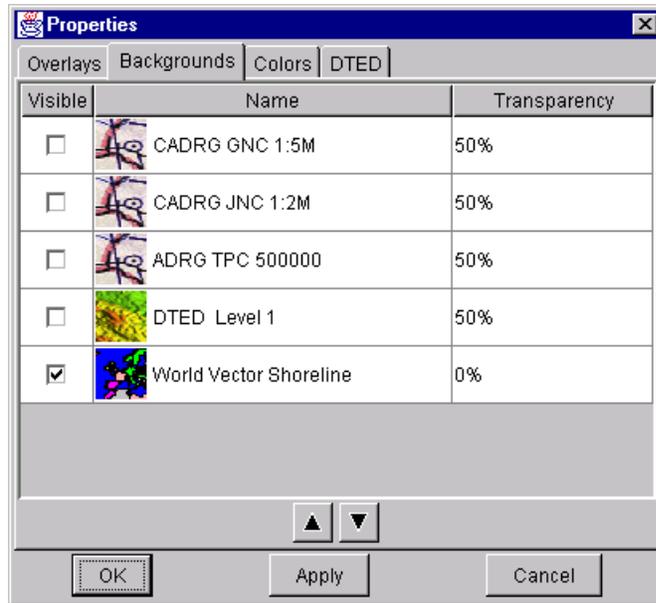


Figure 13 Properties: Backgrounds Window



Figure 14 Properties: Colors Window

Changing the DTED Background

To change properties of the DTED background, use the **Properties: DTED** panel (Figure 15). After selecting the background's type and setting new parameters, click on the **OK** or the **Apply** button to update the map.

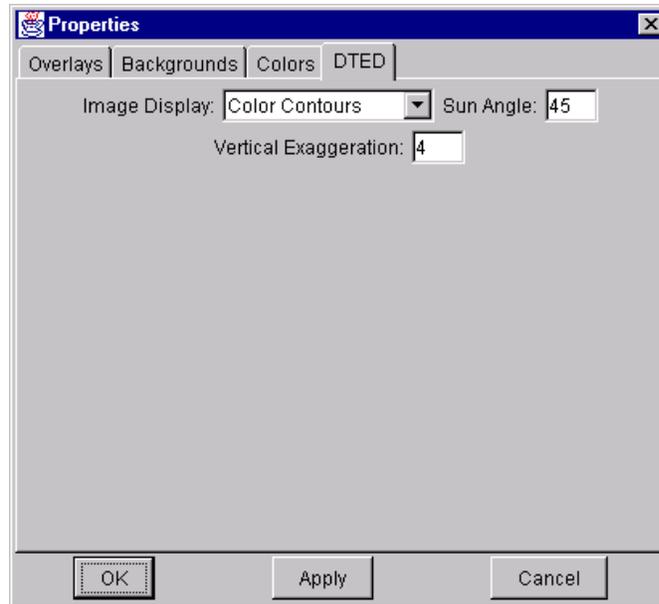


Figure 15 Properties: DTED Window

Zooming

When defining the objects at the different parts of the facility, you can zoom in and out in the map in the main window to reflect different map scales. RULST supports both predefined scales — expressed as a percentage — and arbitrary user-defined areas. If you know the exact scale you want, you can choose it directly from the **Scale** menu. If the desired scale is smaller than the current one, the map display echoes the extent of the new scale with a box. After you pick the center of the new location, the map zooms in at that location. If the desired scale is larger than the current one, the map automatically zooms out to that scale using the current center location. RULST records a stack of previous zoom scales to use when you select the **Zoom:Previous** option.

Tip: The easiest way to automatically switch to the next predefined scale is to click on the plus and minus zoom buttons in the toolbar above the map.

To specify a user-defined zoom area, first select the **Zoom:User Defined** menu or toolbar button. With the mouse pointer, press down and drag on one corner of the new area, while the system highlights the new area with a box. Release the button when the pointer is over the opposite

corner. To display the entire area covered by the facility, select the **Zoom:To Fit** option.

Panning

To pan to a new center location at the same scale, use the **Zoom:Pan** option or toolbar button. Click on the new center position in the map with the left mouse button. As with other zoom options, if you decide to cancel the action while RULST is waiting for a mouse press, you can cancel by selecting either the **Edit>Select** option or the **Select** button from the toolbar. You can then return to selecting objects from the map with the mouse. You can also pan the map by simply clicking on the new center location with the right mouse button at any time.

EDITING DATA OBJECTS

Displaying a List Window

The standard way to view or edit objects in RULST is by using list and edit windows (Figures 16 and 17). You can display a list of all objects of a specific type by selecting the appropriate item either from the **Edit** menu or from the toolbar. The object list toolbar serves a dual purpose. First, it acts as a legend, illustrating the color and general appearance of each category of object. Second, it provides a quick way to open the list window for each type of object.

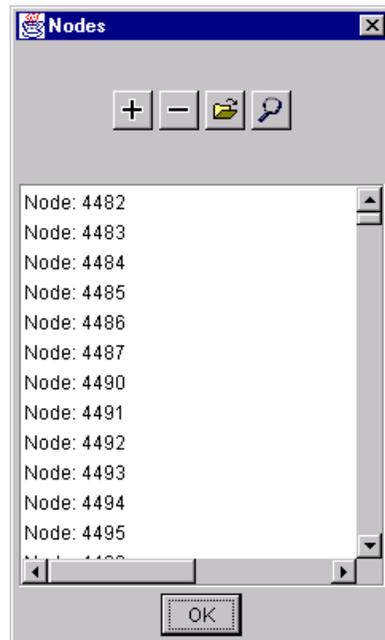


Figure 16 Node List Window

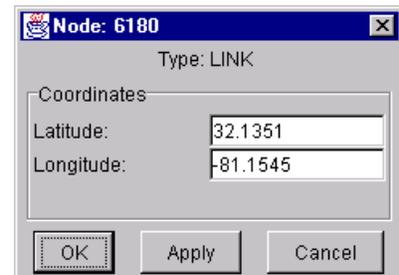


Figure 17 Node Edit Window

When you click on the mouse to select an object in the map, your selection is sent to the currently active list or edit window, which then determines if that selection is relevant. Bringing up a new edit or list

window in RULST blocks other list or edit windows to avoid confusion over which windows are currently active and receiving map selections. The active window displays a prompt above the map view to indicate those objects that can currently be selected.

Note: Only one list or edit window is active at a time. Disabled windows are grayed out and do not receive mouse selections.

Identifying an Object

To identify an object in the map, move the mouse pointer over the top of that object. The name of the object below the pointer is displayed in a message above the map view.

You can also identify an object by clicking on the object in the map when its list window is open. The item's name is highlighted in the scrolling list in the list window. The corresponding overlay item is also highlighted in the map.

Finding an Object in the Map

To find an object in the map, select the item in the list window and click on the **Pan** image button (the "magnifying glass" icon). The map then pans so that the highlighted object is in the center of the window.

Editing an Object

You can edit an object in several ways. If you know the object by name, bring up the list window for that object and double-click on its name in the scrolling list; the associated edit window opens. You can also edit an object by clicking on that object in the map and then pressing the **Edit** image button in the list window.

Tip: The quickest way to edit an object is to double-click on the item in the map.

Understanding Network Objects

As described in the following sections, RULST contains five main types of transportation network objects: nodes, links, routes, landmarks, and resources. Nodes and links are based on the physical locations within the facility site. Routes are composed of links and tie landmarks together. Transportation items move from one landmark, such as a gate, to another landmark, such as a staging area along routes. Landmarks use resources to perform operations such as loading items on ships. All of the actual physical coordinates of these objects are defined with the node object.

NODES

RULST has three types of nodes: general, centroid, and location nodes. General nodes define links and are referred to simply as "nodes" because they are general purpose. To list all nodes, use either the **Edit:Nodes** option or the object list toolbar to open the **Node List** window

(Figure 16). Nodes are represented by small circles in the map. To view the data for a specific node, double-click on that node in the map view. When the list window is active, you can select a node by either clicking on the object in the map, which highlights the object in the list, or simply selecting the item from the scrolling list itself. Click on the **Edit** image button in the window to bring up the data for that node in a **Node Edit** window (Figure 17). You can also edit an item by double-clicking on its name in the list. To pan the map view to show the selected object, use the **Pan** image button.

Adding a Node

To create a new node, use the **Add** image button (the “plus” icon). The system changes the mouse pointer to a hand cursor and waits for you to select the location for the node. To cancel this action, click on either the **Select** button from the toolbar or the **Edit:Select** option, which moves you back to select mode. To quickly add one or more nodes, use the **Add Nodes** toolbar button (the “hand” icon). The system lets you select multiple node locations until you change back to select mode.

Note: RULST automatically generates ID values for all newly created objects.

Deleting a Node

To delete a node, select the node and click on the **Delete** image button (the “minus” icon) in the **Node List** window. RULST will not let you delete an object if other objects depend on it.

Moving a Node

While in select mode, you can move a node by pressing the mouse pointer over the node, dragging the node, and releasing it at the desired position. The position of any object related to this node (i.e., a link attached to this node) is also updated. You can also change the position by typing the new coordinates in the edit window.

Using Centroid Nodes

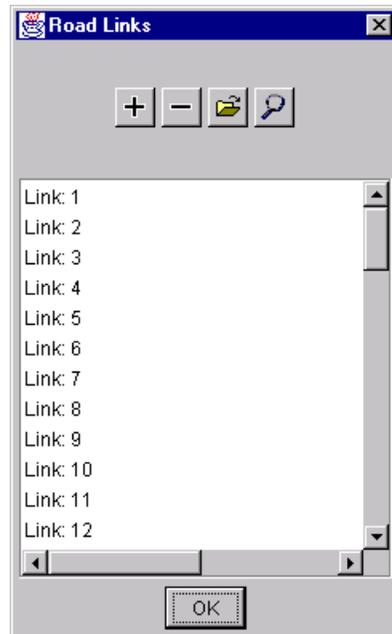
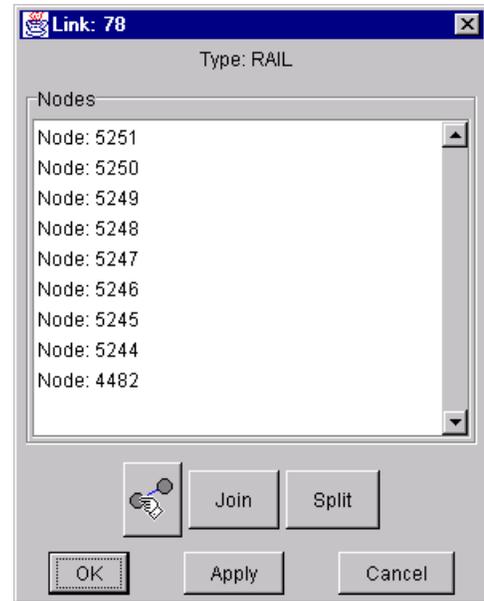
Centroid nodes serve as the centroids of landmark areas. Centroids look like yellow nodes with cross-hairs. Centroids are edited and listed in windows similar to those of general nodes.

Using Location Nodes

Location nodes define the boundaries of polygons that are derived from other GISs. Because there are many of these nodes and because you generally do not need to use them directly, they are not shown in a list window. In addition, you usually leave the overlay for location nodes invisible so that the map does not become cluttered.

LINKS

RULST uses three types of links: rail, road, and tank links. Rail links are depicted by green lines in the map; road links by blue lines; and tank links by yellow lines. Links are listed and edited by using standard list and edit windows (Figures 18 and 19).

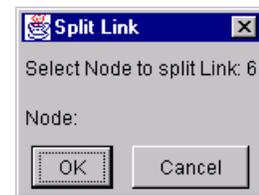
Modifying Links**Figure 18 Link List Window****Figure 19 Link Edit Window**

To add, delete, or edit links, click on the appropriate image button in the **Link List** window. When the **Link Edit** window is open, specify the nodes of the link by selecting the nodes in the map. To select entirely new nodes for a link, use the **Add Link** image button. To join two links together into one link, use the **Join** button to show the **Join Links** window (Figure 20). Select the link in the map that should be joined with the current link. To split a link into two new links, use the **Split** button to show the **Split Link** window (Figure 21). Specify the node in the map where the split occurs.

When you have edited a link, click on either the **OK** button to save the changes and exit the window or the **Apply** button to save the changes without exiting the window. Click on the **Cancel** button to exit the window without saving the changes.

Adding a Link

To quickly add a link, use the **Add Link** toolbar button. After choosing the type of link in a dialog window, select the points that define the new link. If you click on an existing node, RULST snaps to the center of that node. After you have chosen the last point, switch back to **Select**

**Figure 20 Join Links Window****Figure 21 Split Link Window**

mode with the **Select** toolbar button. RULST automatically creates the links connecting those points and creates any new nodes that are needed. You can also use the **Enter** key to signify that the link is done or the **Escape** key to undo a point that you picked.

Tip: The **Add Link** option is particularly useful when defining a facility from scratch, when no nodes are pre-existing.

ROUTES

RULST uses three types of routes: rail routes, road routes, and spurs. A **Route List** window is available for each type of route (Figure 22).

Adding a Route

If link data exist, use the **Add** image button in the **Route List** window to display the **Route Edit** window for a new route (Figure 23). Each route has a name, which is initialized by using the ID of the route. The origin and destination entry/exit points must also be specified for each route. An entry/exit point ties a route to a particular landmark. To define these points, use a table in the edit window for the associated landmark. Entry/exit points appear in the map as large gray circles. Selecting an entry/exit point in the map changes the origin or destination preceded by the depressed **Select** image button.

Selecting Route Links

The **Route Edit** window also contains a panel for picking those links that compose a route (Figure 24). Rail routes and spurs contain only rail links. Road routes contain only road links. The **Links** panel displays a



Figure 22 Route List Window

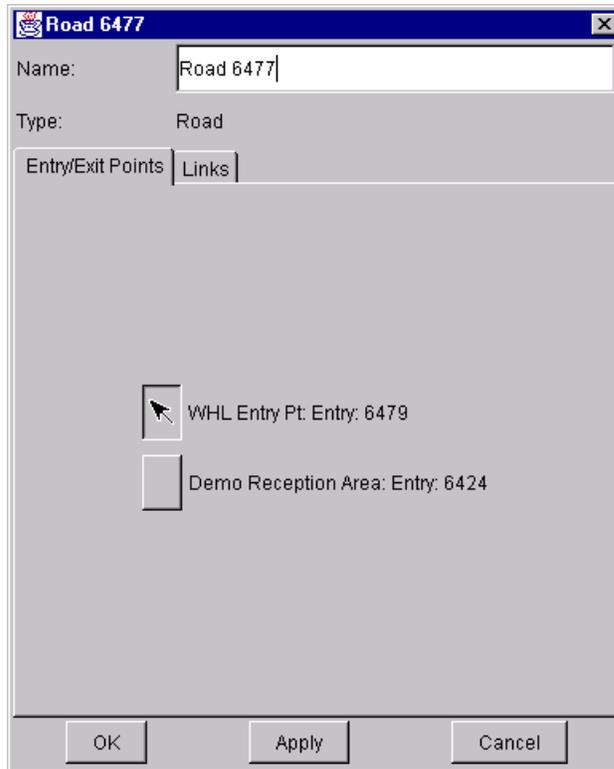


Figure 23 Route Edit Window: Entry/Exit Points

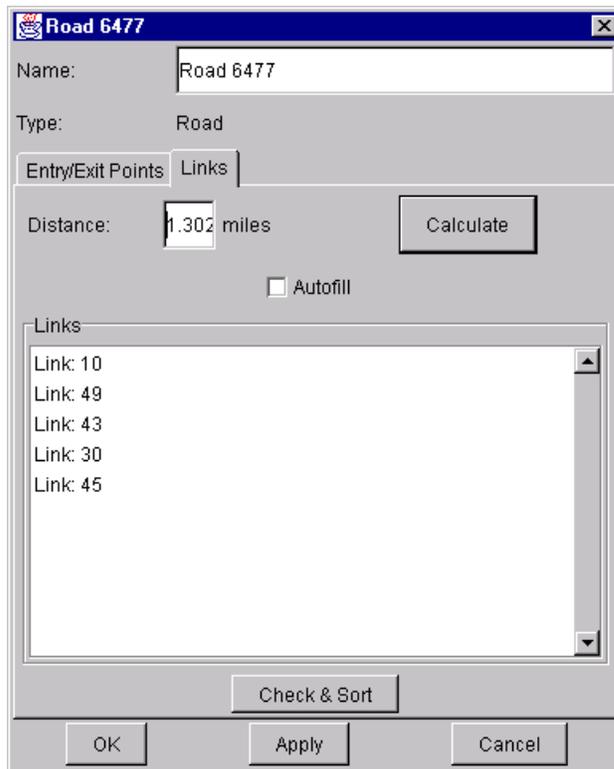


Figure 24 Route Edit Window: Links

scrolling list of links. To add a link to the route, click on the link in the map view. To remove a link from the route, select the link in the list and click the **Delete** key.

Autofilling Links

The **Autofill** check box toggles on a limited autofill capability. When autofill is active and you click on a new link, RULST attempts to add other adjacent links in both directions until it finds a previously selected link. This feature is intended for use in creating simple routes for which you first select the beginning and ending links and fill in the interior links by selecting only one of them.

Tip: Because the autofill feature sometimes results in the selection of undesired links, limit its use to unambiguous situations. Save any other changes to the route before performing this action; the autofill can be undone if needed by clicking on the **Cancel** button.

Entering Spur Attributes

The **Route Edit** window for spurs contains an additional panel of information (Figure 25). The **Attributes** panel contains a list of text fields for entering attributes that relate to rail centerline data for the spur. Text fields in RULST contain either strings, real numbers, or integer numbers. Tool tips assist you in entering the correct type of data within a specified range of values. Press the **Enter** key within a text field to check the entered value. If the value is illegal, the field turns red. To insert a default value in a text field, press the **Escape** key while the insertion cursor is in that field.

Attribute	Value
Name	Spur 6747
Type	Spur
FRCOORD_ID	
LENGTH_U_D	
PRIORITY	1
RAIL_WEIGHT	
RR1	
RR2	
RR3	
SPUR_TYPE	Open Staging
STFIPS	
TOCOORD_ID	
TOT_LENGTH	1000.0

Figure 25 Route Edit Window: Attributes

Checking a Route

After you define route data, check the link and entry/exit point data with the **Check & Sort** button (Figure 24). The checking process verifies that all necessary data have been entered. It also sorts the links in order from the origin to the destination, reporting errors such as missing elements or superfluous links. At this point, enter a distance for the route; either click on the **Calculate** button or type a known distance value in the **Distance** text field.

Save the route by clicking on either the **OK** or the **Apply** button. Before saving the data, RULST checks that the route has a unique name and that attribute fields are valid.

Tip: Tool tip messages appear over text fields to display their correct type and range. When you try to save illegal text fields, they are flagged in red. A dialog box allows default values to be used for the incorrect fields before they are saved.

Adding a Route from Scratch

To quickly add both a route and its associated link, use the **Add Route** toolbar button. This option allows you to pick the endpoints of the links that compose a route. After you switch back to **Select** mode, RULST generates the nodes, link, and connecting route. If you selected an entry/exit point as the first or last point, RULST assigns those points as the origin or destination of the route.

Tip: The **Add Route** button is useful when defining a facility from scratch when no links are pre-existing.

Copying a Route

To copy a selected route, click on the **Copy** button (the “duplicate” icon) in the list window (Figure 22). This function is useful for defining routes that follow similar or reversed paths. First, copy the existing route; then, after switching the origin and destination, click on the **Check & Sort** button to reorder the links (Figure 24).

LANDMARKS

Landmark objects come in a variety of types, such as berths, staging areas, and buildings. In the map, a landmark is shown as a polygon with a labeled centroid. All landmarks have a name, area, and a centroid. The **Landmark List** window lists the names of all landmarks (Figure 26).

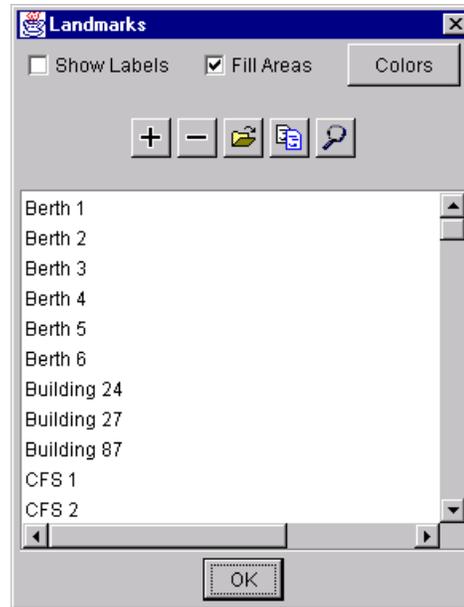


Figure 26 Landmark List Window

*Selecting Labels
and Fill Colors*

You can choose **Show Labels** in the **Landmark List** window to hide or show the text labels of landmarks in the map view. Similarly, you can specify if areas should be filled in when drawn by choosing **Fill Areas**. To change the colors used to fill landmark areas, click on the **Colors** button. Select the color for each type of landmark from the **Landmark Colors** window (Figure 27). (These colors are saved to the file “landmark.clr” in the current directory for future RULST runs.)

*Adding a
Landmark*

To add a landmark, click on the **Add** image button. The **Add New Landmark** window opens (Figure 28). Choose the desired type of landmark and click on **OK**. The **Landmark Edit** window opens for the new landmark object (Figure 29).



Figure 27 Landmark Colors Window

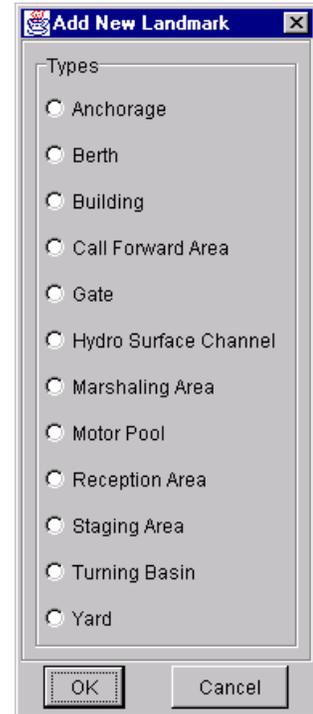


Figure 28 Add Landmark Window

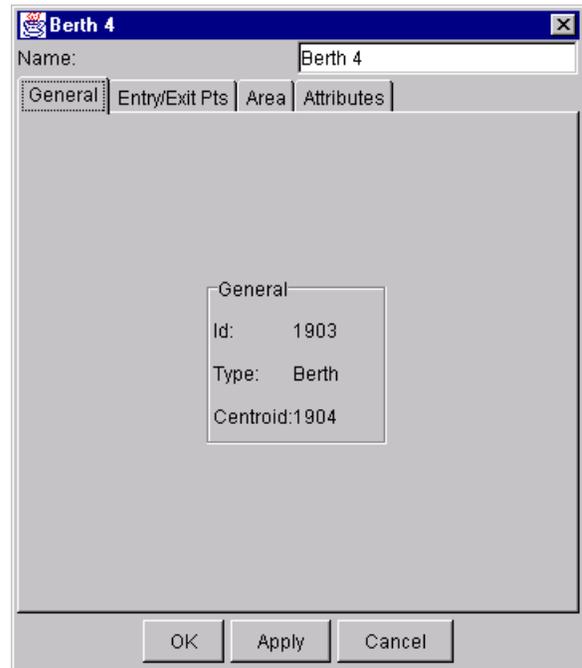


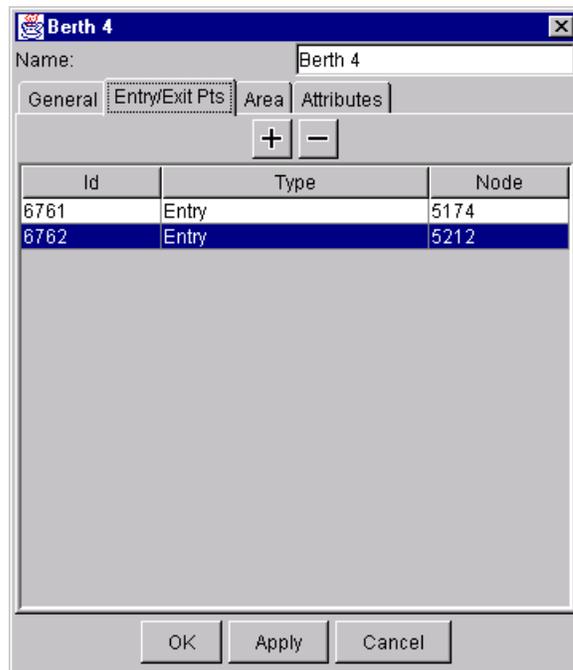
Figure 29 Landmark Edit Window: General

Note: Only one landmark of type “Terminal” or “Installation” can be added for each facility because it represents characteristics of the entire facility area.

*Setting General
Attributes*

All landmarks contain several general attributes, such as name and type, which are shown in the **General** panel. In addition, each landmark must have a centroid node. To specify the centroid of a landmark, select a node in the map while the **General** panel is open.

A landmark also has a set of entry/exit points that indicate the relationship between that landmark and routes (Figure 30). To add an entry/exit point, use the **Add** image button above the table to add a new row to the table. To delete a point, select the desired row by clicking on the **ID** field for that row. Click on the **Delete** button to delete the point. When a point is deleted, any reference to it as the origin or destination of a route is also removed. Specify the type of point as either “Entry” or “Exit” with the pull-down choice in the **Type** field. To specify where a point is located, first select the desired row and then select a node in the map view. The **Node** field is updated to reflect that node.



**Figure 30 Landmark Edit Window:
Entry/Exit Pts**

Specifying the Area

All landmarks also have an area as listed in the **Area** panel (Figure 31). You can specify the nodes that define an area in several ways. You can designate an entire area by selecting a different landmark in the map, which replaces all of the area nodes with the ones for that landmark. A confirmation window verifies this action. By selecting individual nodes in the map, you add them to the area list. To delete a node, highlight it and use the **Delete** key. To change the ordering of area nodes, highlight a node and use the **Arrow** buttons. The polygon in the map changes immediately to reflect these changes.

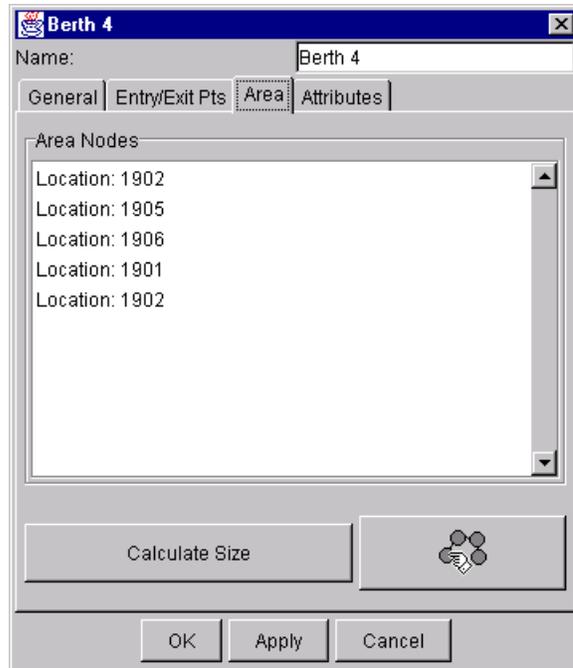


Figure 31 Landmark Edit Window: Area

To quickly create a new area for a landmark, use the **Add Area** button in the **Area** panel. After specifying the vertices of the area, indicate that you are done by switching back to **Select** mode. RULST creates any needed nodes and replaces the nodes in the area list with this new set of vertices.

Tip: When adding a landmark from scratch, the **Add Area** button is the fastest way to select its area.

Determining Landmark Size

To determine the size of a landmark, click on the **Calculate Size** button (Figure 31). For a parking lot landmark, you need to specify a length and width value in text fields in the **Area** panel (Figure 32). To estimate these values, click on the **Estimate Size** button, which will approximate the area.

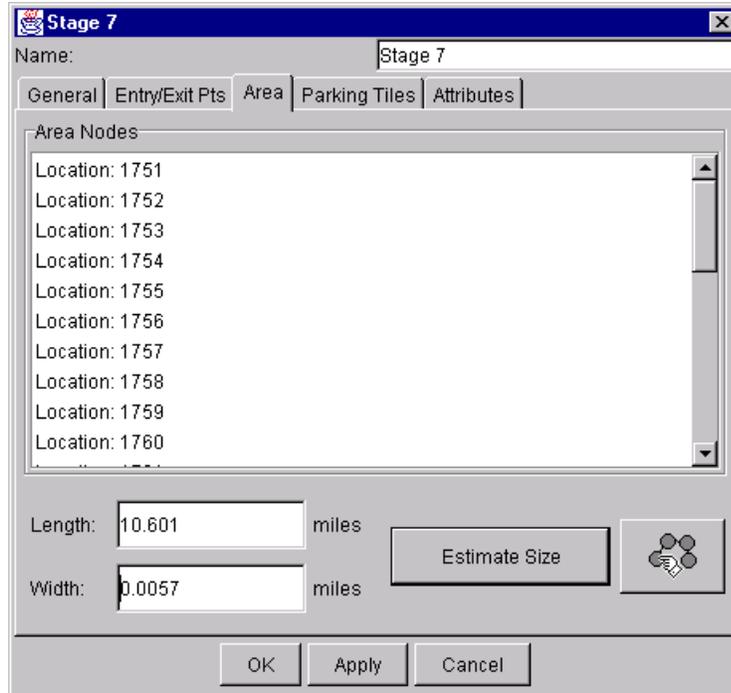


Figure 32 Landmark Edit Window: Parking Lot Area

Editing Specific Attributes

The **Attributes** panel lets you edit a set of specific attributes associated with a landmark (Figure 33). When you attempt to save

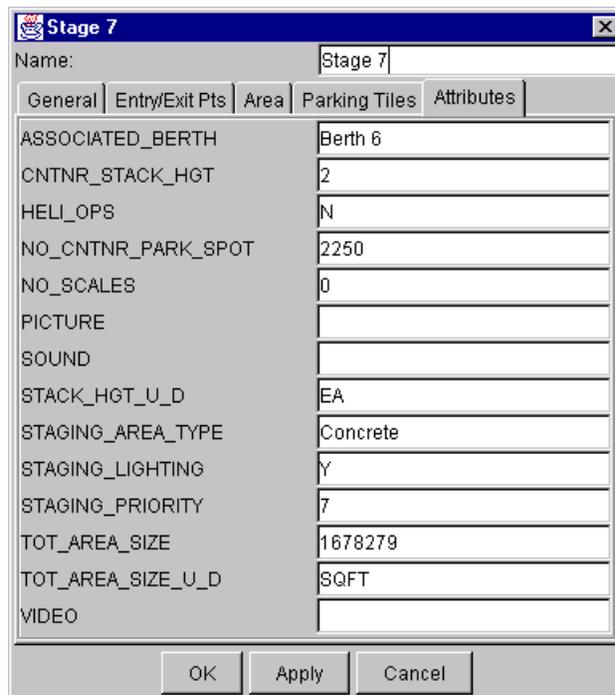


Figure 33 Landmark Edit Window: Attributes

changes by clicking on the **OK** or the **Apply** button, the system checks these attributes to verify that they contain legal values. RULST also checks that the landmark name is unique.

Creating Parking Tiles

The **Parking Tiles** panel lets you edit a set of specific attributes associated with a parking lot landmark (Figure 34). To create a new parking tile, use the **Add** image button to add a new row to the table. To pick the entry or exit point associated with the parking tile, select the field in the table and highlight the point on the map. To specify the area of the parking tile, press the **Add Area** button in the row, and draw the area on the map. The system will constrain the new area to be rectangular in shape. To delete a parking tile, select the row in the table and press the **Delete** image button.

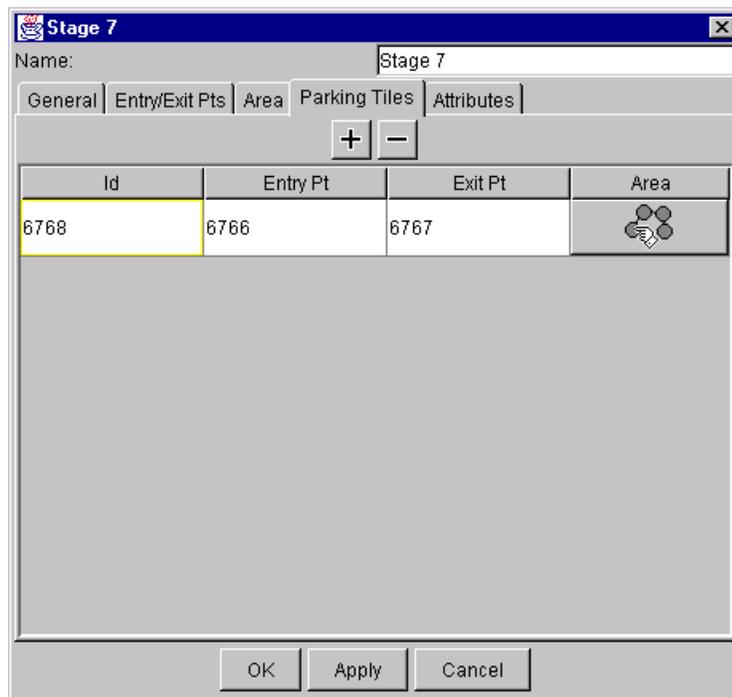


Figure 34 Landmark Edit Window: Parking Tiles

*Choosing Yard
Types and Spurs*

The **General** panel of a yard landmark also allows you to choose the type of the yard. In addition, the **Landmark Edit** window for a yard contains a **Spurs** panel (Figure 35). When you select a spur in the map, it is added to the list if the **Spurs** panel is displayed.

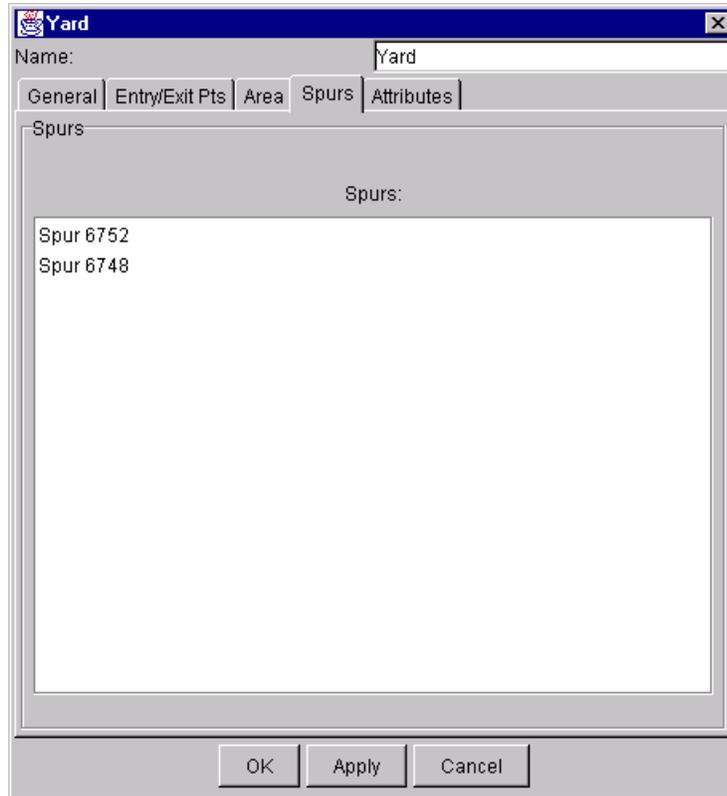


Figure 35 Landmark Edit Window: Spurs

RESOURCES

Resources are shown in the map as labeled icons. Resources represent assets, such as cranes and ramps. To list all resources, use the **Resource List** window (Figure 36). Choose **Show Labels** to either hide or show the labels associated with resource icons.

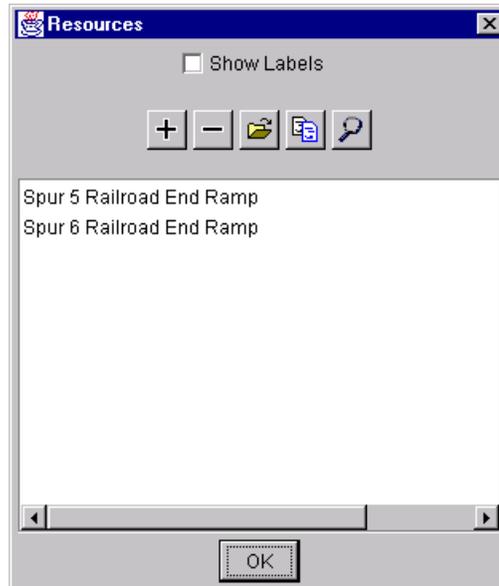


Figure 36 Resource List Window

To add a resource, click on the **Add** image button to open the **Add New Resource** window (Figure 37). Select the type for the new resource from the choice and click on **OK**.

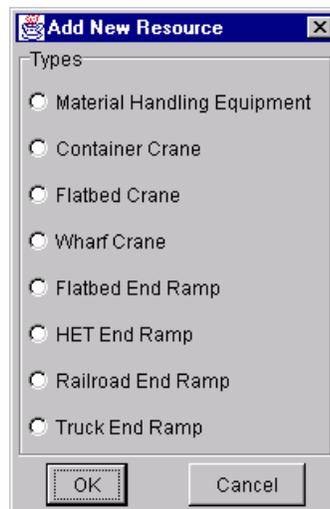


Figure 37 Add New Resource Window

Note: You can add only one resource of the type “Material Handling Equipment” because it represents global resources for the entire facility.

Changing Initial Location

As shown in the **Resource Edit** window, all resources have an initial location at which the icon is drawn in the map (Figure 38). To specify this location, select a node in the map while the **General** panel is displayed.

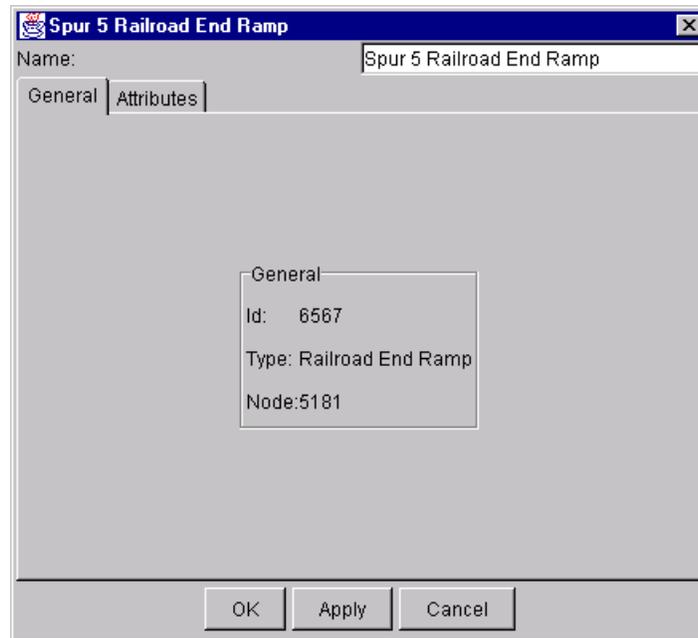


Figure 38 Resource Edit Window: General

Setting Attributes

Resources also contain a set of attributes as shown in the **Attributes** panel (Figure 39). When you click on either the **OK** or the **Apply** button to save the data, these attributes are checked to verify that they contain legal values. RULST checks that the resource has a unique name before saving it.

MULTIPLE OBJECT DELETION

RULST has several functions that can be used to delete several objects at the same time. When you create a facility data set, it is easy to inadvertently generate nodes that are not needed. To quickly delete these unneeded nodes, use the **Edit:Delete Objects:Unused Nodes** option.

In addition, a baseline facility data set may contain objects that are not needed for a limited area scenario. To limit the data set to those objects within a particular area, first zoom in to the area of interest in the map. Then select the **Edit:Delete Objects:Outside View** option and select the types of objects to remove in the **Delete Objects** window (Figure 40).

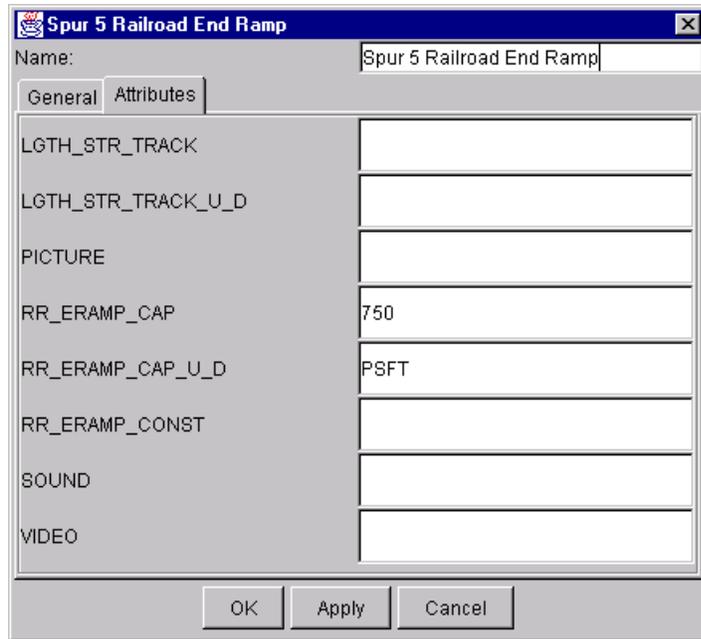


Figure 39 Resource Edit Window: Attributes

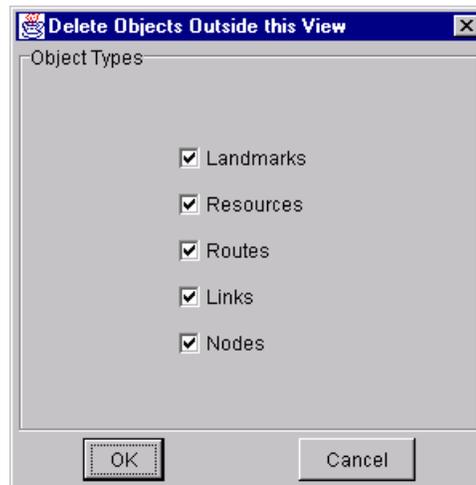


Figure 40 Delete Objects Window

RULST asks you for verification before each deletion and makes sure that these objects are not referenced by other objects within the view. Similarly, to delete the objects within a particular area, use the **Edit>Delete Objects:Inside View** option after zooming in to an unneeded area.

HELP INFORMATION

To view a brief description of RULST, select the **Help:About** option. To access this user's manual with a browser, such as Netscape or Internet Explorer, use the **Help:Help Topics** option. The browser is specified with a command line parameter when bringing up RULST.

TUTORIAL

This section presents a sample tutorial, which outlines the steps required to create a simple facility with one route and one landmark.

1. Start RULST. Under Windows 95/NT, select either the appropriate item from the **Start Menu** or run the **rulstPC** batch file from a DOS shell. On the Sun, run the **rulstSun** script from a command shell within X Windows.
2. Zoom in to the correct geographic location on the map.
3. To open the **Properties** window, click on the **File:Properties** option. Type in a facility name, subname, and description. To exit the window, click on **OK**.
4. Create a terminal to serve as the base of the facility by performing the following steps. Click on the Landmark toolbar button to bring up the **Landmark List** window. Click on the **Add** button to open the **Add New Landmark** window. Choose **Terminal** and click on **OK** to create the new landmark object.
5. After the **Landmark Edit** window opens, create a centroid for the terminal. Click on the **Centroid** toolbar button to open the **Centroid Node List** window. After clicking on the **Add** button, select the point in the map where you want the centroid to appear. Click on **OK** in the **Centroid Node List** window to close it.
6. Return to the **Landmark Edit** window to select the newly added centroid node. The ID of the centroid appears in the **Centroid** field in the **General** panel when you select the node in the map.
7. Create nodes for the boundary of the terminal. Click on the **Add Area** button in the **Area** panel. To add nodes for the boundary, click on the desired locations in the map. Add some nodes on the border for use as entry/exit points. When you have selected the vertices, press the **Enter** key to return to **Select** mode and complete the area. Save your entries periodically by clicking on the **Apply** button in the **Landmark Edit** window.
8. Switch to the **Entry/Exit Points** panel. Add two rows to the table by clicking the **Add** button twice. Select the first row of the table. When it is highlighted, click on a node in the map to serve as an entry point into the landmark. Select the second row of the table. Click on a node in the map to serve as an exit point from the landmark. Use the pull-down choice menu for the second row to indicate that this type of point is an "Exit" point.

9. Switch to the **Attributes** panel. Change values for the displayed attributes as desired. Click on **OK** to save the landmark and close the **Landmark Edit** window. Then click on **OK** to close the **Landmark List** window.
10. To continue, create a route that goes across the terminal. Click on the **Add Route** toolbar button to create the nodes and links needed for the route. Choose the type “Road” from the dialog. Click on the entry/exit point in the map that acts as the origin of the route. Click on the intermediate points along the route. Finally, pick the entry/exit point that serves as the destination of the route. When you have selected these points, press the **Enter** key to return to **Select** mode and complete the route. To edit the new route, double-click on it in the map.
11. After the **Road Route Edit** window opens, switch to the **Links** panel. To add or remove a link from the route, select it in the map. After adding or deleting links, click on the **Check & Sort** button to make sure the route is valid. Calculate the route’s length with the **Calculate** button. Change the name of the route if desired. Click on **OK** to save the route and close the **Route Edit** window.
12. Save the data to Oracle by selecting the **File:Save** option. When the **Save** window opens, click on the **Save As** button to open the **Save As** window. Click on **OK** to save the data after entering a different ID or name if desired.
13. If you have problems saving the data to Oracle, check the parameters in the **Set Database** window and make sure that you are connected to the network. To save the data to a flat file rather than to the database, use the **File:Export** to Directory option. When the **Export to Directory** window opens, enter the name of the new output directory and click on **OK**.

Now you have created a simple facility model. To create a realistic model, you must define a complete network of both road and rail routes with multiple landmarks and resources. However, the process is similar to the one outlined above.

-
- adding
 - landmark, 21
 - multiple nodes, 15
 - node, 15
 - resource, 28
 - route, 17, 20
 - autofill, 19
 - background, 9
 - browser, 31
 - centroid node, 15
 - checking a data set, 5
 - copying a route, 20
 - creating a data set, 4
 - data set
 - checking, 5
 - creating, 4
 - deleting, 7
 - exporting, 7
 - importing, 7
 - opening, 5
 - properties, 7
 - saving, 5
 - setting database, 4
 - transportation model, 4
 - database, 4
 - deleting
 - multiple objects, 29
 - node, 15
 - deleting a data set, 7
 - edit window, 13
 - editing an object, 14
 - entry/exit point, 17, 23
 - exporting a map, 8
 - exporting data, 7
 - finding an object, 14
 - help, 31
 - identifying an object, 14
 - importing data, 7
 - landmark, 20
 - adding, 21
 - adding an area, 24
 - area, 24
 - attributes, 25
 - centroid, 23
 - colors, 21
 - entry/exit point, 23
 - labels, 21
 - size, 24
 - spurs, 27
 - link, 15
 - adding, 16
 - editing, 16
 - segment, 16
 - list window, 13
 - loading a data set. *See* opening a data set
 - locating an object, 14
 - location node, 15
 - main window, 2
 - menus, 3
 - moving a node, 15
 - new data set, 4
 - node, 14
 - adding, 15
 - centroid, 15
 - deleting, 15
 - location, 15
 - moving, 15
 - opening a data set, 5
 - overlays, 9
 - panning, 13
 - printing a map, 8
 - properties of a data set, 7, 10
 - resource, 28
 - adding, 28
 - attributes, 29
 - label, 28
 - location, 29
 - route, 17
 - adding, 17
 - autofill, 19
 - checking, 20
 - copying, 20
 - distance, 20
 - entry/exit point, 17
 - segments, 17
 - sorting segments, 20
 - spur attributes, 19

RULST

- definition, 1
- design, 1
- menus, 3
- purpose, 1
- system requirements, 1

saving a data set, 5

- system requirements, 1
- thumbnail view, 9
- transportation model, 4
- tutorial, 32
- yard type, 27
- zooming, 12