# Decision Support Toolbox (DSTB) User Manual

**DSTB Release 1.0**

**This document does not contain any CLASSIFIED information. Individual paragraph markings are not required.**

**February 2000**

**Prepared for:**
**Marine Corps Tactical Systems Support Activity (MCTSSA)**

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DSTB User Manual, Version 1.0

## 7.1. Purpose.

This manual describes how to use the Decision Support Toolbox (DSTB). DSTB is designed to allow the user to perform basic terrain visualization and terrain analysis functions within C2PC. In version 1.0, DSTB allows the user to perform these functions when appropriate Digital Terrain Elevation Data (DTED) datasets are available either within a C2PC database, or on a CDROM produced by the National Imagery and Mapping Agency (NIMA). The next release of DSTB will include the capability to perform analyses using Vector Interim Terrain Data (VITD) data sets, which provide more detail than DTED.

## 7.2. Overview

The DSTB tool allows you to import, manipulate, and analyze terrain data in order to gain better understanding of the effects of terrain on operations. By performing analysis of DTED data, DSTB assists the user in performing terrain categorization, finding high-speed mobility corridors for tactical movement, identifying fast cross-country travel routes, and determining travel times for routes. DSTB is designed to be installed on an Intel/Ops workstation running the Microsoft Windows NT operating system and Command and Control PC (C2PC).

The objective of DSTB is to support you in performing the terrain analysis functions associated with Intelligence Preparation of the Battlefield (IPB). The key tasks are development of cross-country mobility analyses and development of mobility corridors. This assists the user in identifying enemy avenues of approach.

The Intel/Ops workstation is first loaded with DTED data, or a CDROM containing DTED data is inserted. The DTED data should cover the appropriate area of operations. During planning and execution of an operation, DSTB can then be used to obtain various analyses of the data. DSTB uses the raw DTED data, as supplied from the National Imagery and Mapping Agency. If you are storing DTED data on the Intel/Ops workstation hard drive, it will require approximately 650 Mb of storage space.

Version 1.0 of DSTB performs the following major functions, which are broken into three types of analysis- linear, area, and point:

- Linear Analysis
  - Find the fastest path between two points, and provide distance and time to traverse

- Area Analysis
  - Categorize and show terrain within an area as Unrestricted, Restricted, and Severely Restricted,
  - Determine mobility corridors within an area, and display according to the tactical echelon which the corridor will support,
  - Show an elevation relief map of the terrain within an area.

- Point Analysis
  - Show the elevation of any point of terrain under the mouse cursor,
  - Show the optical or weapons line of sight from a designated point,
  - Show all areas which can be reached in a given time from a designated point.

In order to perform the line, area, or point analysis functions, the user must input or select a number of setup criteria for the analysis. The criteria may be changed at any time, and the analysis may be redone in order to gain different perspectives on mobility through terrain. You may have any or all of the different types of analyses results on the map display at the same time. The following sections describe the DSTB tool, how to use the various functions, and also provide examples of various terrain analysis functions which you can perform.

## 7.3. Launching the DSTB Tool.

Before any terrain analysis functions can be performed in DSTB, you must first launch the tool. First, start the C2PC Client. Once C2PC is running, select the "**Tools**" choice from the top menu bar of C2PC. Under this selection, choose the "**Decision Support**" choice. This will launch the DSTB application. After the application is launched, you will see the DSTB Injector at the left of the C2PC display, and a set of tool buttons on the top of the map display. Figure 7-1 shows the initial display.

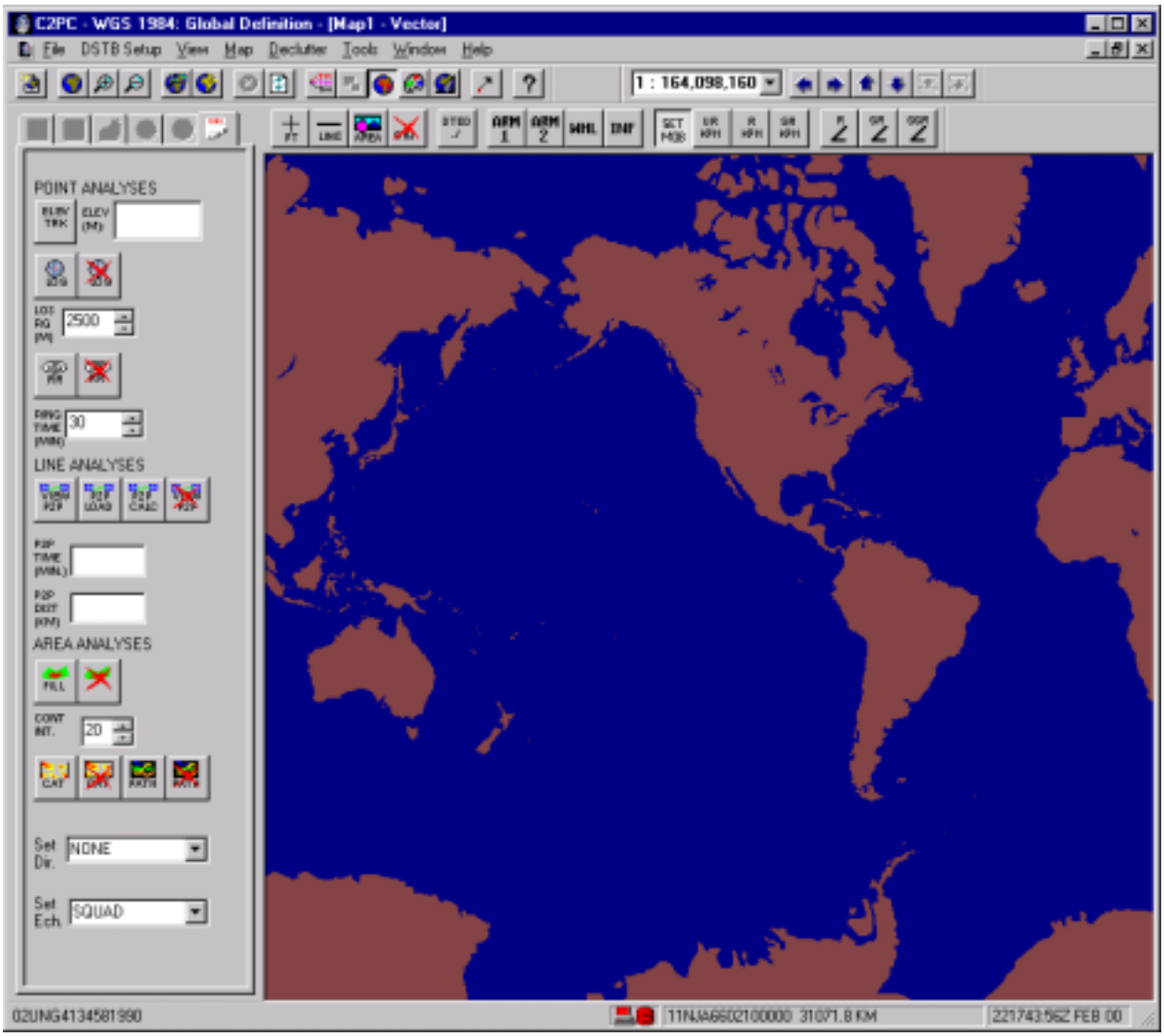


Figure 1. DSTB Initial Display

## 7.4. Setup the DSTB Tool to Perform Terrain Analysis

### *7.4.1 Data Paths and Data Use in Calculations.*

The first thing the user must do is tell the system where the raw terrain data is located. This is called "setting the data path." Normally, DTED data will be located on a CDROM inserted into the machine. In some cases, you may have copied the contents of the CDROM to a directory on the hard drive of the machine. In either case, you must set the path to the data. To do this, click on the toolbar button labeled "**DTED**." This is shown in figure 7-2.


Figure 7-2. Toolbar Buttos for Setting DTED Data Path.

Clicking the button will display a window in which you may enter the data path. This is shown in figure 7-3. In the figure, the DTED data is on a CDROM, and the path shows the drive letter of the CDROM followed by the letters cdrom. It is important that you follow the drive letter with a colon and backslash, i.e., e:\cdrom. If the data were placed in a "dted" directory on the hard drive, an example path might be c:\h\c2pccl\data\dted.

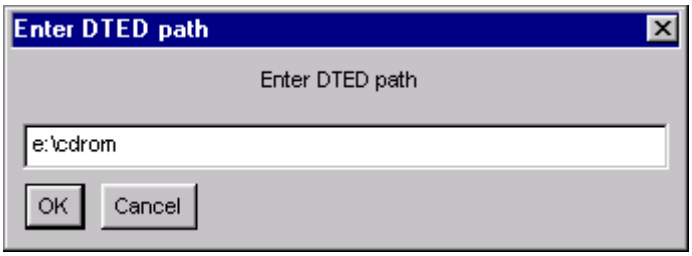


Figure 7-3. Setting the System Search Path for DTED Data.

When you are finished setting the data path, click on **OK** to close the window. The system will then search for the terrain data on the path specified. The **CANCEL** button will close the window without setting the search path.

### *7.4.2 Saving and Loading User Defined Terrain Data. (Reserved for Future Use)*

### *7.4.3 Specify Vehicle or Foot Mobility Characteristics to be Used.*

In DSTB, four terrain categorizations are used. These are: Unrestricted, Restricted, Severely Restricted, and Super Severely Restricted. These terrain categorizations refer to the effect that terrain has on mobility. Unrestricted terrain does not restrict mobility. Restricted terrain has a moderate slowing effect on mobility. Severely restricted terrain severely hampers mobility. Super Severely Restricted terrain is nearly impossible to traverse.


Figure 7-4. Buttons for Specifying Movement Rates Through Terrain Types.

The buttons shown in figure 7-4 are used to specify various movement rates for different terrain categorizations. This can be done in two ways. First, the user may select a mobility family type, as in **ARM 1**, **ARM 2**; or **WHL**; or **INF**. Only one of these four selections may made for any particular analysis. **ARM 1** denotes later armored vehicles with high mobility in terrain, for example, the M1A1 or T-80 tanks and M2A2 Bradley and BMP-3 infantry fighing vehicle. **ARM 2** denotes older armored vehicles, with less mobility than modern armored vehicles. Examples would be the M60A3 tank, T-62 tank, M113 APC and BMP-1. **WHL** denotes wheeled combat vehicles such as the LAV or BTR-70. **INF** denotes dismounted infantry. Picking one of these selections will automatically assign default movement rates for each of the terrain category types of Unrestricted, Restricted, and Severely Restricted. If none of the selections are made, the system defaults to ARM 2. If you select one of the buttons, it will remain depressed until you choose another mobility family, or choose to set the mobility characteristics yourself, using the **SET MOB** button. Default movement rates for each mobility family are shown in table 1.

Table 1. Default Mobility Rates Through Terrain Categorization Types.

| Mobility Family | Vehicle Examples | Unrestricted (UR) | Restricted (R) | Severely Restricted (SR) |
|---|---|---|---|---|
| ARM 1 | M1A1 or T-80 | 40 kph | 24 kph | 1 kph |
| ARM 2 | M60A3 or T-62 | 24 kph | 16 kph | 1 kph |
| WHL | LAV or BTR-70 | 30 | 15 | 1 |
| LT INF | N/A | 4 kph | 2.4 kph | 1 kph |

You may desire to manually set the mobility rates through the various terrain types. This would be done if you had specific knowledge of certain mobility characteristics, or if you wanted to try several different mobility combinations in an analysis. Currently this can only be done for the UR, S, and SR types of terrain categorization. To do this, you must first click on the **SET MOB** button. This deactivates the mobility family buttons, and activates the **UR KPH**, **R KPH**, and **SR KPH** buttons. Next, you can click on any of the **UR KPH**, **R KPH**, or **SR KPH** buttons shown in figure 7-4. This will display a small text entry window where you can enter the desired rate of speed through the terrain. Clicking on **OK** will apply the new setting and close the window. Clicking on **CANCEL** will close the window without applying the new speed setting.

Once you have selected a mobility family, or applied custom settings, these mobility rate settings are used in all analyses where vehicle transit times are considered. At present, they are used in the "Range Ring" point analysis, and in the calculation of the fastest path between two points.

**Key Term: Range Ring**
A range ring is an irregularly shaped outline on the map, which shows the maximum distance that a vehicle or light infantry soldier could travel from a given point in a given time, taking into account the estimated rates of movement through Unrestricted, Restricted, or Severely Restricted Terrain.

### *7.4.4. Specify Terrain Slope Settings*

In order to use DTED data to analyze terrain mobility, the slope of the terrain must be used. In general, the steeper the slope, the more difficult the terrain is to traverse, and hence the slower the speed of transit, whether vehicle or foot soldier. Slope can be set for all of the different terrain categorizations. Normally, the system defaults to predefined slope settings for each terrain categorization. The system defaults are:

- Unrestricted Terrain (UR) or GO Terrain: <15 degrees
- Restricted Terrain (R) or SLOW GO Terrain: 15 degrees
- Severely Restricted Terrain (SR) or NO GO Terrain: 30 degrees
- Nearly Impossible Terrain (SSR): > 45 degrees

Note that slopes are expressed in angles rather than percent slope, as is sometimes used. If we use the default value for Restricted Terrain, a value of 15 degrees means that any slope between 15 and 29.99 degrees will result in terrain being categorized as Restricted Terrain. To change these settings, click on the appropriate **R**, **SR**, or **SSR** button as shown in figure 7-5.


Figure 7-5. Buttons for Changing Slope Calculations in Terrain Categorization.

This will produce a text entry window in which you may then type in the desired slope setting as shown in figure 7-6. Clicking on the **OK** button will apply the new slope setting and close the window. Clicking the **CANCEL** button will close the window without applying the new setting. A similar window is shown for each selection.

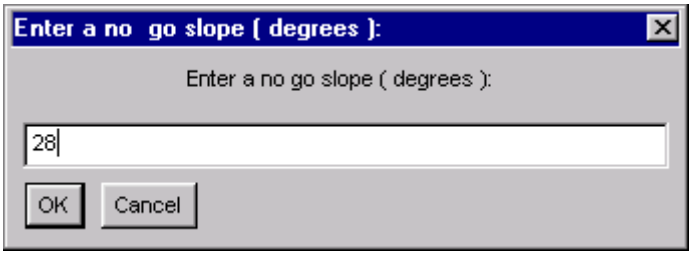


Figure 7-6. Setting a New Slope for Severely Restricted (or NO GO) Terrain.

## 7.5. Performing Terrain Analysis with DSTB

DSTB can perform terrain and mobility analysis functions using line objects, point objects, and area objects. Point objects are used to perform range ring and Line of Sight (LOS) operations. Area objects are used to analyze rectangular-shaped areas for such characteristics as terrain categorization (UR, R, SR); for calculation and display of mobility corridors; and for display of elevation contours. Line objects are used as base objects for calculation and display of fastest path between two points.

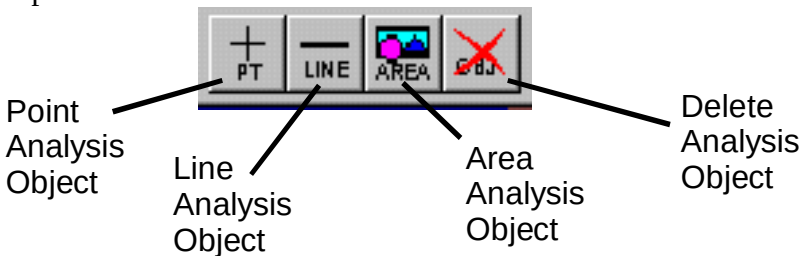


Figure 7-7. DSTB Toolbar Buttons for Placing Objects on C2PC Map Display.

The first step performing an analysis is to place one of these objects on the C2PC map display using the **POINT**, **LINE**, or **AREA** buttons on the DSTB toolbar (figure 7-7). To place the Analysis Objects, the user simply clicks on the appropriate button in figure 7-7, and then places the mouse cursor at the desired location on the C2PC map display and clicks on the map. This will drop the object on the map. A point object will appear as a large dot; an area object will appear as a rectangle; and a line object will appear as a line. Initially, the object will be red in color. This indicates the object is currently selected. An example of each of the three types of analysis objects is shown in figure 7-8. In the figure, the point object is selected, while the line and area objects are not selected. A terrain categorization has been performed in the area object.

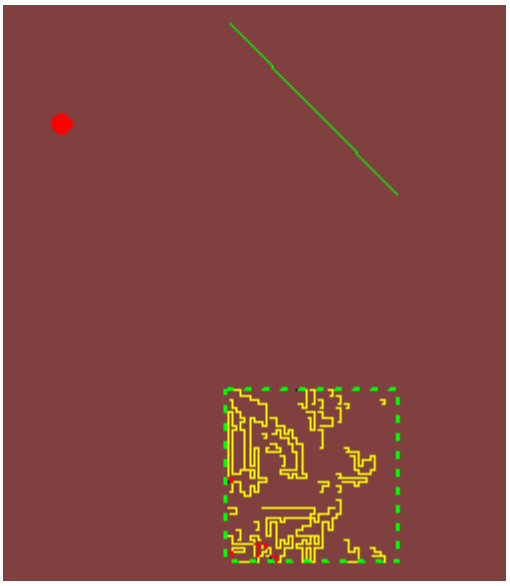

Figure 7-8. Examples of Point, Area, and Line Objects.

Next you will use one of the analysis functions on the DSTB injector (left side of map display) to perform the analysis. When the analysis is finished, the results will appear on the map display. After you are finished looking at the analysis, you can delete the analysis by clicking on the appropriate delete button for the analysis. For each type of analysis, such as Line of Sight, there is a corresponding delete button. The delete button will be similar to the analysis button, but will have a large red "X" across the button. Deleting the analysis does not delete the object which you placed on the screen in order to perform the analysis. This remains on the screen until you delete the object. The purpose of having separate delete functions for analysis results and analysis objects is to allow you to perform multiple analyses using the same object. To delete the analysis object (line, point, or area), you must select the object by clicking on it and then use the object delete button on the top DSTB toolbar. If you still have analyses associated with the object showing on the screen, these analyses will be deleted along with the object.

### *7.5.1. Point Analyses.*

By placing a point analysis object on the C2PC map display, you can perform two types of analysis: Range Rings and Line of Sight. The Range Ring analysis shows how far a unit can move from a certain point within a given amount of time. Based on the type of mobility selected (**ARM 1**, **ARM 2**, **WHL**, or **INF**) the distance will vary. The nature of the terrain will also determine how far the unit can go in a given time. This is because a unit will travel slower through Severely Restricted terrain than through Restricted or Unrestricted terrain. Figure 7-9 shows an example of a range ring analysis where a 30-minute range ring was performed for an ARM 2 type unit.

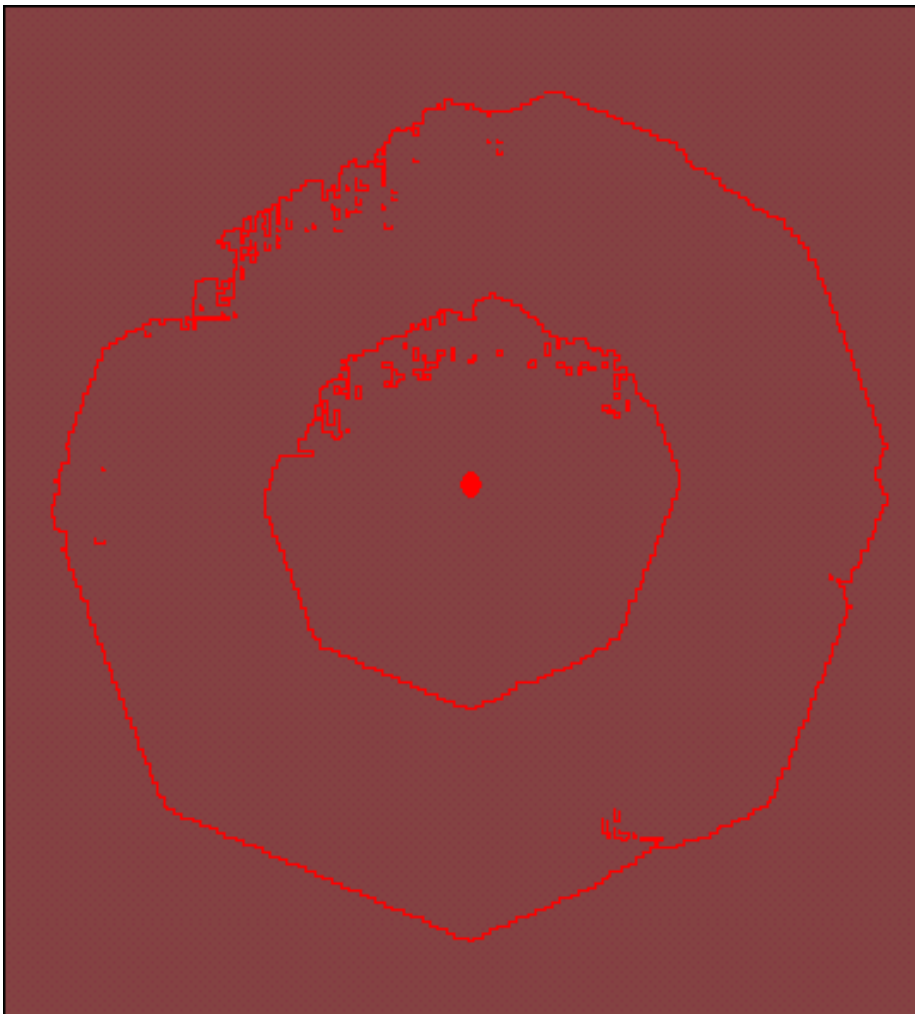

Figure 7-9. 30-Minute Range Ring for an Armor/Mech Unit.

In the figure, note that there are two major rings surrounding the central point of the analysis. Each of these rings represents 15 minutes of travel time. From the point object to the first major ring is 15 minutes of travel time. From the first ring to the second ring is another 15 minutes of travel time. Within the rings, there may also be small dots or rings. These represent areas of difficult terrain, where it would take the unit 15 minutes to reach. In the figure, the top left portion of the rings appear to be distorted. This is caused by terrain effects on mobility.

The second type of analysis performed with a point analysis object is Line of Sight. In this analysis, the point object is placed on the C2PC map display, and an optical or direct fire line of sight is calculated. You can specify nearly any distance for the line of sight to be calculated. Figure 7-10 shows an example of a line of sight calculation, where the line of sight distance was specified at 3700 meters, which is the maximum effective range of a TOW missile. Areas which can be seen from the point analysis object are shown in blue. The other areas are not visible from the point.

Figure 7-10. Line of Sight for a TOW Missile (3700 meters)

Finally, although not technically an analysis, an elevation tracking function is included in the point analysis portion of the DSTB tool. This is a simple On/Off toggle button, which when turned on, displays the elevation in meters of any point under the mouse cursor. As you move the cursor across the C2PC map display, the elevation readout will change, showing the elevation at each point you move the cursor to.

The Point Analysis functions are located on the top portion of the DSTB injector. This portion of the injector is shown in figure 7-11.

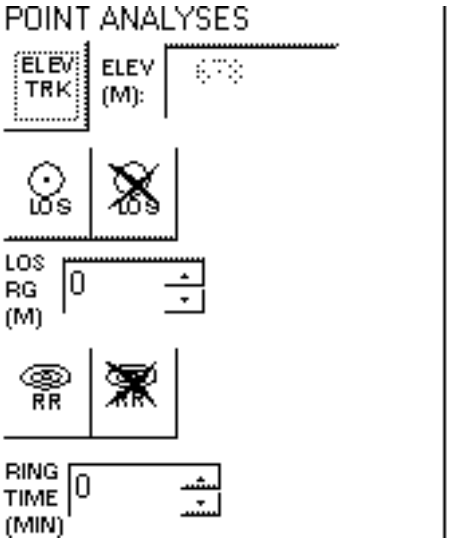


Figure 7-11. DSTB Injector Point Analysis Functions.

The following sections discuss in detail how to perform the Range Ring, Line of Sight, and elevation tracking functions within DSTB.

### 7.5.1.1. Perform a Range Ring Analysis.

To perform the analysis, first ensure that you have selected a mobility type (**ARM 1**, **ARM 2**, **WHL**, or **INF**), or that you have specified **U**, **R**, and **SR** rates in the mobility characteristics setup. You must also ensure that you have set the path to your DTED data, and have specified

slope angles as described in section 7.3.4. Only set the angles if you do not want to use the default settings.

**NOTE:** If you specify rates for UR, R, and SR terrain, do not click on the mobility type buttons. Clicking the **ARM 1**, **ARM 2**, **WHL**, or **INF** buttons will override the specified rates and apply the default rates for these mobility types.

Next, click on the point analysis object button on the top DSTB toolbar, move the cursor to the desired location on the map, and click on the map. A small green dot will appear on the map at the specified location. Click on the dot to select it as the object to be analyzed. The dot will change to a red color, indicating that it is selected.

The next step is to specify a travel time from the point. By doing this, you are telling the system that you want it to calculate how far the type of unit can travel from the point in that amount of time. This is done by clicking in the entry box for **RING TIME (MIN),** as shown in figure 7-12. Double click on the number in the entry field (30 in the figure) and highlight the number. Then enter the number of minutes to be calculated for the range ring time. You can also use the up and down arrows at the right of the entry field to increment the time in 15 minute intervals.

**NOTE:** It is recommended that you enter **RING TIME** entries in multiples of 15 minutes. This ensures regularity in the range ring appearance.

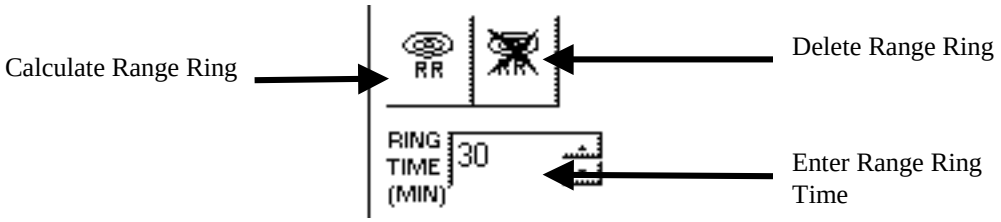


Figure 7-12. Range Ring Time Entry and Calculation Interface.

After entering the ring time, click the button labeled **RR** to begin the range ring calculation. When the calculation is complete, the range rings will appear on the map display, centered around the analysis point, as shown in figure 7-9. To delete the range ring analysis, click on the **DELETE RANGE RING** button. If you perform a new analysis using the same point, it will automatically overwrite and delete the previous analysis.

### 7.5.1.2. Perform a Line of Sight Analysis.

To perform the analysis, you must first ensure that you have set the path to your DTED as described in section 7.3.1. Line of Sight does not require that the other SETUP items be performed.

Next, click on the point analysis object button on the top DSTB toolbar, move the cursor to the desired location on the map, and click on the map. A small green dot will appear on the map at the specified location. Click on the dot to select it as the object to be analyzed. The dot will change to a red color, indicating that it is selected.

The next step is to specify a distance or range from the point object for which the Line of Sight analysis is to be performed. This is done by clicking in the entry box for **LOS RG (M)**, as shown in figure 7-13. **LOS RG (M)** means Line of Sight Range in Meters. Double click on the number in the entry field and highlight the number. On the first use of this function, there will be a "0" in the entry field. Highlight the "0" and then replace the number by typing the desired range in meters for the line of sight range. This should be entered in 100 meter increments. . You can also use the up and down arrows at the right of the entry field to increment the range in the field by 100 meter intervals up to 25,000 meters.

**NOTE:** It is recommended that you enter **LOS RG (M)** entries in multiples of 100 meters. Most DTED data currently available cannot provide any greater accuracy than 100 meters. Entering ranges in other than 100 meter increments will make calculation times much longer.

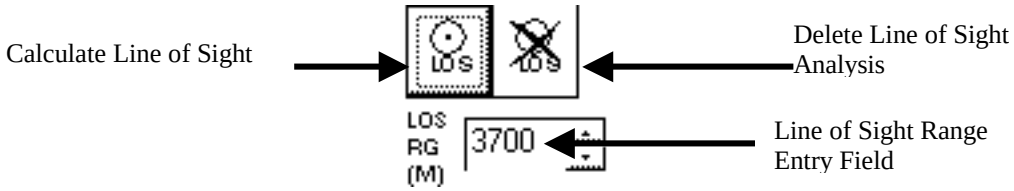


Figure 7-13. Line of Sight Entry and Calculation Interface.

After entering the LOS Range, you then click the **LOS** button to calculate the line of sight. Depending on the LOS range, this calculation may take very little time, up to about half a second. While the calculation is taking place, the LOS button will remain depressed. It will return to it's up position upon the completion of the calculation. When the calculation is completed, a line of sight overlay will be shown on the C2PC map display, centered on the point analysis object. Areas which can be seen from the point will be shown in blue. All other areas are not visible. An example of a line of sight overlay was shown in figure 7-10. When you are finished with the line of sight overlay, click the Delete LOS button to delete the overlay.

### 7.5.1.3. Elevation Tracking

Elevation tracking is activated by clicking the "**ELEV TRK**" button on the DSTB injector panel. When the button is clicked, it will remain depressed until you click it again. After activating elevation tracking, it may take a second or two for the tracking to begin, as DTED data must be loaded into memory. After tracking begins, the elevation of the point under the mouse cursor will be shown in the **ELEV (M)** readout box to the right of the **ELEV TRK** button.


Figure 7-14. Elevation Tracking Interface. Elevation tracking is ON in the left figure, and OFF in the right figure.

### *7.5.2. Line Analyses.*

By placing a line on the C2PC map display, you can perform a calculation of the fastest path from one given point to another. To perform this calculation, you must first ensure that the mobility types have been set, that the DTED path has been specified, and that any desired modifications to slope parameters have been performed. Next, you must click the **LINE OBJECT** button on the DSTB toolbar, and then draw a line on the map from the proposed starting point of the route or path to the proposed end point. When you are finished, the line will appear on the display as a green line between the route starting point and the route ending point, as shown in figure 7-15.

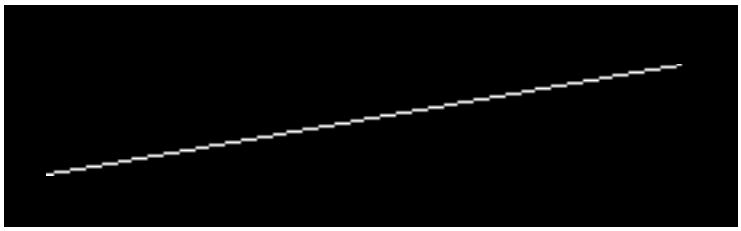

Figure 7-15. Line Object Placed on C2PC Map Display, With Left End at Route Start Point and Right End at Route End Point.

Click on the line to select it, and it will turn red, as shown in figure 7-16. At this point, you will be ready to perform a fastest path or line analysis.

Figure 7-16. Line Object Selected and Ready for Analysis.

To display the fastest route between two points, you will use the line analysis functions on the DSTB injector (figure 7-17). First click the **VIEW P2P** button. This button causes the analysis to be shown on the map display. The button will remain depressed after it is clicked, signifying that the view is on. If you do not click this button, the analysis will be performed, but the result will not be shown on the map display. Only the resultant route length and time to traverse the route will be shown in the **P2P TIME (MIN)** and **P2P DIST (KM)** windows on the injector.

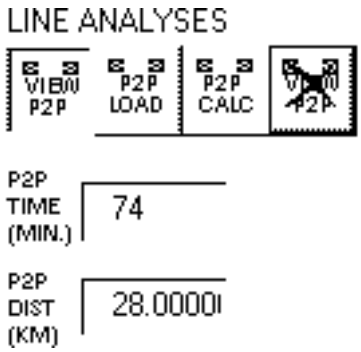


Figure 7-17. DSTB Injector Line Analysis Functions.

Next, click on the **P2P LOAD** button to display a text entry window (figure 7-18). This will allow you to specify a "load" or percent of maximum safe speed through terrain. For example, a load of 80% would reduce the maximum cross country speed of ARM/MECH type vehicles through unrestricted terrain by 20%, from 24 kph to 19.2 kph. Clicking on **OK** in this text window will apply the load factor to the fastest path calculation and dismiss the window. Clicking **CANCEL** will dismiss the window without applying the load factor.

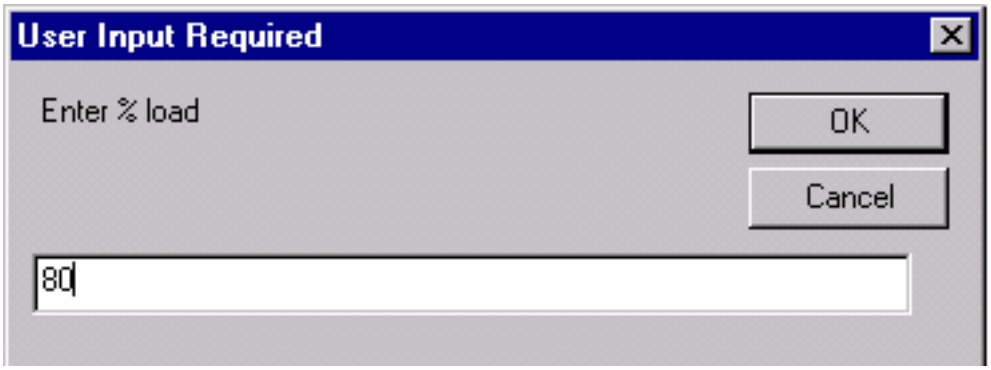


Figure 7-18. Applying Vehicle Loading to the Fastest Path Calculation.

Next, you should click the **P2P CALC** button. This will start the calculation. When the calculation is finished, the calculated fastest path will be displayed alongside the line analysis object. Figure 7-19 shows an example of a fastest path displayed on the C2PC map. The time to transit the fastest path will be shown in the **P2P TIME** display window, and the distance along the fastest path will be shown in the P2P DIST display window. As shown in figure 7-17, the time for this path was 74 minutes, and the distance to be traveled on the fastest path was 28 km. The fastest route is destroyed by clicking on the **DELETE VIEW P2P** button.

Figure 7-19. Graphical Result of a Line Analysis.

**NOTE:** You can perform any number of analyses along the line object, using different mobility characteristics such as ARM 1, ARM 2, WHL, or INF. You can also specify rates of movement through UR, R, and SR terrain. If you fail to specify a mobility characteristic, the system defaults to ARM 2 mobility. You may notice a difference in the displayed path between INF calculations, and for ARM 1, ARM 2, and WHL. This is because the calculation may find it faster to traverse some R, or even SR terrain, than to bypass it.

### *7.5.3. Area Analyses.*

Area analyses allow you to perform terrain categorization of a box-shaped area on the C2PC, identify mobility corridors within the terrain categorization, and display an elevation contour

map of the area within the box. You will perform all area analyses using the Area Analyses portion of the DSTB injector, which is shown in figure 7-20.

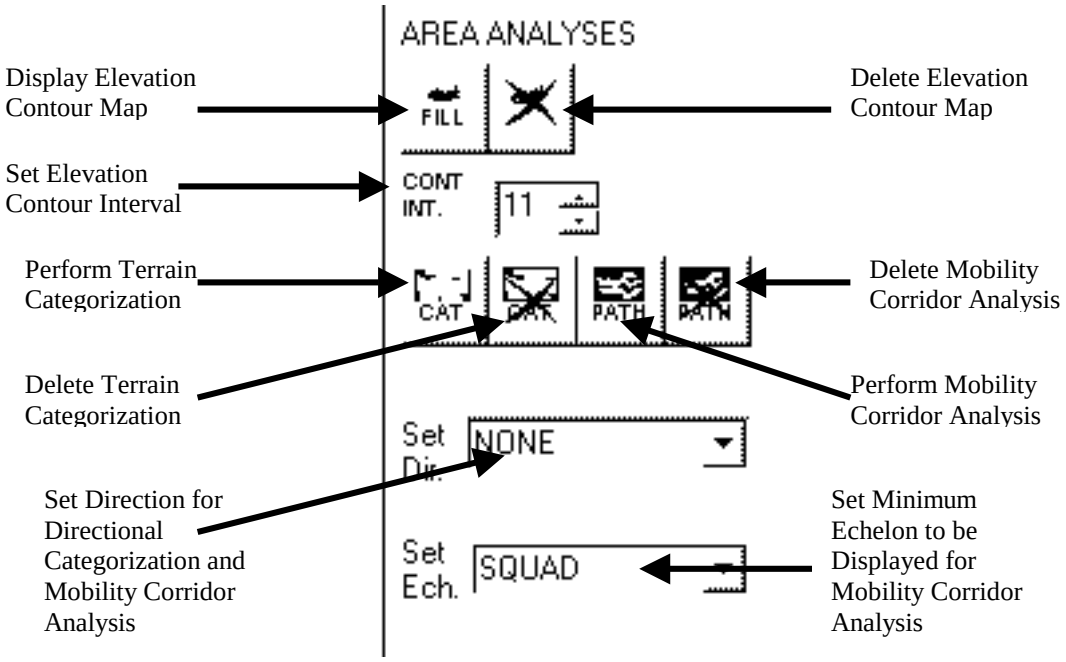


Figure 7-20. Area Analysis Portion of DSTB Injector.

Terrain categorization is shown in terms of Unrestricted (U), Restricted (R), and Severely Restricted (SR) terrain. These terms were discussed in section 7.3.3. The terrain categorization shows SR terrain as red cross-hatched areas, and R terrain as yellow cross-hatched areas.

Mobility corridors are normally defined as high speed paths through terrain features, where vehicles or foot infantry can move with minimum restrictions due to terrain features. Different echelons of units require different widths for mobility corridors. When DSTB calculates mobility corridors, it tracks the width of each corridor, and then displays the corridors using color-coding to identify the size unit or echelon which can use the corridor. This color-coding is explained in section 7.3.5.3.2.

An elevation contour map allows you to display a grayscale picture of elevation contour lines, with white indicating the higher elevations and black indicating lower elevations. You can vary the contour interval for the elevation bands in order to manipulate the picture.

Prior to using the area analysis functions, you should have set the mobility types on the DSTB toolbar, set the path to DTED data, and made any desired changes to the slope settings for R, SR, and SSR terrain categories.

The following sections discuss each of the analysis functions available under the Area Analysis portion of the DSTB injector.

### 7.5.3.1. Terrain Categorization.

To perform a terrain categorization, you will begin by placing an area analysis object on the C2PC map display. Click on the **AREA OBJECT** toolbar button, then move the mouse cursor to the center of the area you want to analyze. Click the mouse at that point, and while holding down the left mouse button, drag out a box which covers the desired area, as shown in figure 7-21. Release the left mouse button when the box covers the desired area, and the box will turn green. This indicates that the area has been placed on the map, but has not been selected.

Figure 7-21. Area Analysis Object Placed on Map Display.

At this point you are ready to perform terrain categorization. Click on the corner of the area object in order to select it. The area object will turn red, indicating that it is selected. Next, you must determine whether you want to perform a directional terrain categorization. In many cases, you may want to specify a particular direction in which a terrain analysis operation is to be performed. This is generally done when you are analyzing the terrain with respect to friendly or enemy movements, where general directions of movement are known or assumed. Set a direction using the **SET DIR** drop down selector on the DSTB injector. This allows you to choose one of eight cardinal directions or no direction, as shown in figure 7-22. The default setting for terrain categorization is non-directional or NONE.

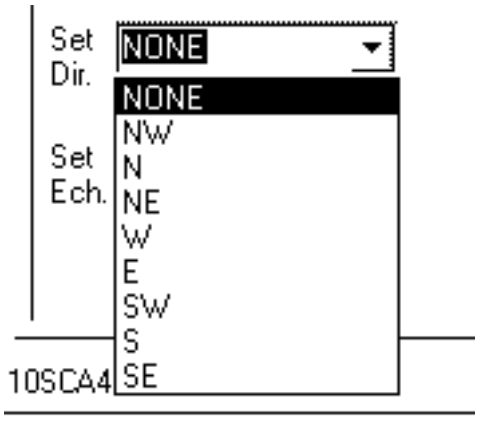


Figure 7-22. Setting Direction for Directional Terrain Categorization.

Next, you must click on the **CAT** button (figure 7-23) on the Area Analysis portion of the injector. This will begin the terrain categorization. Depending on the size of the area being analyzed, the categorization may take up to a minute to calculate.

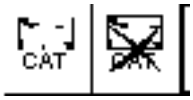


Figure 7-23. CAT and DELETE CAT Buttons.

When the calculation is finished, it will generate a terrain categorization overlay, in which yellow crosshatched squares signify Restricted (R) terrain, and red crosshatched squares signify Severely Restricted (SR) terrain. Figure 7-24 shows an example of terrain categorization in C2PC. To remove the terrain categorization from the map display, the user clicks the **DELETE CAT** button (figure 7-23), which is located to the right of the **CAT** button.

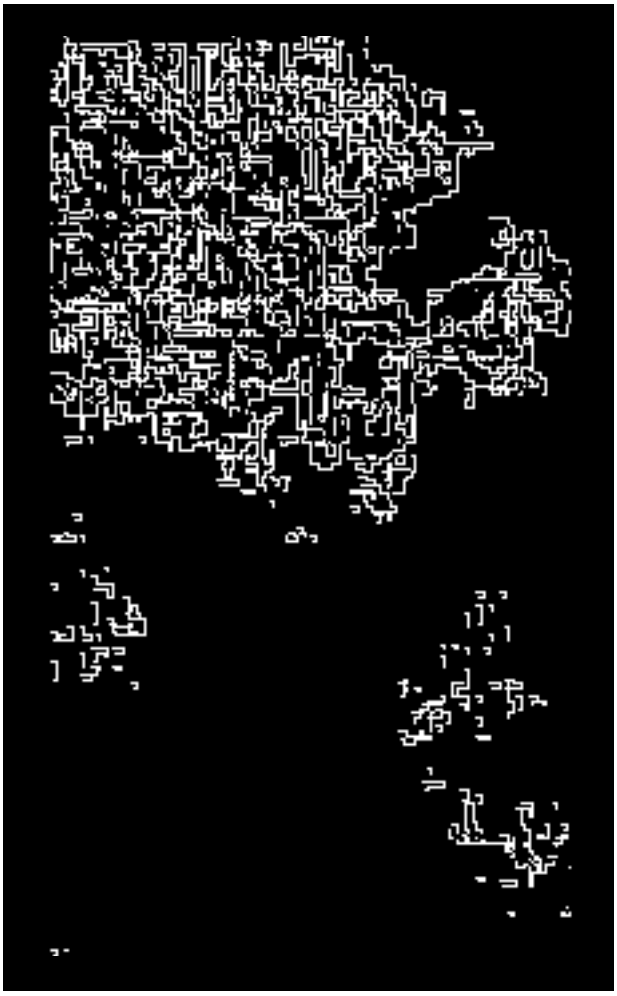

Figure 7-24. Example of Terrain Categorization.

### 7.5.3.2. Mobility Corridor Analysis

To begin a mobility corridor analysis, you will begin by placing an area analysis object on the map display, as discussed in section 7.3.5.3.1. You should have already performed any setup procedures for mobility characteristics, data paths, etc. Additionally, you may specify a

direction of transit of the area as discussed in section 7.3.5.3.1. Next, you may wish to limit the display of the mobility corridors to some tactical echelon. For example, if you are analyzing a division-sized area of operations, you may not want to see squad-sized mobility corridors. You would probably only be interested in battalion–sized and larger corridors.

To limit the size of the mobility corridors to be shown in the analysis, you can use the **SET ECH** drop down selector on the DSTB injector (figure 7-25). This allows you to choose an echelon between squad and division for mobility corridor size. After you select an echelon, the mobility corridor analysis will only show corridors for that echelon and larger echelons. For example, if you chose "COMPANY," the analysis would show company, battalion, regiment, and division-sized corridors. Squad and Platoon corridors would not be shown. If no selection is made for either echelon size or direction, the mobility corridor analysis will perform a non-directional analysis and show corridors for all echelons.

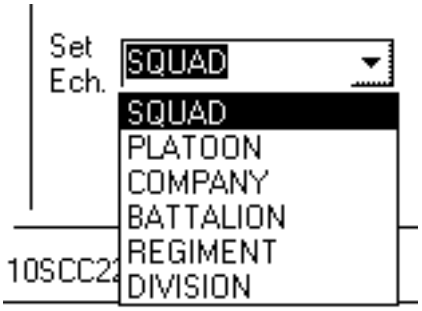


Figure 7-25. Setting Echelon Size for Mobility Corridors.

With the echelon set, you can then click on the **PATH** button shown in figure 7-26. This will generate a mobility corridor overlay, in which mobility corridors correspond to the color codes described in table 2.


Figure 7-26. PATH and DELETE PATH Buttons.

| Display Color | Echelon | Size in Meters |
|---|---|---|
| Blue | Squad | < 50 m |
| Yellow | Platoon | 50-250m |
| Green | Company | 251-500m |
| Orange | Battalion | 501-1500m |
| Black | Regiment/Division | >1500m |

Table 2. Default Mobility Corridor Widths for Tactical Echelons.

This mobility corridor analysis can be performed without first performing a terrain categorization, or may be performed after performing the categorization. If performed before the categorization process, the generation of the corridors will take slightly longer than the alternative option. Figure 7-27 shows an example of mobility corridors without having first performed a terrain categorization. No echelon was selected for this analysis in order to show the different color coding of the corridors according to the size force which can use the corridor.

To remove the mobility corridors from the map display, the user clicks the **DELETE PATH** button which is located to the right of the **PATH** button.

Figure 7-27. Mobility Corridor Analysis.

### 7.5.3.3. Display of Elevation Contour Map.

The last type of area analysis product which can be produced with DSTB is an elevation contour map. Figure 7-28 shows an example of an elevation contour map which was performed using two side-by-side area analysis objects.

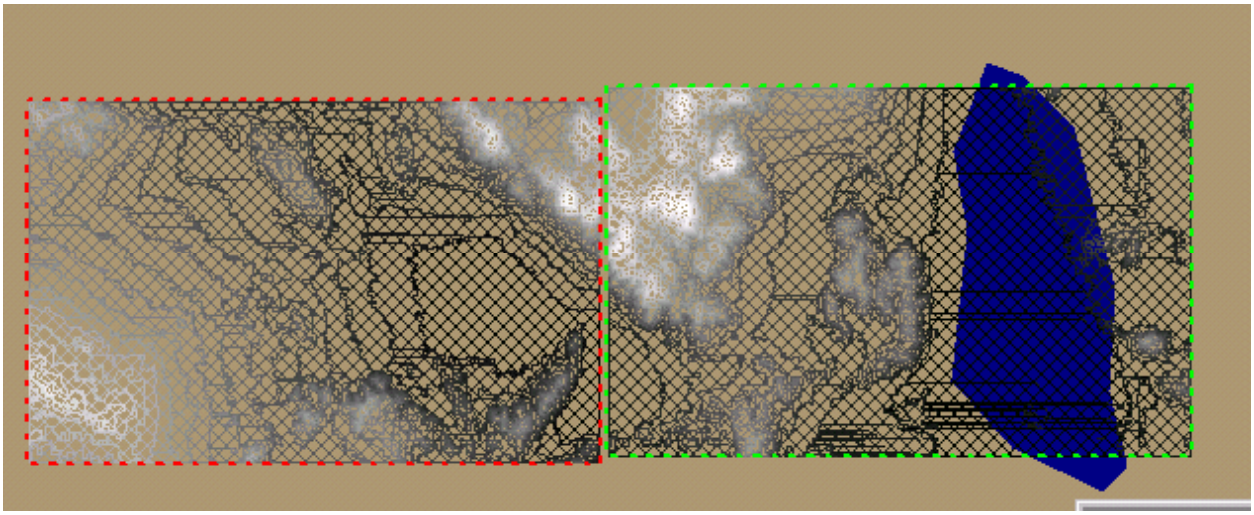

Figure 7-28. Elevation Contour Map.

The elevation contour map is displayed with white indicating high ground, black indicating low ground, and intermediate gray colors indicating contours, or elevation bands, between the high and low ground. There will also be small areas of red enclosed within the white areas, indicating the highest elevations within the area.

To display a contour map of an area, you must first have set the DTED data path, and must have placed an Area Analysis Object on the map display. Ensure that you have selected the Area

Analysis Object, i.e., that it is red in color. Next, select a contour interval to be displayed in the contour map. This is done by clicking on the number in the **CONT INT** selector window (figure 7-29), and either typing in a contour interval, or by using the **UP** and **DOWN** arrows to increase or decrease the interval in ten meter increments. Next, click the **FILL** button to display the elevation contour bands. The system may take several seconds to perform the computation depending on the size of the analysis object. The button will remain depressed during the calculation, and will return to its normal appearance upon completion of the calculation. The contour map is destroyed by clicking on the **DELETE CONTOURS** button which is to the right of the **FILL** button.

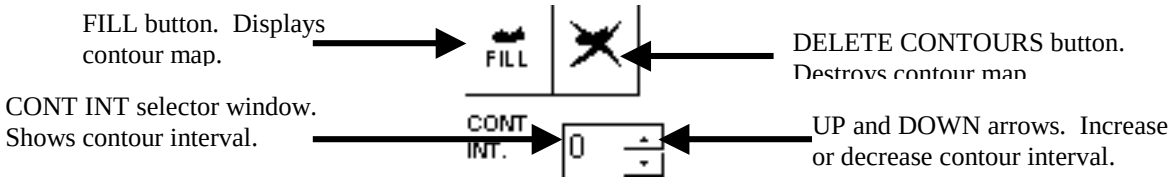


Figure 7-29. Elevation Contour Map Interface.

## 7.6. General System Hints.

1. When deleting or destroying an analysis, ensure that the point, area, or line analysis object is selected (red highlight) and then click on the appropriate delete button. Otherwise, the system will not know which analysis to delete.

2. If an analysis does not appear after the appropriate function button is clicked, check to see if the system busy cursor is shown in place of the mouse cursor. If it is active wait until the busy cursor turns off.

3. To delete an analysis object, click on the object to select it, then click on the delete analysis object button on the DSTB top toolbar. You cannot delete multiple objects.

4. When performing mobility corridor analysis, the computational process requires a lot of computer memory. It is recommended that you not attempt to analyze a greater area than approximately 30 km x 15 km at a time, or you may run out of computer memory.

5. If analyses produce no results, or if the elevation tracking readout shows –32000, you have probably not set the path to the DTED data correctly. The system default path to DTED data is E:\cdrom.

6. In this version of DSTB, only DTED data is used to perform analyses. You should view a map under the analyses, whenever possible, in order to ensure that the data makes sense. For example, using DTED data, a mobility corridor analysis may place a corridor through a body of water. Obviously this is wrong. If you see this, you should eliminate the corridor from consideration in your planning. The best rule is to use your common sense.

Appendix 1. Vehicle Types and Mobility Parameters.

This appendix is a partial listing of the types of vehicles which fit the ARM1, ARM 2, and WHL mobility parameters.

**ARM 1: Highly mobile armored vehicles**

M1, M1A1 Abrams
M2, M2A1, M2A2, M2A3 Bradley Fighting Vehicle
M3, M3A1, M3A2 Cavalry Fighting Vehicle
T-72, T-72M, and Chinese T-72 derivatives (Tank)
T-80 Tank
T-90 Tank
BMP-3 (Infantry Fighting Vehicle), and derivatives
Challenger (Tank)
Crusader howitzer

**ARM 2: Moderately mobile armored vehicles**

M60A3 tank
M113 Armored Personnel Carrier
M109-series howitzers
T-62 tank
T-54/55 tank
BMP-1, BMP-2, and Chinese derivatives
MTLB
T-34 Tank
M-47/M-48 tank
2S1, 2S3, 2S5, 2S7, 2S9 howitzers
LVTP/AAV-7

**WHL: Wheeled combat vehicles**

LAV
BTR-60, BTR-70, BTR-80, BTR-90
BRDM
HMMWV