

Archaeological survey

Standing monuments and sites, particularly earthworks, may be surveyed (measured and recorded) in order to obtain a permanent record of the site, sometimes as a preliminary to excavation. There are various means of recording – from making sketch plans using one's pace as a measure, to more accurate plans using a variety of instruments, the most basic being measuring tapes and ranging rods. A level can be used to make drawings of the contours of the area by taking readings of successive points. Besides measured drawings, photography and making written notes are important parts of surveying.

Measured survey by triangulation

Use of a grid

The survey may be based around a grid, established temporarily in the area to be surveyed. This is particularly useful in open areas with no landmarks that appear on Ordnance Survey maps to use as base points. It is not practical in areas with lots of standing buildings or in woodlands. Where a grid is established, it must be tied in to Ordnance Survey data, such as buildings, field boundaries and so on; this is most effectively accomplished using an Electronic Distance Meter (EDM) or theodolite.

Practical sizes for grids on survey sites are 10×20 m, 20×20 m or 20×50 m.

Sketch sheets

On the gridded sketch sheet, write the name of the site or site code, the south-west grid co-ordinate (if using a grid) and the number of the sketch. The person who will be sketching should put their initials and the date; if using a grid, an approximate scale can be indicated (1:200 will normally encompass a whole grid square), otherwise write NTS (not to scale).

Sketch all the visible features (banks, mounds, ditches, gullies, hollows etc.) and any other details such as fences, hedgerows, trees, paths, streams and so on that will help to match your survey with Ordnance Survey maps or satellite photographs. It is generally easiest to work from the edge of an area in towards the centre if using a grid. You can work to an approximate scale on the assumption that 1 stride \approx 1 metre. Gradually fill in more and more details and you will find that a reasonably accurate sketch can be drawn quite accurately. A selection of conventions suitable of measured survey is given on the next page.










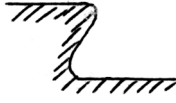
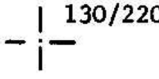
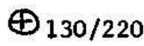



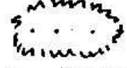

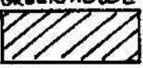

Although a sketch plan is just that, it is also primary archive material, so neatness and legibility are important and must never be sacrificed to speed. However, it is not necessary (or even possible) to produce an accurate scale drawing at this stage.

Using the sketch to guide you, determine which points are to be measured in: the tops and bottoms of slopes, changes in alignment, corners and places where features cross grid lines should all be measured. These points must be marked clearly on the plan and numbered for reference. They should then be marked out on the ground using surveyors' arrows or ranging poles.

On a Universal Recording Form, on which the sketch number should be entered together with the site name or code, label the first five columns: *Reference point*; *Grid 1*; *Measurement*; *Grid 2*; *Measurement*. In the first column, list the reference points previously marked on the sketch sheet.

Much of the measuring that you need to do next will be done by triangulation. This involves measuring the distance from two reference points (grid pegs or previously surveyed reference points) to the point to be measured. No measurements should be taken over a distance greater than 30 m; if a point is more distance from an existing reference point than this, it is perfectly acceptable to put in temporary marker points using surveyors' arrows or ranging poles.

In the *Grid 1* and *Grid 2* columns, enter the respective grid coordinates of the pegs from which you are measuring, the reference letter/number of the points from which you are measuring or a descriptive term relating to a mapped feature (e.g. 'south-west corner of 17 Cherry Tree Lane). In the corresponding measurement columns, enter the distance to the nearest 5 cm. Ensure that the measurement is related to the correct reference point and that you are reading from the metric side of the tape, not the imperial.

	Rounded hachures indicate slopes with no defined break at top or bottom		
	Hachures without tails indicate a vertical face		
	A triangular head on a solid line indicates a break at the top of the slope		
	A dashed line at the end of the tails indicates a break of slope at the bottom		
	Unblacked hachures indicate an undercut feature		
	Grid peg		Grid peg (sketch sheets only)
	Reference point for measurement (sketch sheets only)		
	Tree or tree stump		Spot level
	Shrubs and hedges		Fence and posts
	Standing feature (with description)		Gate

The tape measures should be kept taut and level at all times. Surveys often take place on exposed, windy sites, and a tape blown by the wind will obviously not give a true reading of distance. On hilly sites, especially, hold the tape as level as possible.

If using a grid, a point close to a grid line (within 2 metres) cannot be triangulated accurately. In these cases, an offset is taken: one tape is stretched between two grid pegs on the nearby grid line and a second tape used to measure the distance at right angles from the first to the point to be located. This can be done by a method known as 'swinging the tape', in which the tape is swung along the grid line, using the point to be measured as a pivot, until the lowest reading on the moving tape is found. This value and the reading on the first tape, where it is crossed by the second, are noted in the *Measurement* columns as a distance, in metres, and *bearing* (north, south, east or west) from a grid peg (in the case of the first tape) or the first tape (in the case of the second).

Where a point to be measured is actually on a grid line, only one measurement need be taken. This is then recorded as a distance and heading from a grid peg. In both this case as well as with offsets, it is possible to calculate the exact grid reference using basic addition and subtraction.

Transferring the data to accurate plans

Archive plans are drawn up indoors on drafting film using the sketch sheets and measurements taken in the field. This can be done at a larger scale than the sketches, usually at 1:100, although with very extensive sites, a smaller scale of 1:200 or even 1:500 may be appropriate. Each plan should be labelled with details of the site name, survey type, survey date, plan number, scale, plan date, draftsman, adjacent sheet numbers and north arrow.

The measured point should now be transferred to the plan. Mark the grid points (if used) and protect the film at these points with small pieces of masking tape, as compasses are used to triangulate other points. If not using a grid, start with two points at the edge of the sketch whose distance apart is known. For each point, set the compasses to the required scaled distance and draw an arc on the film. The second measurement is transferred in the same way and the point where the two arcs cross is the point measured in the field. The point should be marked clearly and labelled with its reference number; the rest of the arcs can then be erased. Offsets and points on grid lines can be plotted directly onto the plan after calculating their coordinates. As each point is plotted, a tick should be placed in the last column of the recording form (now labelled *Transferred*).

When all the measured points on the sketch have been plotted, they should be joined to complete the plan, in the manner of a join-the-dots puzzle. Reference should be made to the sketch throughout the procedure, both to give the features their correct shapes and to determine which points should be joined with others. It is particularly important that lines be drawn smoothly to avoid giving the plans an unnaturally angular appearance. When the plan has been completed, the reference points and numbers can be erased.

Error checking

By this stage, any errors or omissions in measurements made in the field will have become apparent: the sketch may be unclear or incomplete; points may be labelled incorrectly; measurements may be incorrect; a vital measurement was not made and so on. In these cases, check whether two or more points have been measured in the wrong order or if a 1 or a 0 has been left out of a measurement. Many errors can be corrected in this way. Sometimes, further measurement and drawing in the field will be necessary and the need for this should be indicated by a query in the last column of the recording form.

Levelling

Once the archive plans have been drawn, they can be used to determine points at which levels can be taken. The tops and bottoms of slopes, tops of banks and bottoms of ditches, at intervals of 5 to 10 metres (depending on the nature of the site) should be included. A few general levels should also be taken in each area to illustrate the natural topography.

Relating the survey to mapping

Once all the individual area plans have been drawn up and checked, an overall plan should be drawn for the archive. The scale of the plan will depend on the size of the area surveyed but it must be of a recognised standard (1:200, 1:500, 1:1000). The quickest method of producing this plan is by direct reduction from the area plans by scanning at a reduced scale or by making reduced photocopies.

In drawing up the overall plan, it will often be noticed that features planned in one area do not line up directly with the same features continuing into an adjacent area. This does not mean that the original survey was wrong: it more likely shows subjective differences in the interpretation of features on the ground by the original recorders. This may be overcome by drawing through a point midway between the two plotted.

The completed plan can then be related to Ordnance Survey mapping, using data from the EDM or theodolite to tie the grid in to mapped features, or by comparing features such as field boundaries on both sets of data. At this stage, it may be easiest to reduce the survey to 1:1250 or to enlarge the Ordnance Survey map data to 1:1000.