



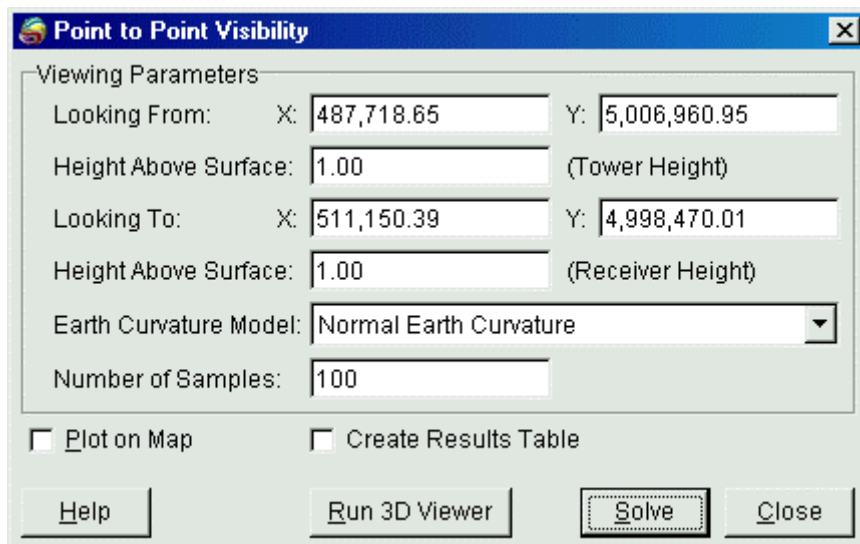
## Point-to-Point Visibility (Intervisibility)

Intervisibility and viewpoint analysis in *Vertical Mapper* make use of elevation grid files to determine visual exposure relationships within a map area. Intervisibility is defined as the ability to see in a direct line of sight from one position on the earth's surface to another, considering the intervening terrain.

The **Point-to-Point Visibility** function in *Vertical Mapper* allows the user to specify a line across an elevation grid file (digital elevation model) for the calculation of intervisibility. The calculation returns an answer that is both simple in response: “the two points ARE/ARE NOT intervisible”; and more complex: “this is the height that one of the two points would have to be raised to become visible”, or “this is the height that one of the two points could be lowered and be visible”. For an instructional lesson on *Point-to-Point Intervisibility* refer to Lesson 9 of the *Installation and Tutorials* manual

The *Point-to-Point Visibility* tool is designed either to select a line representing the line of sight path from a MapInfo Map window or to generate a line of sight path directly in the Map window.

- 1 From the *Vertical Mapper* ButtonPad, select the  tool. With the left mouse button held down, draw the line of sight path in the Map window of the open elevation grid file, where the line direction corresponds to the direction of sight, i.e. the “looking from” position is the start of the line. Once the line is drawn, the **Point-to-Point Visibility** dialogue box will automatically appear.
- Alternately, the user may select the *Point-to-Point Visibility* command directly from the  drop-down menu. This brings up the **Point-to-Point Visibility** dialogue box immediately followed by a dialogue prompting the user to select a line from the Map window.



The dialog box titled "Point to Point Visibility" contains the following fields and controls:

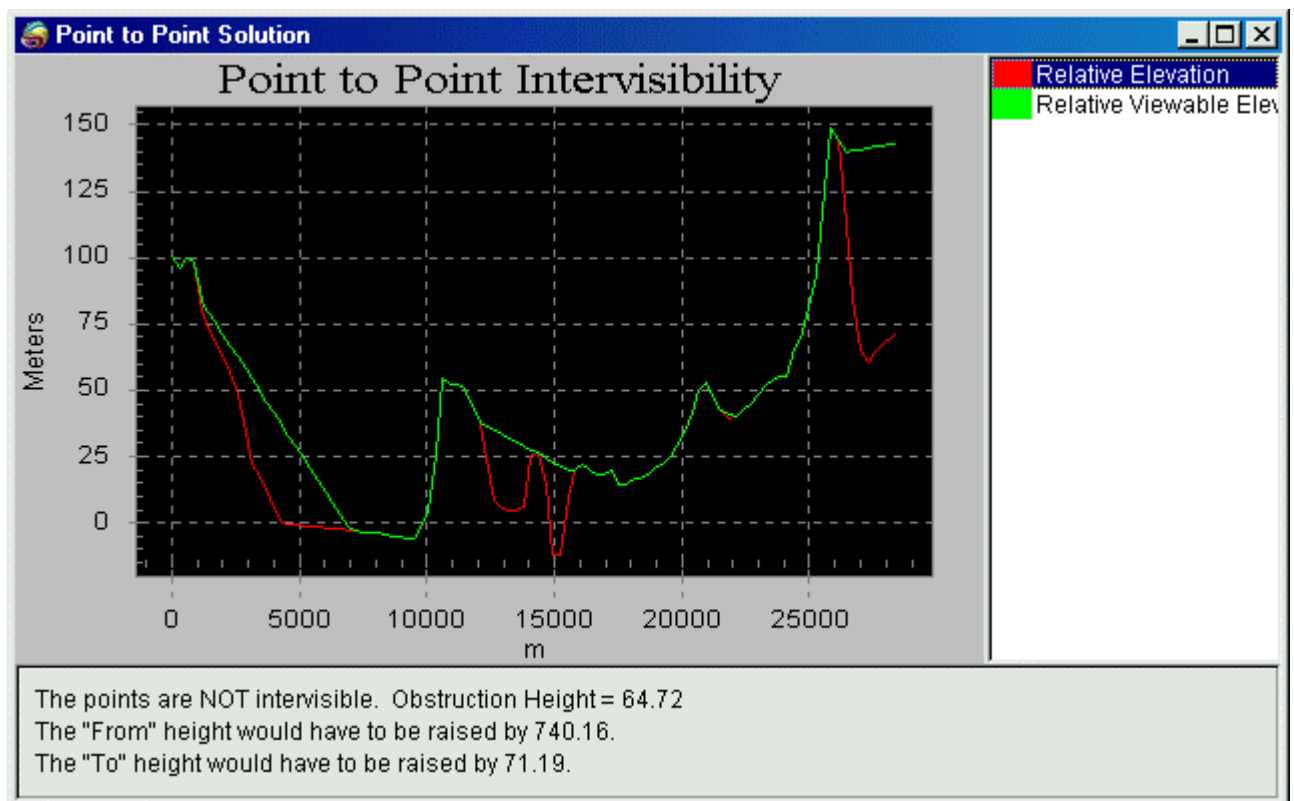
- Viewing Parameters:**
  - Looking From: X: 487,718.65, Y: 5,006,960.95
  - Height Above Surface: 1.00 (Tower Height)
  - Looking To: X: 511,150.39, Y: 4,998,470.01
  - Height Above Surface: 1.00 (Receiver Height)
  - Earth Curvature Model: Normal Earth Curvature (dropdown menu)
  - Number of Samples: 100
- Plot on Map
- Create Results Table
- Buttons: Help, Run 3D Viewer, Solve, Close

- 2 The **Viewing Parameters** section of the dialogue box offers settings that control the intervisibility calculation for each endpoint of the line.
  - 1 It is possible to enter an X and Y coordinate as well as an offset height above the surface at both the “**Looking From**” and the “**Looking To**” view point positions. This setting allows users to add a value to the “From” point that represents, for example, the height of a

transmission tower. Similarly, a height value may be added to the “To” site that represents, for example, the height of a receiver. A user trying to measure line of sight from a transmitting antenna to a receiving car antenna may wish to add a value of 120 metres to the “From” point to represent the height of the transmission tower. Adding 1.5 metres to the “To” point approximates the height of the car antenna above the surface of the ground.

- 2 An **Earth Curvature Model** can be selected from the drop-down list. Earth curvature must be taken into account for most line of sight calculations. **Normal Earth Curvature** is calculated using an oblate spheroid model. The **4/3 Earth Curvature** model allows radio frequency engineers to model the slight curvature of a radio wave as it travels over the earth’s surface due to diffraction effects. **No Earth Curvature** correction may also be selected.
- 3 The **Number of Samples** setting controls the number of points along the line of sight from which the intervisibility calculation is made and therefore the number of points that will be plotted in the line of sight graph. A value of **100** is considered appropriate for most calculations, however, the greater this value, the more detail is added to the graphed profile.

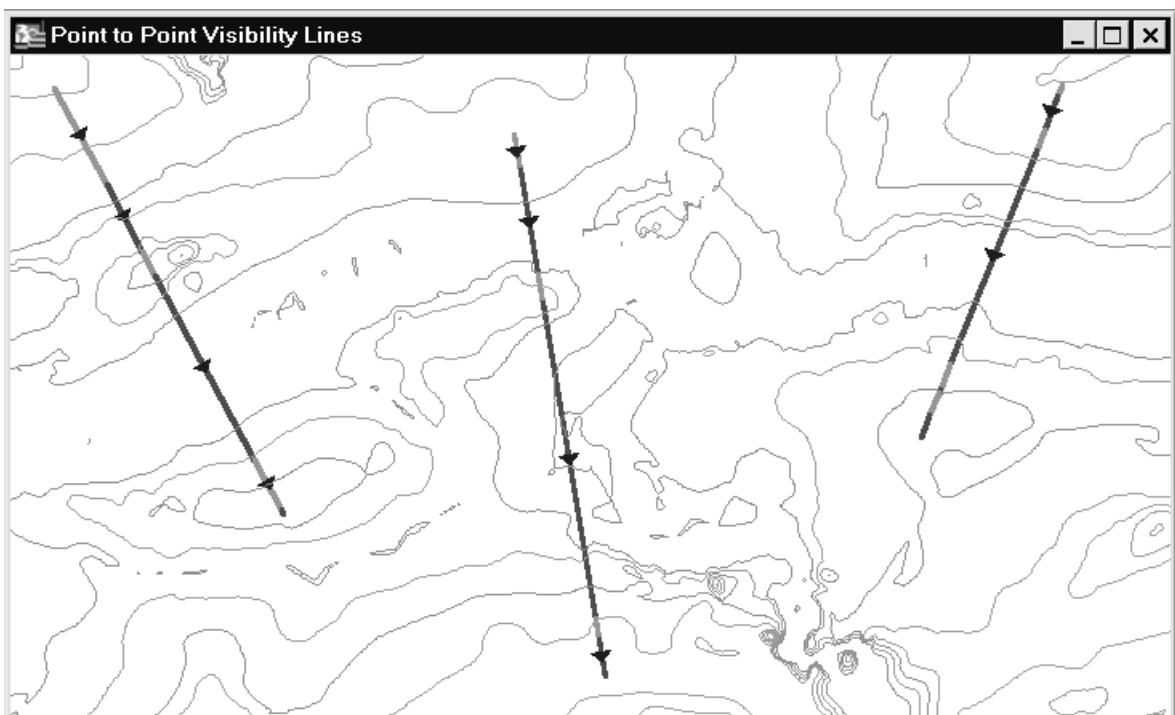
- Once the user is satisfied with the *Viewing Parameters*, selecting the **Solve** button will initiate the *Point-to-Point* calculation.



- 1 The **Point-to-Point Solution** dialogue box is a graphical representation of the line of sight calculation. Two lines of cross section are constructed in a *Vertical Mapper Graph Window* along the line of visibility.
  - 1.
  - 1 The Relative Elevation (red) represents the surface topography along the line of sight, while the

Relative Viewable Elevation (green) represents the line of visibility. Where the two lines are coincident, that section of topography is visible from the “From” point.

2. Immediately below the graph is a written description of the relationship between the “From” and “To” points of the line of sight path. If the two endpoints of the line **ARE** intervisible, the dialogue will report how the “From:” and “To” heights could be adjusted and still remain visible. If the line endpoints are **NOT** intervisible the dialogue will report the corrections necessary to produce intervisibility.
  3. Selecting the **Solve** button initiates a new calculation every time a different line of sight path is constructed using the *Point-to-Point* tool.
- Two other options are available in the *Point-to-Point Visibility* dialogue.
    1. Checking the **Create Results Table** box saves all of the graphed information to a MapInfo table, which can be viewed in a Browser window.
    2. Checking the **Plot On Map** box before selecting the **Solve** button will result in the construction of a line plot in the Map window. The line plot traces the extent of the line of sight and indicates, using colour, the intervals between the endpoints that are visible (green) and obstructed (red) relative to the direction of sight. Line plots are saved as individual MapInfo .TAB files using default file names (*subdirVMLineX.tab*). As subsequent lines are chosen and solved, new files are saved with incremental numbers in the file name.



**Note:** The *Point-to-Point Visibility* function is only appropriate for use on a grid file which has, as its Z-value, a unit of elevation (feet or metres). If the *Viewshed* command encounters a grid file where the unit type is not recognized as being a unit of elevation measurement, the following warning will occur and the user will be unable to proceed with the command.

