Comparison of the Elevation Contours based on DTM from NGI and DEM from DataForWind

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This document shows the comparison between the calculated WAsP compatible elevation map based on the DEM (Digital Elevation Model) extracted from DataForWind and the WAsP file calculated based on DTM (Digital Terrain Model) files as 3E got them from NGI (National Geographic Institute of Belgium).
The maps were created for a site in the Walloon region. It is a very complex terrain. In fact, it's a rock excavation site = for which the orography is continuously in evolution. The site is located near the river 'Meuse'.

Figure 1 is a topographic map of the area of interest
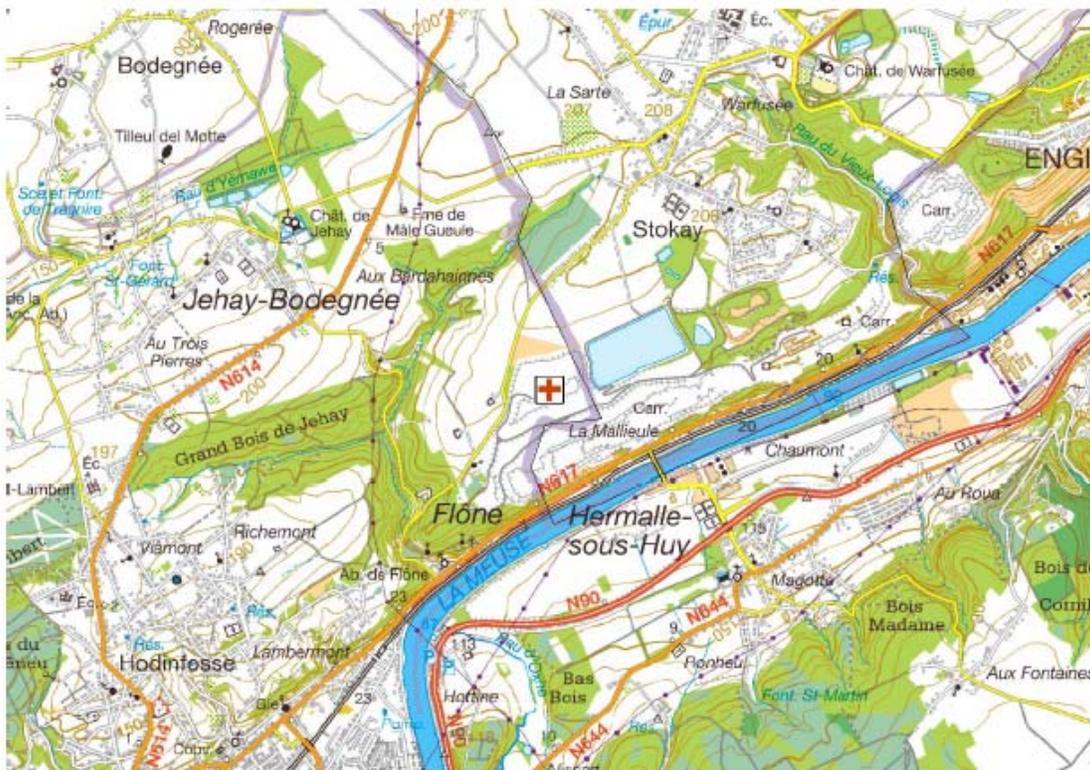

Figure 1. Topographic Map of the site under concern. Copyright NGI

For this site, 3E has a measuring mast installed at the position marked with the red cross. According to the topographic maps available from the NGI, the position of the mast is between 180 and 190 m above sea level. However, for the exact position of the measuring mast, no elevation contour lines are drawn, so it is quite unclear. This is not what it should be. From the developer of the site, we received an AutoCAD drawing with the detailed contour lines (see Figure 2). The position of the measuring mast is marked by the red box. In this drawing, we find that the altitude of the mast is about 225 m above sea level.
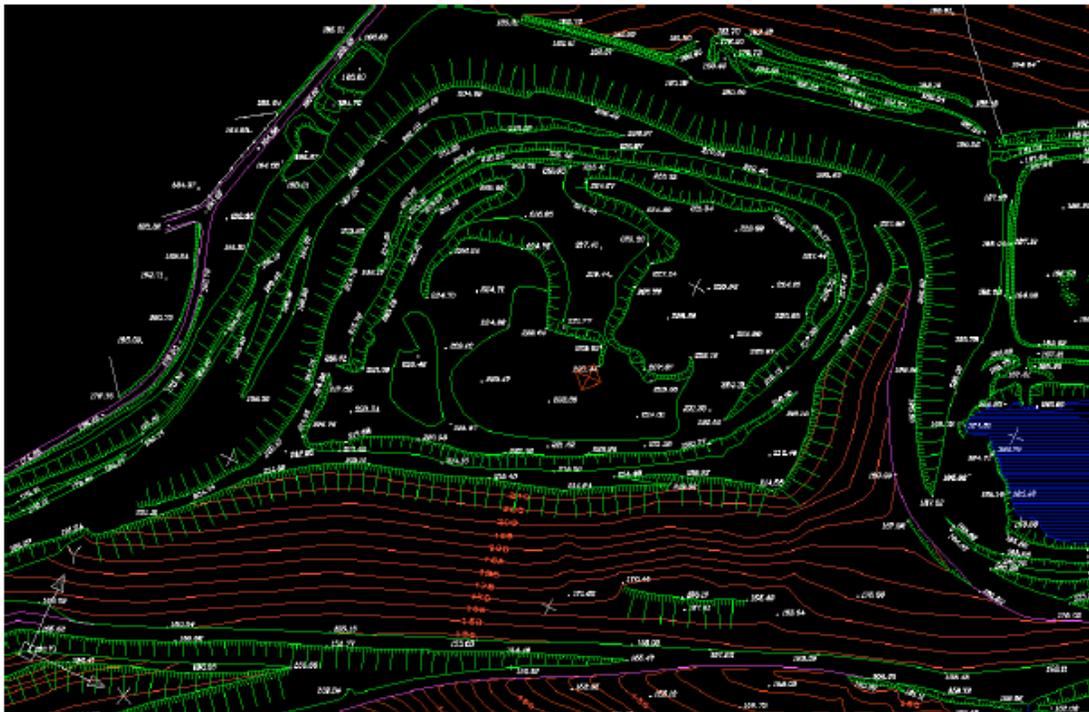
Figure 2. AutoCAD drawings of the site from the developper.

Now, let's have a look to the calculation achieved with the DTM files from NGI. Figure 3 shows the WAsP compatible map file as depicted in WindPro.
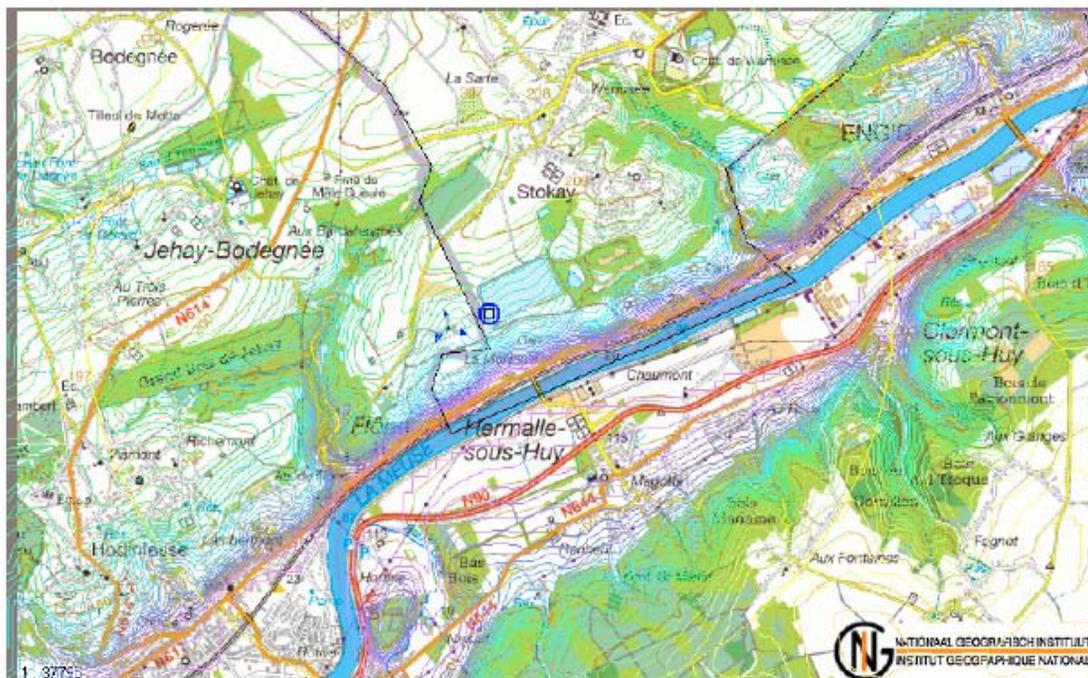

Figure 3. WAsP compatible map from DTM and WindPro calculation

It is seen that the calculated WAsP map file based on the DTM follow well the height contours of the topographic map, as we could expect because both come from the same institute. Using the WindPro interpolation model (TIN

model) between the defined height contours of the WAsP map file, we find that the elevation of the measuring mast is at 157.2 m above sea level. The deviation from the AutoCad drawing (225 m versus 157.2 m) is significant.

Further, let's have a look on the WAsP map file as calculated based on the DEM file downloaded from DataForWind Web server. I downloaded the DEM in ASCII XYZ file from longitude 5.3 til 5.4 and latitude 50.5 to 50.6. The ASCII file was imported in ArcView where the elevation contours were created using the Spatial Analyst tool in the UTM projection system.
This created shapefile with the elevation contours was then imported in WindPro in which it was converted to the WAsP map file. Again the TIN interpolation method of WindPro was used.

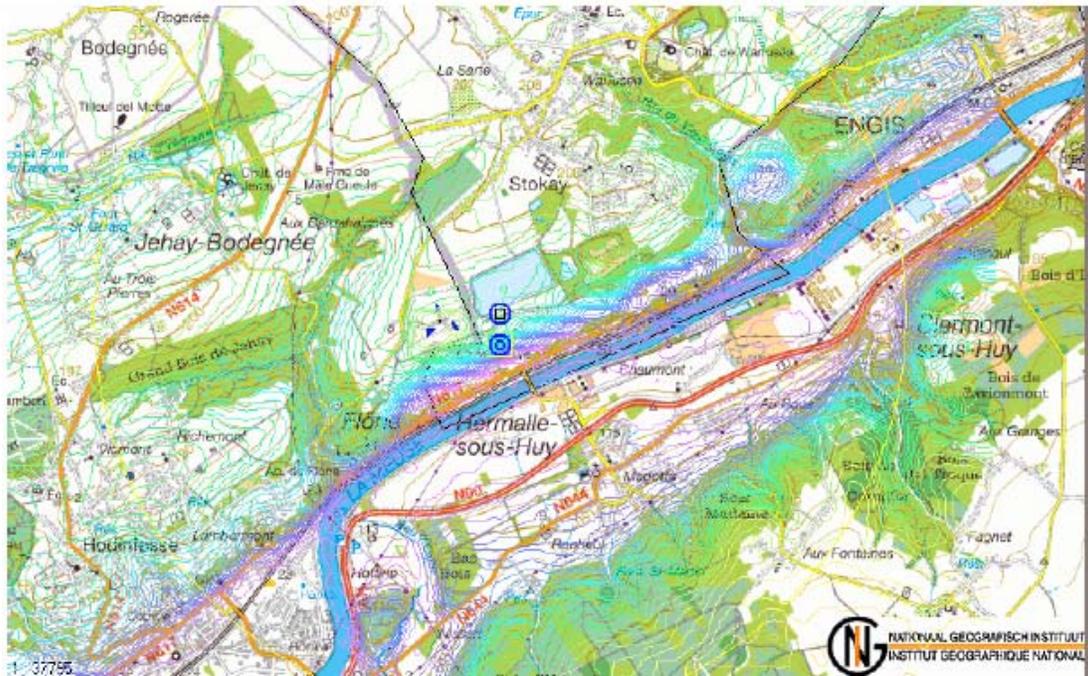The resulted map is depicted Figure 4.

Figure 4. WAsP compatible map from DEM extracted from DataForWind and WindPro calculation

Now we find that the position of the measuring mast is at 210.8 m.

Conclusion:
If we may trust the AutoCAD drawing from the developer of the terrain, it seems that the created elevation map based on the DEM dataset from DataForWind is much more relevant than the one based on the DTM files from the NGI. Figure 5 shows both created elevation maps together with the AutoCAD drawing.
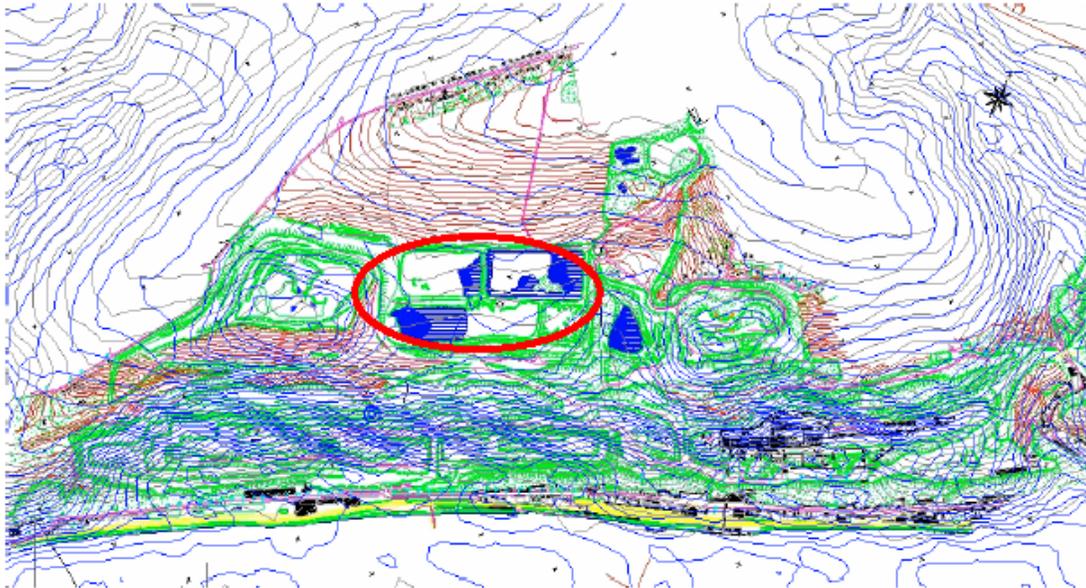
Figure 5. Superimposition of Elevation maps created from DTM and DEM and AutoCAD drawings The DTM map is in grey, the DEM map blue.

Let's have a look on the marked area. This area consist of two lakes. So the height contours in this area must be quite constant. According to the AutoCAD drawing, the elevation is around 185 m. With the DEM file, we find between 180 m and 185 m. With the DTM file, we find between 165 m and 175 m.

Since that area is not under construction, we can consider the values mentioned on the AutoCAD drawing as constant. The DEM file from DataForWind is more precise than the DTM file. Moreover, with the DTM file we find that the area with the lakes has a higher elevation than the area of the measuring mast which conflicts with reality.