

**National Asset Delivery
Technical Surveys and Testing**

**569243 - A46 NB SB Sixhills Geotech –
Water Erosion: Topographical Survey**

Scope

CONTENTS AMENDMENT SHEET

Amend. No.	Revision No.	Amendments	Initials	Date
1	1	Original version issued with tender	LR	07/10/19

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1 PURPOSE OF THE SERVICES

1.1 Project objectives

1.1.1 The principle objective of this project is to undertake a 3D topographic survey at the location stated in drawing: HE569243-KIER-VDS-A46_Z-DR-CD-0500_03 (A46 NB SB Sixhill Geotech – Water Erosion) and provide subsequent reporting in accordance with the requirements detailed in the specification.

1.1.2 The specification that applies to the *services* is included in Section 6

1.2 Scope of services

1.1.3 The *services* to be provided under this contract are:

- 1) A 3D topographic survey of both the north and southbound carriageways, verges and the embankments encompassing the defective locations, as outlined on drawing HE569243-KIER-VDS-A46_Z-DR-CD-0500_03 (lane 1 to the boundary fence. Topo survey does not include lane 2 and central reservation), showing, inter-alia :
 - i. The geometries of both the earthworks within the topographic extents (as per drawing: HE569243-KIER-VDS-A46_Z-DR-CD-0500_03), including slope length, height and slope angle.
 - ii. A grid of levels on the carriageway and earthworks,
 - iii. String lines on linear features and changes of slopes
 - iv. Identification and level of point features
 - v. The geometries of both the eastbound and westbound earthworks within the survey area, including slope length, height and slope angle.
 - vi. Details and location of each earthwork defect in relation to the earthwork and carriageway, with particular attention to changes of slope, scars, tension cracks and bulges.
- 2) A 3D topographic survey of the watercourse that passes beneath the A46. The survey will cover 500m upstream and 500m downstream of the A46 at 10m either side of the watercourse channel (As per drawing HE569243-KIER-VDS-A46_Z-DR-CD-0500_03), showing, inter-alia:
 - i. The geometries of the stream channel within the topographic extents, including channel slope length, height and slope angle. Where ditches convey watercourses, the ditch and the adjoin culverts shall be treated as watercourses and surveyed in accordance with 'Addendum to the Specification for watercourse and flood plain surveys'
 - ii. The location of any structures pertaining to the watercourse.

- iii. The watercourse flow rate.
- iv. The geometries of any structures pertaining to the topo extents.

Please refer to the 'Addendum to the Specification for watercourse and flood plain surveys' document which forms part of the Topographical TST Package, for further information.

- 3) A pre-start meeting can be arranged on request in Stirling House, Lakeside Court, Osier Drive, Sherwood Business Park, Nottingham, NG15 0DS at least two weeks prior to mobilisation to site.

1.3 Deliverables

1.2.1 The *Contractor* is required to produce the following deliverables:

- 1) Topographic survey report, drawings and 3D AutoCAD file.
- 2) Watercourse and flood plain surveys, the data is to be delivered in the format prescribed in the 'Addendum to the Specification for watercourse and flood plain surveys'

2 EXISTING INFORMATION

2.1 Site Location

See Site Information Document and Drawing HE569243-KIER-VDS-A46_Z-DR-CD-0500_03.

2.2 Underground Services and Drainage

See Drawings 569243-KIER-VUT-A46 SixHills-DR-CE-0600_03 to 0600_12, which includes C2 utility information pertaining to the site extents. Note that in addition to recorded statutory services, other cables, pipes and services can and do exist which may not be recorded. These may include street lighting, traffic signal control cables and traffic detector loops.

There are no existing comprehensive records of the drainage network, so searches will need to be made on site for access chambers, outfalls and gullies.

2.3 Drawings

The Drawings listed below apply to this contract. Refer to the site information for details of existing site conditions including ground conditions, limitation on access, position of existing structures etc.

Drawing Number	Title	Revision / Date
HE569243-KIER-VDS-A46_Z-DR-CD-0500_01	Topographic and additional drainage survey. Sheet 1 of 3	23/09/2019
HE569243-KIER-VDS-A46_Z-DR-CD-0500_02	Topographic and additional drainage survey. Sheet 2 of 3	23/09/2019
HE569243-KIER-VDS-A46_Z-DR-CD-0500_03	Topographic and additional drainage survey. Sheet 3 of 3	23/09/2019
HE569243-KIER-HGT-A46 Sixhills-DR-CE-0600_01	Drainage features and Borehole Locations	25/09/2019
HE569243-KIER-HSC-A46 Sixhills-DR-EN-0600_02	Vegetation Clearance	25/09/2019
569243-KIER-VUT-A46 SixHills-DR-CE-0600_03 to 0600_12	Utilities Drawings	25/09/2019

3 CONSTRAINTS ON HOW THE CONTRACTOR PROVIDES THE SERVICES

3.1 General

- 3.1.1 The *Contractor* provides the services in such manner as to minimise the risk of damage or disturbance to or destruction of third party property.
- 3.1.2 The *Contractor* complies with the constraints and meets with the requirements outlined in Appendix 1.
- 3.1.3 The *Contractor* submits information detailing how the *Contractor* will provide the Services to the *Client* prior to the *services* commencing. This information will include any lifting plans, risk assessments, method statements, the *Contractor's* staff training information and any other relevant Health and Safety requirements.

3.2 Working hours & site specific constraints

- 3.2.1 The Contractor's working hours will be limited by the traffic management (TM) constraints (see also cl 5.1.1). TM is only able to be placed between the hours of 8pm and 6am. It can take up to 1 hour to put out and to remove TM. The working hours will therefore be constrained to 8hrs at night-time. All works on site are expected to be carried out in up to 2 weeks.
- 3.2.2 The site can be accessed from the carriageway.
- 3.2.3 The extent of the TM will cover the full extent of the scheme as outlined in drawing ref: HE569243-KIER-VDS-A46_Z-DR-CD-0500_04. The survey provider shall liaise with the TM provider regarding the sequencing of traffic management.
- 3.2.4 All staff working on the carriageway must have received a 1-day Highways England Common Induction and a Highways England EMAD induction.
- 3.2.5 Highways England rules require that no person may cross the carriageway on foot unless traffic management is in place.

3.3 Health, Safety and Environment & Risk Management

Health and Safety requirements

- 3.3.1 In Providing the Services the *Contractor* meets the requirements of Annex 2 of the supplementary constraints relation to health and safety duties.
- 3.3.2 The *Consultant* shall comply with the requirements of Highways England's safety passport scheme and ensure that all of his employees, and any of his subcontractor's, are registered in accordance with the implementation of

the scheme. Details on the scheme can be found here: <http://www.highwaysafetyhub.com/safety-passport.html>

- 3.3.3 For details of the CDM duty holders, refer to the pre-construction information which can be found in the TST package under the file name "A46 Sixhills Pre-Construction Information".
- 3.3.4 Before commencing the construction phase of the *services*, the *Contractor* confirms to the *Client* that adequate welfare facilities are in place. Where the facilities detailed in section 5 are not deemed adequate, the *Contractor* provides all necessary facilities to provide the *Services* and to comply with the minimum requirements set out in HSE guidance document L153.

Environmental requirements

- 3.3.5 In Providing the *Services* the *Contractor* meets the requirements of Annex 2 of the supplementary constraints in relation to environmental duties.

Risk Management

- 3.3.6 The *Contractor* identifies, manages and mitigates risks in accordance with the principles of ISO31000.
- 3.3.7 The *Contractor* submits a risk register, which captures all risks associated with the delivery of the *services* including those identified by the *Client*, with their tender and maintains it for the contract period. The Designers Hazard Risk Assessment for the site is included in the TST documentation pack.

4 REQUIREMENTS FOR THE PROGRAMME

- 4.1.1 The *Contractor* submits programme to the *Client* with their tender.
- 4.1.2 The *Contractor* provides the services taking into account the following programme constraints:
- (i) the *starting date* and *completion date* and any post site works, reporting and review period
 - (ii) The services and other things provided by *Client* (see Section 5)
 - (iii) All related topographical and drainage documents, including drawings and reports, should be submitted up to two weeks after the survey has been carried out.
 - (iv) The order in which the earthwork surveys are to be carried out is up to the contractor's discretion in agreement with the traffic management provider.
 - (v) The site works shall be completed within the timeframe of the TM, to be advised, for which an allowance of 10 shifts has been assumed. Reports and drawings are to be provided within two weeks of the completion of site works (note: due to ground investigation and drainage surveys being carried out at the same time, TM will be on site for 1 month – estimated to be between 01/03/2020 – 31/03/2020).
- 4.1.3 The programme must be in the form of an activity and time related bar chart produced as a result of a critical path analysis.
- 4.1.4 The programme must be provided in a PDF (or MS Project or MS Excel format) and cover the full contract period including post site activities. All activities should be clearly defined and named and the following shall be shown on the programme:
- (i) the *starting date*, *completion date* & *Contractors'* planned completion
 - (ii) for each activity, the proposed resources (plant & labour) expected to deliver each activity should be shown on the programme
 - (iii) review periods for any reporting requirements
 - (iv) key dates for the Client to provide 'services and other things'
 - (v) key dates for co-ordination with Others
- 4.1.5 The *Contractor* updates the programme every week. The *Contractor* submits an updated programme to the *Client* upon request.

5 SERVICES AND OTHER THINGS PROVIDED BY THE *CLIENT*

5.1.1 The following temporary traffic management will be provided Highways England to allow the *Contractor* to Provide the Works:

- 1) Highways England's TM Provider will arrange for TM to be provided. The requirements and instructions of the Traffic Safety Control Officer (TSCO) shall be complied with at all times.
- 2) The TM window is to be confirmed, but see also section 3.2.1 above for general guidance.

5.1.2 Mobile welfare facilities are expected to be made available on the site by the TM Provider.

6 SPECIFICATION FOR THE SERVICES

6.1.1 See also section 1.2 scope of works.

6.1.2 Specification for Geodetic

1.0 Introduction

This specification is for the use of geodetic survey firms engaged in work for Highways England on the Area 7 network and adjacent third party land where detailed in each Scheme Task Order. Where this Specification requires options to be deleted or details to be added, these shall be explicitly identified in each Scheme Task Order.

2.0 Purpose and Scope

Surveys commissioned are for the purposes of facilitating detailed design of highway works the nature of which are further detailed in the Scheme Task Order. The highest achievable levels of accuracy are required both horizontally and vertically for key elements within the highway envelope. Section 5 lists the required accuracy levels for various items required to be recorded during the survey.

The location and extent of the survey shall be as identified in the drawing(s) accompanying the Scheme Task Order.

The survey scope shall be to review this specification and supplementary information provided in the Scheme Task Order to determine a programme and quotation for completion of site works - including requirements for Traffic Management. The provision of the presentation material as detailed in Section 6 shall be listed separately within the programme and quotation. Traffic Management will be arranged, provided and funded separately by Highways England but the type, phasing and duration shall be determined by the Survey Contractor to suit their method of working and other contractors working within the same Traffic Management provision.

3.0 General Requirements

Project information shall be as detailed in the Scheme Task Order. This specification is not intended to be used for specialist surveys of structures such as bridges but basic level and positional information for structures shall be included as detailed in the Scheme Task Order. However, it's intended to be used with Watercourse and Flood plain surveys. An Addendum to the Specification for watercourse and flood plain surveys is provided for this purpose.

3.1 Health and Safety at Work etc Act 1974

All activities performed during the course of work undertaken by the Survey Contractor on this Contract shall be in accordance with the requirements of the Health and Safety at Work etc Act 1974. Any operations or areas which involve safety considerations over and above those normally required during survey activities will be identified within the Scheme Task Order.

3.2 Landowners, Occupiers and Entry

Unless otherwise stated in the Scheme Task Order, owners and occupiers of all the land covered by the survey will have been notified of the period during which entry is likely to be required and their permission for entry secured by Highways England. Notwithstanding the above, the Survey Contractor shall, where possible, notify the landowner / occupiers upon arrival and agree with them all routes and means of access. Where access to the Survey Contractor is refused, the Survey Contractor shall immediately notify the Highways England contact who commissioned the survey.

3.3 Prior to undertaking survey

Within two weeks of award of the Contract, the Survey Contractor shall provide the Highways England Survey Coordinator with a detailed programme and method statement of the activities the Survey Contractor intends to carry out, in order to meet the Contract timetable and the Specification. The method statement shall include copies of calibration certificates for the survey equipment.

4.0 Project Control

Planimetric and vertical control shall be made up of a framework to provide a suitable foundation for the production of a reliable survey and for future setting-out during construction.

4.1 Requirements

Planimetric and vertical control frameworks shall be established and tied into the Ordnance Survey National Grid and datum.

A minimum of two primary points shall be established connected by direct measurement and located at a nominal distance of 250m on motorways and 100m on trunk roads. Where ever possible these should be located within the highway boundary in locations that are unlikely to be disturbed.

Secondary points tied into the primary points shall be utilised as required to provide adequate coverage of the survey area as defined by the task order but intervals shall not exceed those of the primary points.

Use of Minor control points may be employed where necessary to obtain full coverage within third party land.

4.2 Ground Markers

The primary and secondary control points shall be defined by permanent ground markers. Final positions of permanent ground markers shall be determined by terrain and intervisibility constraints. Minor control points need not be permanently marked.

Permanent Ground Markers shall be stable for a period of 5 years and shall be of a construction which conforms to the types illustrated in Appendix J of Manual of Contract Documents for Highway Works Volume 5 Section 1 Part 2 available online at:

http://www.dft.gov.uk/ha/standards/mchw/vol5/sect1/5_1_2.pdf

4.3 Schedule of Permanent Control Stations

A Schedule of Permanent Control Stations shall be prepared incorporate the following information:

- a. Station designation
- b. Plan co-ordinates
- c. Level value
- d. Description
- e. Ordnance Survey triangulation stations (if used)
- f. Ground marker type

4.4 Framework Accuracy

The acceptance criteria specified below are in terms of internal rather than absolute accuracies and are given as permitted deviations for distances, angles and levels. Internal accuracies are more critical to the construction process than the absolute accuracy of points in a higher coordinate system.

The relation between the permitted deviation (PD) and root mean square error (rmse) is:

$$PD = 2.5 \times rmse.$$

Where the control system forms a network, it shall be observed by measuring sufficient distances and angles to obtain a redundant number of observations, which shall then be adjusted by a least squares method.

When comparing measured distances and angles with those derived from the adjusted coordinates the differences shall not exceed the following permitted deviations:-

(a) Primary Points

Distances:- $\pm 0.5\sqrt{L}$ mm

Angles:- $\pm 0.035/\sqrt{L}$ degrees

As an offset:- $\pm 0.61\sqrt{L}$ mm

(b) Secondary Points

Distances:- $\pm 0.75\sqrt{L}$ mm

Angles:- $\pm 0.045/\sqrt{L}$ degrees

As an offset:- $\pm 0.75\sqrt{L}$ mm

(c) Minor Control

Distances:- $\pm 1.0\sqrt{L}$ mm

Angles:- $\pm 0.09/\sqrt{L}$ degrees.

As an offset:- $\pm 1.5\sqrt{L}$

Where L is the distance in metres between the points concerned. In the case of angles, the shorter of the two distances defining the angle shall be used.

When using GPS the adjustment must pass the chi squared test on the control network.

Post adjustment relative errors for distances and bearings at the 95% confidence level should be calculated for each line to show compliance with the criteria above. In addition, compliance measurements should be observed between selected points in the network to confirm the validity of the adjustment positions on plan.

4.5 Accuracy Acceptance Criteria

When comparing measured height differences with those derived from the adjusted reduced levels, the differences shall not exceed the following permitted deviations:

- a. Between bench marks, primary stations and other closed loops in the framework:
 $\pm 12\sqrt{K}$ mm where K is the distance levelled in km
- b. Between adjacent secondary stations or minor control points less than 300 m ± 5 mm

4.6 Surveyed Features Accuracy

The required accuracy when surveying features has been identified using two categories, Max and Medium. These are defined below.

Max

This shall represent survey using a Total Station offering accuracy tolerance of +/- 5mm or better. Use of GPS survey techniques or other means not providing this level of accuracy shall not be permitted.

Medium

This shall represent items for which survey via total station is preferred but that use of GPS is not precluded. However, it is likely that use of GPS techniques will be limited to large areas of third party agricultural land or expansive highway verges.

Section 5 details the level of accuracy required for the various features required to be captured during a survey for each class of road unless explicitly varied by the Scheme Task Order.

5.0 Items to be surveyed

The primary information to be surveyed is that which determines the shape, alignment and make-up of the public highway envelope. This shall extend into the adjacent third party land where identified by the Scheme Task Order. Specific items that must be recorded are detailed below. This shall not be taken as a complete list and any features / items not specifically referenced shall also be recorded.

The line or point to be surveyed on a feature shall be at the feature's intersection with the ground surface unless otherwise noted.

Water courses and flood plains shall also be surveyed as specified in the "Addendum to the Specification for watercourse and flood plain surveys" document.

5.1 Roads, Tracks, Footways and Road Markings

Ref.	Features	Trunk Roads	Motorways	To be included in drawings	Accuracy	3D feature type
5.1.1	All Road edges (where no kerbs) including side roads, laybys, private access's etc.	5m (2.5m on radii below ~12m)	10m	3D	Max	String
5.1.2	All Kerb lines at channels + Channel blocks including side roads, laybys, private access's and traffic islands	5m (2.5m on radii below ~12m)	10m	3D	Max	String
5.1.3	All Kerb tops including side roads, laybys, private access's and traffic islands	5m (2.5m on radii below ~12m)	10m	3D	Max	String
5.1.4	Location of drop kerbs and transition kerbs (each end)	All	All	3D	Max	Part of kerb strings
5.1.5	Tactile paving and colour	Footprint	N/A	3D	Medium	-
5.1.6	Footway (each edge)	5m (2.5m on radii below ~12m)	5m	3D	Max	String
5.1.7	Other paved areas (extents / material type and changes)	Footprint (max 5m)	Footprint (max 5m)	3D	Max	String
5.1.8	Zebra and signal controlled crossings	Position and extents	N/A	3D	Max	-
5.1.9	All Road and footway crown lines	5m	10m	3D	Max	String
5.1.10	Steps including construction type and railings if present.	Position, extents and height of each step	Position, extents and height of each step	3D	Max	Strings
5.1.11	Road markings – edge of carriageway / rib line, lane markings, give way markings and stop lines and directional arrows and text	5m	10m	2D	Max	-
5.1.12	Extents of High Friction Surfacing and colour surfacing including 'gateway features'	Footprint / extents	Footprint / extents	2D	Medium	-

Ref.	Features	Trunk Roads	Motorways	To be included in drawings	Accuracy	3D feature type
5.1.13	Subways / underpasses / bridges including piers.	Footprint / extents	Footprint / extents	3D	Max	Strings and points
5.1.14	Bridge piers at 2m above ground level.	Cross section	Cross section	3D	Max	Strings and points
5.1.15	Bridge / structures expansion joints	Footprint / extents	Footprint / extents	3D	Max	Strings and points
5.1.16	Permanent structures / building remains	Footprint / extents	Footprint / extents	3D	Max	Strings and points
5.1.17	Boundary features including retaining wall heights and Highways England boundary fence	Footprint / extents	Footprint / extents	3D	Max	Strings and points
5.1.18	Drainage information including manhole covers, gullies, outfall levels, invert levels and pipe diameters	Footprint / extents	Footprint / extents	3D	Max	Strings and points
5.1.19	Visible services information to include overhead cables, service covers and electric poles	Footprint / extents	Footprint / extents	3D	Max	Strings and points

Additional notes:

1. Quadrant radii kerbs to have start, middle and end points picked up.
2. Bus kerbs shall be picked up in the same manner as drop kerbs.
3. For road markings the centre of the lines shall be recorded.
4. Levels should be taken at 5m lateral spacing and at changes of gradient.
5. Contours to be drawn at suitable intervals depending on site gradients.
6. Features recorded shall be given full 3D (xyz) coordinates. No features may be given a level 0.

5.2 Verges, earthworks and other soft landscaping and vegetation

Ref.	Feature	Trunk Roads	Motorways	To be included in drawings	Accuracy	3D Feature type
5.2.1	Cuttings and embankments – crest and toe lines	5m	10m	3D	Medium	String
5.2.2	Retaining Walls or other level change without a slope such as raised planting beds.	Footprint (max 5m) Levels at top and bottom	Footprint (max 5m) Levels at top and bottom	3D	Max	String
5.2.3	Localised changes of level such as mounds and swales.	Footprint (max 5m) Enough levels	Footprint (max 5m) Enough levels	3D	Medium	Strings and points as required

Ref.	Feature	Trunk Roads	Motorways	To be included in drawings	Accuracy	3D Feature type
		to illustrate form / shape	to illustrate form / shape			
5.2.4	Drainage ditches and all other waterways. Footprint including embankments and bed plus levels of each element including water.	5m or less if required to accurately capture shape	10m or less if required to accurately capture shape	3D	Medium	String
5.2.5	Drainage headwalls / outfalls to include pipe size and soffit level	Footprint, levels at ditch bed, water, and top of walls	Footprint, levels at ditch bed, water, and top of walls	3D	Max	Strings and points as required
5.2.6	Waterbodies such as ponds, lakes and springs including water level	Footprint including any embankment	Footprint including any embankment	3D	Max	String
5.2.7	Line of filter / French drains	5m along run to both sides	10m along run to both sides	3D	Medium	String
5.2.8	Line and height of Safety barriers including terminals, guard railings or parapets *1	5m along run and changes of beam type / height	10m along run and changes of beam type / height	3D	Max	-
5.2.9	Open fields / soft verge	10m centres / grid pattern	10m centres / grid pattern	3D	Medium	Spots as blocks or points
5.2.10	Trees – Canopy extents, height and trunk where latter is greater than 0.5m diameter 1m above ground	All	All	3D	Medium	-
5.2.11	Small trees / Bushes / scrub / brambles etc. Extents and height	All areas	All areas	3D	Medium	-
5.2.12	Individual trees or group of trees (if trunk diameter >75mm then mark them individually)	All areas	All areas	3D	Medium	Points or blocks
5.2.13	Indication of existing boreholes or other ground investigation features	Footprint / extents	Footprint / extents	3D	Max	Points

Ref.	Feature	Trunk Roads	Motorways	To be included in drawings	Accuracy	3D Feature type
5.2.14	Indication of tension cracks, slope bulge, change of slope or any other feature indicative of instability	Footprint / extents	Footprint / extents	3D	Max	Strings
5.2.15	Break of Slope	All areas	All areas	3D	Max	String
5.2.16		Areas of overgrown vegetation		Where critical these will have been cleared prior to survey but where they remain every effort should be made to record ground level information around the full extent of inaccessible area to provide as reliable a representation of the ground levels as possible		

Additional notes:

1. Street furniture shall only be included in the 3D CAD file where it has a direct effect on the topography / levels in the immediate vicinity. If included it shall be represented as a block or string in accordance with Section 6.
2. Levels should be taken at 5m lateral spacing and at changes of gradient.
3. Contours to be drawn at suitable intervals depending on site gradients.
4. Features recorded shall be given full 3D (xyz) coordinates. No features may be given a level 0.
5. Contractors attention is drawn to the earthworks and drainage defects recorded in the site information document and these are to be captured in the topographic survey along with any additional defects discovered whilst on site.
6. Reasonable efforts must be made to penetrate groups of bushes in order to obtain level information.

5.5 Within third party land

Where the survey extents extend into third party land this will be highlighted in the Scheme Task Order and the necessary permissions to enter the land obtained by Highways England in advance. Further requirements are detailed in Section 3.2.

5.5.1 Agricultural land and public open spaces

The same requirements as identified above shall apply except the accuracy level may be reduced to medium.

5.5.2 Private and commercial / industrial properties

Where included within the survey extents these shall be treated as identified above with the same frequency and accuracy as that required on trunk roads regardless of the class of the adjacent highway.

Particular attention should be paid to the building footprint, line of roadways, drives and paths as well as boundary information.

Further requirements will be detailed in the Scheme Task Order.

6.0 Presentation

The Survey Contractor shall provide two CAD files in AutoCAD 2010 dwg or dxf format one to be 3D and the other 3D for use with AutoCAD Civil 3D.

The presentation scale for the survey output drawings shall be 1:250 on trunk roads and 1:500 on motorways unless otherwise stated in the Scheme Task Order.

Drawings shall contain the Survey Contractors title block and contact details and a table detailing the control stations created / used as detailed in Section 4.3. Additionally a legend of all symbol types used shall be incorporated.

In addition, for digital data formats presentation, the data shall be compatible with the following:

- a. Modelling / CAD system MX Road V8i Version - AutoCAD (2010/LT 2010)
- b. Transfer / exchange format
 - (i) MX in Genio format and Survey Codes
 - (ii) AutoCad as Dwg File (2010) with 3d points as blocks,
 - (iii) AutoCAD Civil 3D ASCII and CSV point files in PNEZD format. Point description shall be in accordance with Appendix B. The description in the point files shall be a four letter notation with the full description provided in a features table.

All features not defined under Appendix B of Manual of Contract Documents for Highway Works Volume 5 Section 1 Part 2 shall be represented by a four letter notation. The full description shall be provided in a features table along with the survey in electronic format.

- (iv) For watercourse and flood plain surveys, the data is to be delivered in EACSD format (<http://www.eacsd.co.uk/documentation>). The EACSD format is an ASCII format that is open and independent of survey and modelling software. The Surveyor is to also verify the survey data as compatible with HEC-RAS and Flood modeller geometry files as specified in the Addendum to the Specification for watercourse and flood plain surveys'

6.1 Basic settings

The following settings shall be used:

- Text style shall be RomanS
- Point styles shall be in absolute units appropriate to the presentation scale
- Drawing base units to be set to 'Unitless'.
- No information shall be placed on layer 0

6.2 Use of layers

The drawing layer name convention shall reflect the items listed in Section 5 and named in accordance with the BIM layering convention defined in the NBS so to minimise ambiguity as to the information contained within it. The colour definition for each layer may be at the discretion of the surveyor but shall be used in such a way as to aid in the visual clarity of the survey. Line type definition for each layer shall be continuous except for road markings and fence lines. Individual road markings shall be presented in a line type that reflects the marking surveyed. A library of such line types is available on request.

6.3 Use of blocks

Use of pre-defined blocks to represent surveyed features is permissible provided that this provides an accurate representation of the feature's extents and levels. Where blocks are used the insertion / base point shall reflect the part of the feature that was surveyed. The block orientation and size shall reflect and match the additional points surveyed for the feature. Where the shape and / or level information for an element cannot be adequately represented by a block then strings shall be used.

For all block definitions line colour and type shall be defined as 'by block'.

6.4 Requirements specific to 3Dfiles

3Dfiles shall include contours represented at regular intervals across the survey extents. The required interval for contours will vary between sites and as such should be determined in a manner that provides sufficient indication of the general topography of the site without undue

'clutter'. Broadly the interval shall not be less than 100mm on flat sites or greater than 500mm on sites with significant level range. Major contours at each fifth interval shall be shown differently (weight or line type) so as to aid reading and shall be labelled with its level.

The 3Doutput file shall contain spot level information for all key features along with heights of features such as walls, fences and overhead cables. Additional information on type, size and nature of features surveyed shall also be included.

6.5 Requirements specific to 3D files

No string lines shall cross any other string or block entity as this causes errors when creating a surface with AutoCAD Civil 3D. Contours shall not be included in the 3D file. No feature or item within the 3D file shall have a zero level.

7.0 Quality Control

7.1 Collection of data on site

The Survey Contractor shall employ a suitable methodology to ensure that the requirements of this specification are met and that all relevant features are recorded.

7.2 Presentation data

The survey contractor shall undertake a review of both 3Dand 3D output files for compliance to this specification prior to issue to Highways England. For the 3D file particular attention should be paid to ensuring there are no level anomalies that produce an inaccurate representation of the site topography.

7.3 Record keeping

All source survey information shall be safely held by the Survey Contractor for a period of five years from the date of completion of the Survey Contract.

7.4 Sub-standard surveys

Omission of multiple items or of items of significant size / obvious nature particularly where these have a bearing on the proposed works will be considered sub-standard.

In such circumstances Highways England will review the impacts of the omission(s) and any mitigating circumstances offered for the omission. In exceptional circumstances Highways England reserve the right to instruct a return to site for collection of the missing data at the surveyors own expense, including TM costs if deemed appropriate.