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Barriers, berms and embankments

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The object type 'Berm' in SoundPLAN is widely used to model an embankment of soil. However, it is important to realize that there is a difference between a berm and an embankment established from elevation lines or terrain points.

The berm has the same effect to the sound propagation as two absorbing barriers, one under each edge of the berm top, see Fig 1. But a berm is not (default, see below) included in a DGM calculation, nor is it recognized in the terrain profile from which the reflection plane is evaluated. This is the crucial difference compared to an embankment build from elevation lines/terrain points. To the noise propagation a berm is two screening barriers which in 3D Graphics is depicted as an embankment, whereas a real embankment created from elevation lines/terrain points becomes an integrated part of the DGM and thus affects the ground correction also.

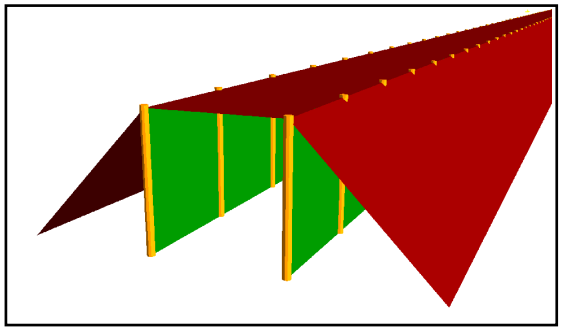

Fig 1 The berm has the same effect as two barriers

The berm is defined by one foot line ('base line'), the height, the slope and the top width. From these parameters the program calculates the two top lines (eventually only a single line if top width = 0) and the other foot line. The foot lines do not necessarily stay on top of the ground; that depends on how you created the base line. If the base line was digitized with a DGM loaded, the inserted points rest on top of the DGM, but the entire segment between points will not follow the DGM triangles (unless the terrain is totally flat which in general is not the case). As for the other foot line the points will be below or above the DGM (unless a cut perpendicular to the input direction is horizontal, in that case the points will rest on top of the DGM). The longer berm segments, the bigger risk for foot lines not following the surrounding terrain. The good news is that the screening effect depends on the location of the top lines.

From Ver 8.1 it has been possible to 'calculate berms into DGM' (calculation type Geometry > Calculate objects into DGM). By doing this the program – internally – converts the foot and top lines into elevation lines and include them in the DGM calculation. During this calculation existing elevation data inside the footprint of the berm is discarded. **In general, this feature should be used to merge the berm into the DGM**. However, in 3D Graphics the object is still presented as a berm.

As mentioned above the foot lines do not necessarily stay on top of the DGM. When foot lines are calculated into the DGM, it might cause a cross section that do not look 'natural'. An example is shown in Fig 2. The risk for such ditches/tops can be reduced by using short berm segments. Details like this normally have no effect on the calculation result.

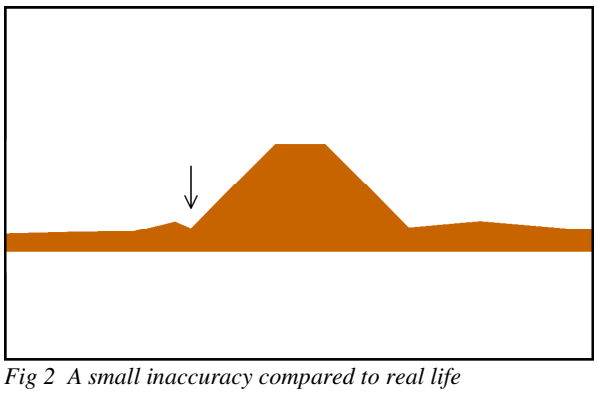

Fig 2 A small inaccuracy compared to real life

Constructing noise barriers with relative height

Creating a noise barrier that runs parallel to a road (or railway) and that has a constant height relative to the road is a bit of a challenge. Since the terrain next to the road might be inclining here and declining there the wall height itself should in general vary along the road. However, the job is fairly easily done using the function 'Calculate object height from top edge' under Geo-Tools. Do like this:

- Select the road and create a parallel object (Geo-Tools > Create parallel object) where the barrier must be located
- Lift the copy (using a coordinate operation) to the position where you want the barrier top to be
- Convert the road to barrier object type
- Select the barrier and load the DGM
- Execute the function 'Calculate object height from top edge' under Geo-Tools

'Calculate object height from top edge' extends the barrier to the DGM and inserts the local difference between top and foot as the wall height.

Constructing berms with relative height

'Calculate object height from top edge' does not work with berms. Modelling a berm with constant height above a road/railroad can instead be done by creating a dummy road, where the berm top should end up, and then leave it to the program to construct the filling by calculating the dummy road into DGM. It goes like this:

- Select the road and create the dummy road by using Geo-Tools > Create parallel object
- Lift the dummy road (using a coordinate operation) to the position where you want the berm top to be
- Load the DGM into which the dummy road should be calculated and perform the calculation Geometry > Calculate objects into the DGM

Remember to delete the dummy road, especially if you put cars on the road.

Calculating a road into the DGM creates – internally – 6 new elevation lines along the road (at the road edges, at the edge of the soft shoulders and at the footprints of the embankment, see Fig 3), and at the same time cuts away other elevation information in between the new lines.

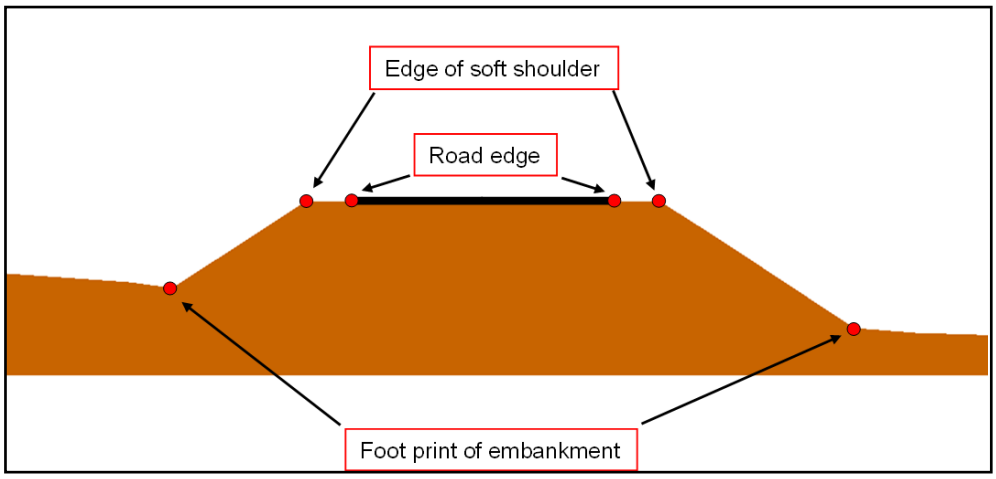

Fig 3 Elevation lines generated when calculating a road into DGM

Fig 4 next page shows an example.

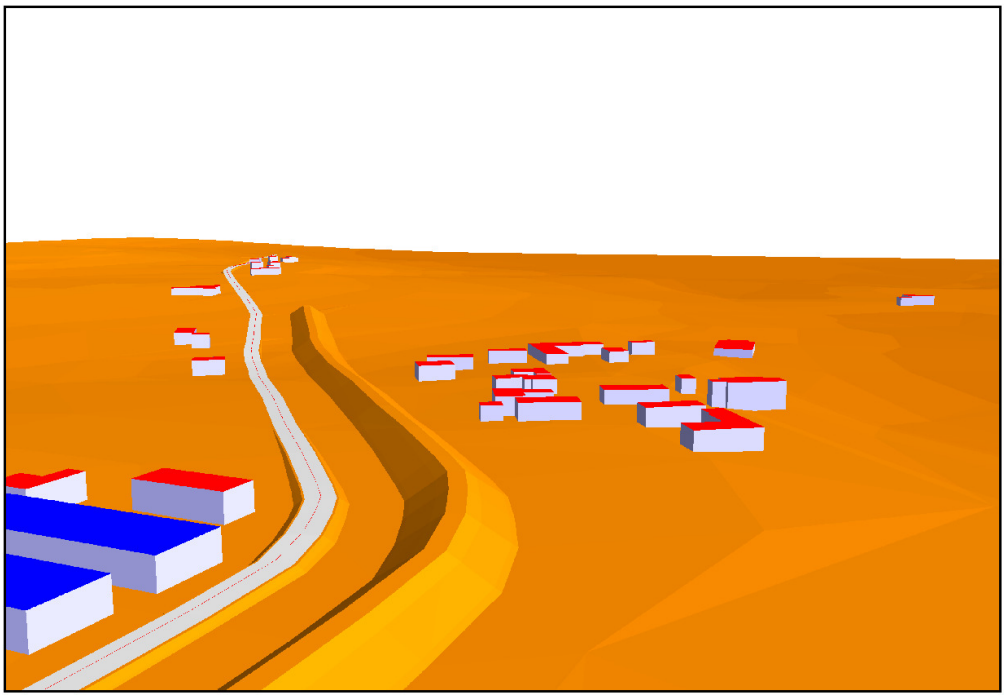

Fig 4 Embankment created using a dummy road