How to Understand Map Scale and Accuracy

Maps now play an important role in our everyday life, whether its using GoogleMaps for finding directions to a site or client, using Ordnance Survey maps for detailed site investigations, aerial photography for identifying what a site or location is actually like, or even just using your mobile phone to find the nearest take away pizza.

Using maps is such a basic function of our work and daily life that we sometimes take it for granted that we know what the map is telling us, but there are a few aspects of mapping that are worth highlighting to make sure we are using maps in the most efficient and appropriate way for our work.

Map Scales (eg: 1:2500, 1:10,000, 1:25,000)

The map scale tells us how big a particular real world feature will appear on the map. It is represented as a ratio of how many measurement units in real life are represented by the same unit on the map. A map scale of 1:10,000 for example, means that every 1mm on the map represents 10,000 mm in real life (equivalent to 10m), on a 1:25,000 map, 1mm represents 25,000mm (equivalent to 25m). So;

Scale	Real world distance for 1mm on map
1:500	0.5 metres
1:1,250	1.25 metres
1:10,000	10 metres
1:25,000	25 metres
1:50,000	50 metres
1:250,000	250 metres

The terms '**Large scale'** or '**Small Scale'** refer to size of the representation of features on the map. A 1:500 map is "Large Scale" map as the features on the map appear large, a 1:250,000 map is a "Small scale" map as the features appear small. A common confusion arises from the fact that 1:250,000 is a larger number than 1:500 and is therefore sometimes erroneously referred to as 'large scale'.

Map mark up, Measurements and Map Scales

If you are taking measurements off a map, then the map scale you use must be appropriate to the level of accuracy you require. If you mark up a feature such as a site boundary with a 1mm thickness line on a 1:10,000 map, then you will be accurate to +/-10 metres, marking the same site on a 1:250,000 map will be accurate to +/- 250 metres. Similarly, if you are taking measurements off a 1:1250 scale map with a ruler marked with mm division, then you will be accurate to +/-1.25 metres, taking measurements off a 1:50,000 map, you will be accurate to +/- 50 metres. When choosing which map scale to use, always consider how accurate you need to be.

Feature displacement on maps

An all too often ignored aspect of maps of 1:10,000 scale or smaller, is the fact that in drawing maps, features such as building outlines are often simplified, merged or moved to aid interpretation of the map.

For example, on a 1:10,000 map, an access road wide enough for a single vehicle which is 3 metres wide (actual representation on map 0.3mm) may be drawn on the map as 2 dotted lines 2mm apart (real world representation 20m width compared to real on-ground width of 3m) for it to be clearly seen. If there is a building immediately adjacent to the road, then to avoid the dotted lines representing the track running right through the middle of the building, then this must be displaced to one side so that its representation is in the same ***relative*** location to the road. This aspect of feature displacement is made worse on smaller scale maps (eg. 1:25,000 and 1:50,000 maps).

Which map product should I use ?

There are a number of different map products available (to keep things simple, only Ordnance Survey mapping products are mentioned here). Which product you use is dependant on a number of factors (some of which are covered above but it always worth thinking through the following questions to determine what the most appropriate map scale is;

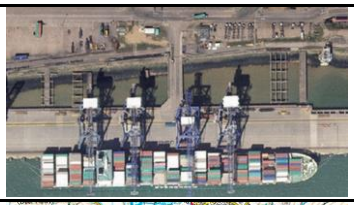
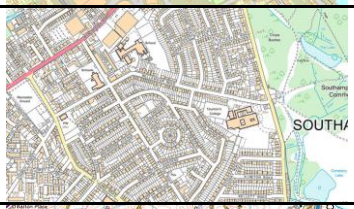
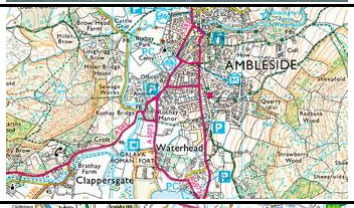
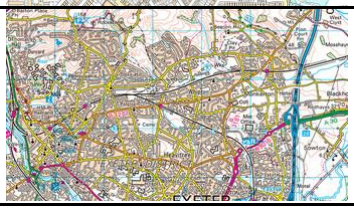
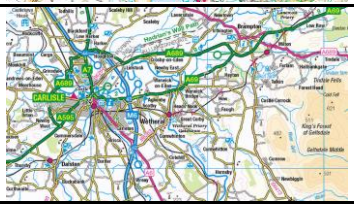
- How accurate and precise does the map need to be? (eg.Is this for precise measurements and area calculations or is it for general locational reference only ?)
- What area of coverage do I need? (eg. within 100m of the site or within 5km of the site)
- What features/buildings/topography do I need to identify from the map? (eg. field boundaries, contours, public rights of way)
- How big does the map need to be in the report? (eg small ½ page insert or full A3 or larger figure)

All of these will dictate the most appropriate map to purchase. In fact, it may be you need to purchase multiple map products to cater for the different purposes within a single project. While it is possible within a GIS to view any map at any scale, for all practical purposes, each map scale has a 'useable' scale range in which each product should be viewed.

Raster maps will appear too 'pixelated' if viewed at too large a scale or the text becoming unreadable if viewed at too smaller scale. Vector (line drawn maps) such as OS Mastermap and the new OS Vectormap Local (replacement for the long established 1:10000 mapping) appear detailed no matter how close you zoom in, but the accuracy of the lines then becomes a major issue. Viewed at too small a scale, then the map will appear as a dense mass of lines. Viewed at too large scale, the map will appear 'blank' apart from a few small line sections.

Useable and preferred map scales for OS Mapping Products Map

Product	Nominal Scale	Useable Scale Range	Preferred Scale Range
OS Mastermap	1:1250 (urban) – 1:2500 (rural)	1:500 to 1:5000	1:500 to 1:3000
OS Mastermap Imagry	25 cm resolution	1:500 to 1:10 000	1:500 to 1:5000
OS Vectormap Local	1:10 000	1:3 000 to 1:20 000	1:5 000 to 1:15 000
1:25000 Raster	1:25 000	1:10 000 to 1:30 000	1:15 000 to 1:25 000
1:50000 Raster	1:50 000	1:20 000 to 1:100 000	1:25 000 to 1:60 000
1:250000 Raster	1:250 000	1:100 000 to 1:300 000	1:100 000 to 1:250 000

OS Mastermap 1:1250 (urban areas) and 1:2500 (rural areas)		OS Mastermap Imagery Layer	
OS Vectormap Local		OS 1:25 000 Colour Raster	
OS 1:50 000 Colour Raster		OS 1:250 000 Colour Raster	

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