

Flood Risk and Hydraulic Modelling Technical Note

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Author	Amelia Vale BSc (Hons) M.Phil Ph.D		
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1. Introduction

This technical note report has been prepared by Hydrock, now Stantec, on behalf of Tritax Big Box Developments Ltd, to provide an executive summary of the hydraulic modelling assessment for Tritax Park Cambridge, completed in November 2024.

The purpose of this hydraulic modelling study was to provide a detailed and site-specific assessment of flood risk. This technical note has been prepared in order to address comments from the Greater Cambridge Housing and Economic Land Availability Assessment (HELAA). It includes a summary the findings of recent assessments, which demonstrate that, following comprehensive modelling, the proportion of the site shown to be located within Flood Zone 2 is greatly reduced, and the flood risk present would not constitute a constraint to development at the site.

2. Site Information

The site is located to the north of the A14, Huntingdon Road, to the north of Bar Hill and northwest of Cambridge. The site's approximate postcode is CB23 8DS. The site comprises two plots, College Land and Wedd Land. Combined they cover a total area of approximately 122 hectares (Ha). The site and plot boundaries are shown in **Figure 1**, below. The current site use is predominantly agricultural land, with some existing farm buildings located in the east.

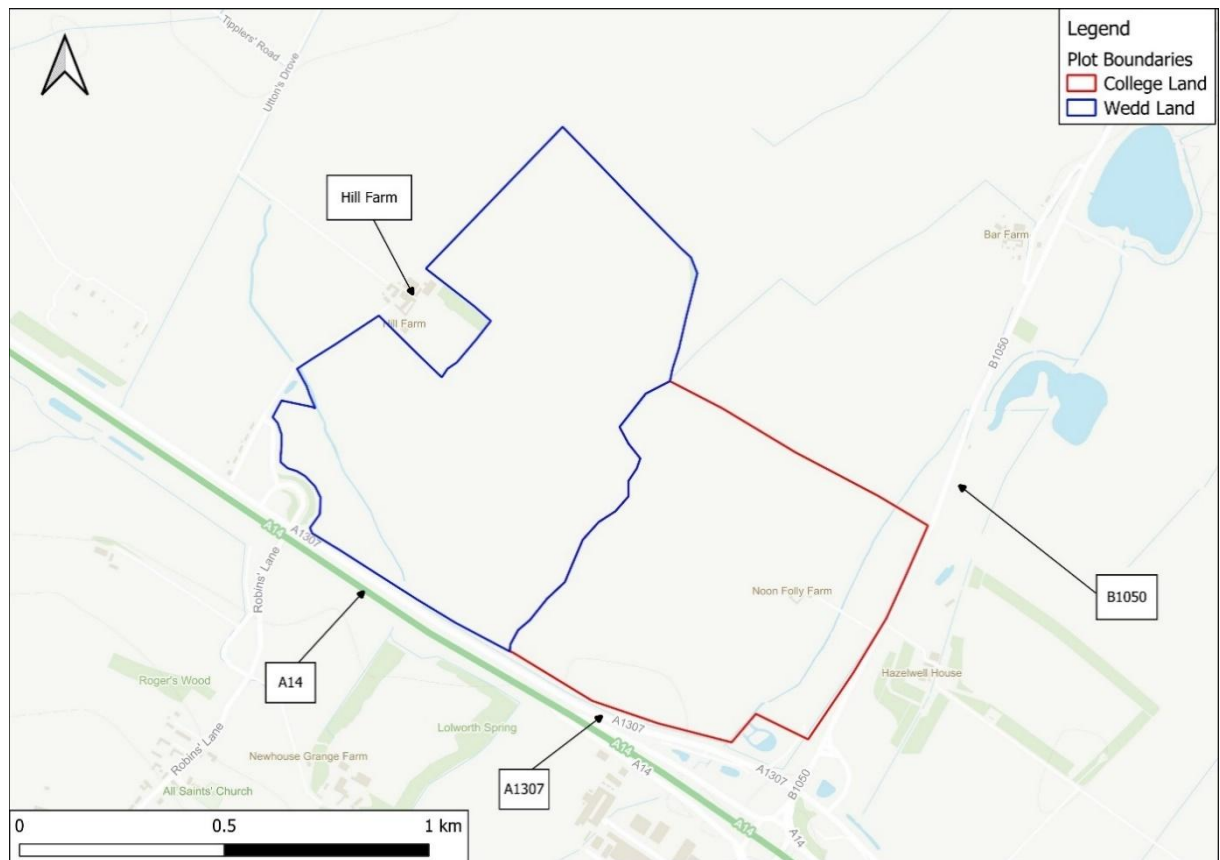


Figure 1: Site Location

There are several unnamed watercourses within and surrounding the site, which form the basis of the site-specific hydraulic model. The relevant watercourses are shown in **Figure 2** and described below.

There is an unnamed watercourse located to the west of the B1050, which flows in a northward's direction along the eastern boundary of the College Land site, which is referred to as the 'Longstanton Brook'.

To the west of the Longstanton Brook, there is an unnamed watercourse flowing in a northward's direction along the boundary of the College Land and Wedd Land sites, referred to herein as the 'Bar Farm Drain'. The Bar Farm Drain arises in the south of development site.

There is an unnamed watercourse to the east of the Longstanton Brook, rising approximately 500 m to the northeast of the site boundary, which is referred to as the 'Wilson Drain'. The Wilson Drain acts as a tributary for the Longstanton Brook and flows in a northward's direction towards the village of Longstanton.

There is an unnamed watercourse arising near Lolworth Spring to the south of the A14, flowing in a north westward's direction through the Wedd Land site. This watercourse is referred to as the 'Wedd Land Brook'.

Finally, there are two land drains flowing parallel to the A14 in a westward's direction, one to the north and one to the south of the A14. For the purpose of this report, and due to the size of the channels, the land drains have remained unnamed.

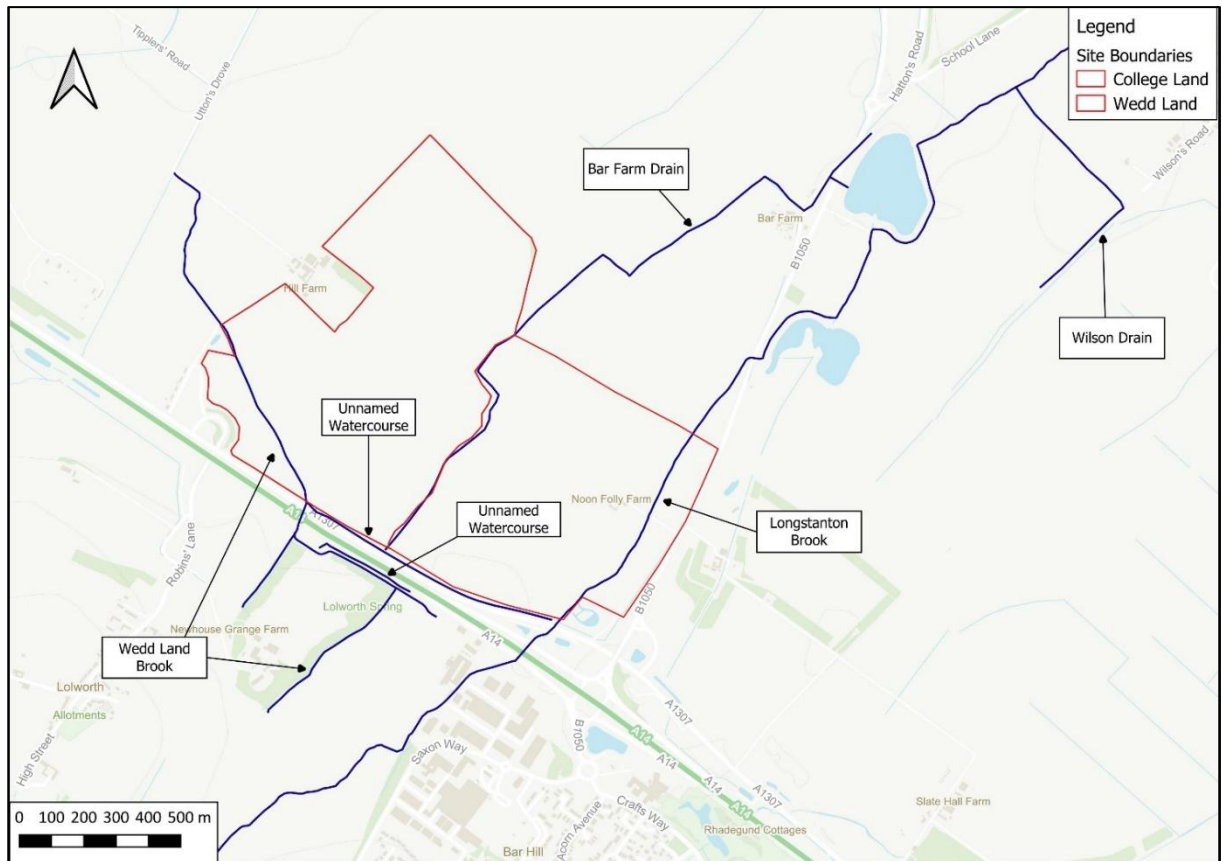


Figure 2: Watercourses within and in proximity to the site

Table 1: Flood Zone Definitions

Flood Zone	Definition
Flood Zone 1 (Low Probability)	Land having a less than 0.1% annual probability of river or sea flooding
Flood Zone 2 (Medium Probability)	Land having between a 1% and 0.1% annual probability of river flooding; or land having between a 0.5% and 0.1% annual probability of sea flooding
Flood Zone 3a (High Probability)	Land having a 1% or greater annual probability of river flooding; or Land having a 0.5% or greater annual probability of sea
Flood Zone 3b (Functional Floodplain)	This zone comprises land where water from rivers or the sea has to flow or be stored in times of flood. The identification of functional floodplain should take account of local circumstances and not be defined solely on rigid probability parameters. Functional floodplain will normally comprise: • Land having a 3.3% or greater annual probability of flooding, with any existing flood risk management infrastructure operating effectively; or • Land that is designed to flood (such as a flood attenuation scheme), even if it would only flood in more extreme events (such as 0.1% annual probability of flooding)

Within the HELAA, it is noted that approximately 47% of the College Land plot is located within Flood Zone 2 and 1% within Flood Zone 1. For the Wedd Land, approximately 11% of this plot is located within Flood Zone 2 with no Flood Zone 3 present. However, it should be noted that the Wedd Land Brook is not represented in the EA's Flood Map for Planning, which is considered to be the primary reason for the small area of Flood Zone 2 and no Flood Zone 3 being present on-site.

When considered as a whole, approximately 27% of the combined site is shown to be within Flood Zone 2 and 0.5% within Flood Zone 3.

3.2 Hydrock's Site-Specific Hydraulic Model

Following review of the EA's current flood maps and discussions with the EA, Hydrock, now Stantec, completed a site-specific hydraulic modelling study of the site in November 2024 (ref: 31188-HYD-XX-XX-RP-WENV-0004, **Appendix A**). The model has been submitted to the EA for review and approval.

The site-specific hydraulic model was used to simulate the baseline scenario, which represents the current site condition, for the 1 in 30 year, 1 in 100 year, 1 in 100 year +19% climate change (CC) and 1 in 1000 year events.

The new baseline flood extents are shown in **Figure 4**. The simulation results show that in the east of the site, up to and including the 1% AEP + 19% CC design flood, flooding is contained within the Longstanton Brook, with out-of-bank flooding occurring only in the 0.1% AEP event.

In the centre of the site, flooding remains contained within the Bar Farm Drain for all design events until the downstream limit, where the drain adjoins the unnamed watercourse, and accumulation occurs.

In the west of the site, and along the southwestern site boundary, out-of-bank flooding occurs for all modelled events along the Wedd Land Brook, and the unnamed watercourse that runs parallel with the site boundary.

The site-specific modelled flood extents are equated to Flood Zones in **Figure 5**.

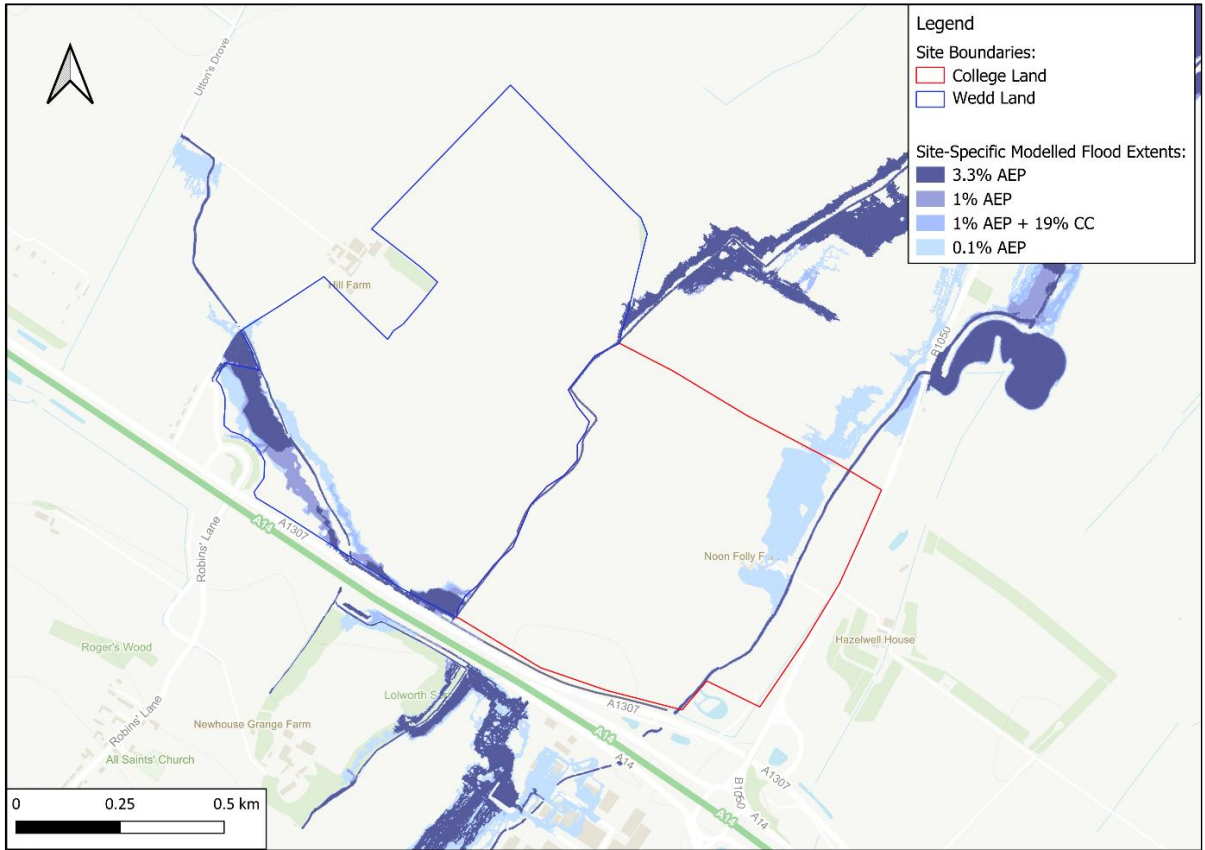


Figure 4: Baseline flood extents

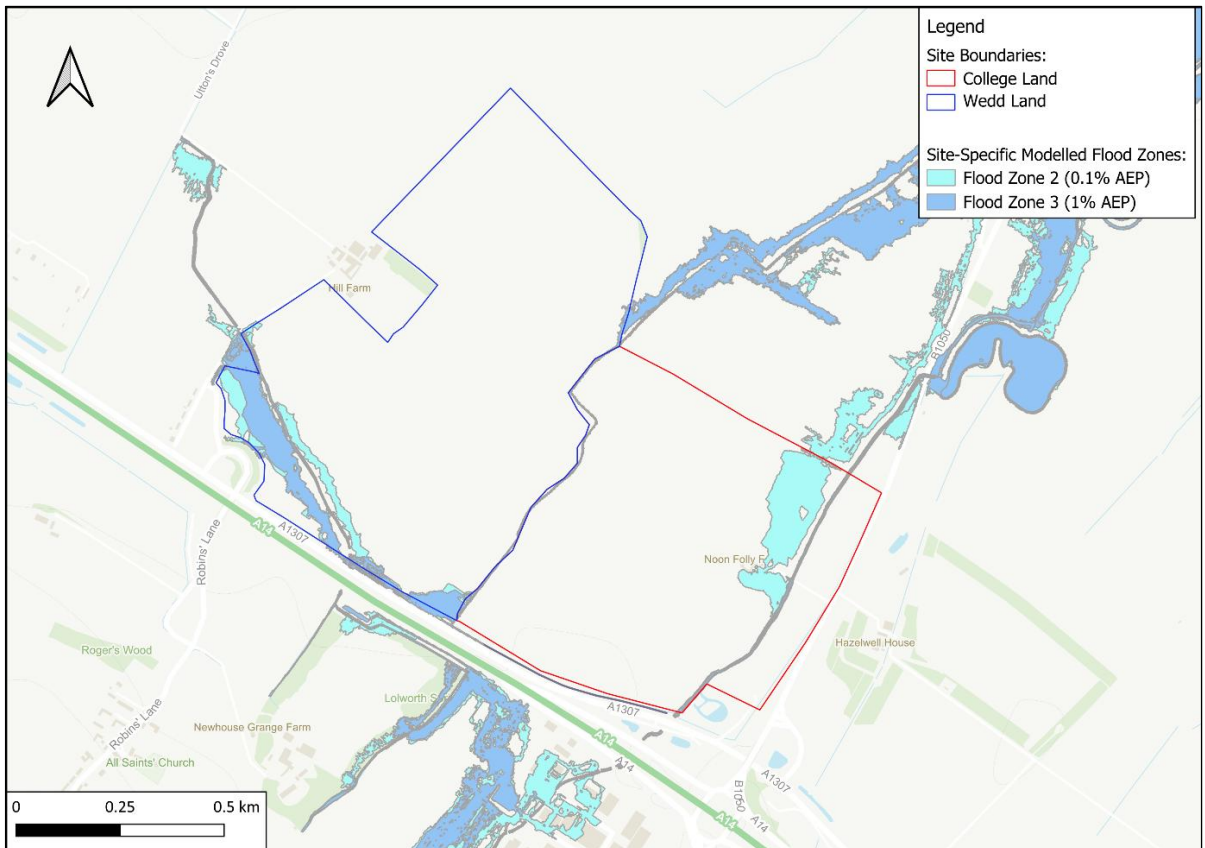


Figure 5: Site-specific modelled flood zones

When considering these updated flood extents, approximately 8% of the College Land Plot is shown to be within Flood Zone 2, with approximately 1% located within Flood Zone 3. For the Wedd Land, approximately 7% of this plot is located within Flood Zone 2 and 5% within Flood Zone 3.

When the two plots are considered as a whole, approximately 8% of the combined site is located within Flood Zone 2 and 3% within Flood Zone 3.

3.3 Comparison between site-specific hydraulic model with EA Flood Zones

The site-specific hydraulic modelling results show a significant reduction in flood extent across the site, particularly surrounding the Longstanton Brook in comparison to the existing EA Flood Map for Planning, as shown in **Figure 6**. Furthermore, there is a decrease in the overall flood extent through the centre of the site, with flows predicted to remain in-channel.

The site-specific modelling does show an increase in the flood extent surrounding the downstream extent of the Wedd Land Brook. However, it should be noted that the EA Flood Map for planning did not include a representation of the Wedd Land Brook and was likely underrepresenting flood risk from this watercourse as a result.

The differences in the flood extents relate to the improved representations of the channel geometries collected during the watercourse surveys, as well as the incorporation of the structures in both the Longstanton Brook and Wedd Land Brook.

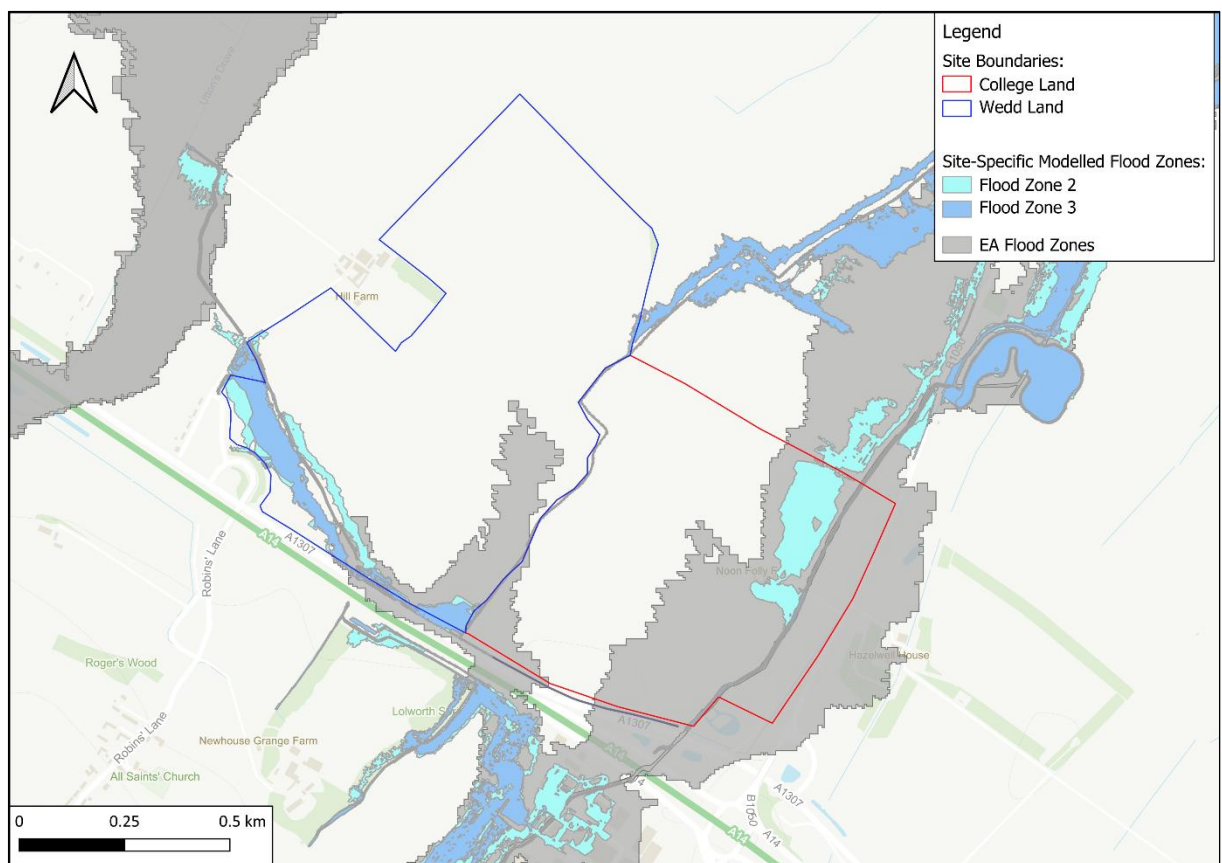


Figure 6: Comparison of Flood Zones between Hydrock site-specific modelled flood extents and EA Flood Zones

Table 2 overleaf presents a comparison of the proportions of the site areas located within Flood Zones 2 and 3, as defined by the EA Flood Map for Planning and the site-specific modelling carried out by Hydrock, now Stantec.

Table 2: Proportion of Sites Located within Flood Zone 2 and Flood Zone 3

Plot	Percentage of Plot Located Within (%)			
	EA Flood Zone 2	Updated Flood Zone 2	EA Flood Zone 3	Updated Flood Zone 3
College Land	48%	8%	1%	1%
Wedd Land	11%	7%	0%	5%
Combined Site	27%	8%	0.5%	3%

Based on this information, it can be seen that when considered as separate plots or as a whole, there is a considerable reduction in the proportion of the site located within Flood Zone 2 in the site-specific modelling when compared to the EA Flood Map for Planning. With regard to Flood Zone 3, there was an overall increase in the proportion of the site located within this flood extent in the site-specific modelling, however, as noted above, this is due to the EA mapping not including a representation of the Wedd Land Brook and underestimating flood risk as a result.

Overall, it has been concluded that there is considerable betterment in terms of flood risk on-site when considering the site-specific modelling, with the extent of flooding reduced significantly. This is attributed to the detailed assessment carried out, which took into consideration site-specific detail and features which were not present in the EA assessment.

3.4 Implications for Future Development

The refined flood extents predicted by the site-specific modelling would enable the site to be developed while meeting the requirements of the NPPF and Local Policy. It has been concluded that the site is largely at low risk of flooding (largely within Flood Zone 1), with only a small portion of the site surrounding the Wedd Land Brook shown to be at high risk of flooding (within Flood Zone 3). No development will be placed within the areas indicated to be at high risk of flooding, with these areas proposed for landscaping and use as a country park.

While 'less vulnerable' commercial uses would be considered acceptable within Flood Zone 2 under the NPPF, in order to ensure that the risk of flooding to the proposed development is as low as reasonably possible, development within Flood Zone 2 will be avoided as far as possible.

Based on this information, it is concluded that flood risk would not constitute a constraint to development at the site.

4. Conclusions

Hydrock, now Stantec, were commissioned to undertake detailed hydraulic modelling of several watercourses on land surrounding the A14, near Bar Hill and Longstanton, Cambridgeshire. The site-specific modelling included detailed representation of the following watercourses:

- » Longstanton Brook, located in the east of the site;
- » Wedd Land Brook, located in the southwest of the site;
- » Barr Farm Drain, which follows the boundary between College and Wedd Land, transecting the centre of the overall site;
- » Wilson Drain, which adjoins the Longstanton Brook north of the site; and
- » Three unnamed land drains.

The modelling results indicate a significant reduction in the extent of flooding surrounding Longstanton Brook and through the centre of the site, leading to a notable reduction in Flood Zone 2 in the eastern part of the site. The centre of the site is also now in Flood Zone 1.

Additionally, the updated modelling has assessed the risk of flooding to the site from the Wedd Land Brook, which was not represented in the EA Flood Map for Planning. For the full modelling report, please refer to **Appendix A**.

Overall, it has been concluded that the site-specific modelling predicts a reduced flood extent when compared to the EA Flood Map for Planning, indicating that development at the site would be suitable in line with the NPPF and Local Policy. Areas on-site shown to be located within Flood Zone 3 would remain free of development and are proposed to form a country park. Where possible development within Flood Zone 2 will also be avoided in order to ensure that the risk of flooding to the development is as low as reasonably possible.

Appendix A – Hydraulic Modelling Report



A14 Corridor, South Cambridgeshire Hydraulic Modelling Report

For Tritax Big Box Developments

Date 29 November 2024

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1. Introduction

This report has been prepared by Hydrock, now Stantec, on behalf of Tritax Big Box Developments to undertake a hydraulic modelling assessment for land to the north of A14, South Cambridgeshire. This Hydraulic Modelling Report (HMR) will inform the site-specific Flood Risk Assessment (FRA) to be submitted in support of a planning application for the proposed development.

This modelling study has been planned and conducted in accordance with the EA Computational Modelling to Assess Flood and Coastal Risk guidance document dated 27 October 2010. The report summarises the modelling methodology and outputs derived for the pre-development (i.e., baseline) scenario.

1.1 Aims and Objectives

This study aims to produce a local, bespoke hydraulic model of the watercourses surrounding the A14, north of Bar Hill, South Cambridgeshire. The following aims have been identified:

- » Review publicly available flood risk information relating to the site;
- » Estimate peak flows for the study catchment for a variety of storm events;
- » Build a model of the 1D domain, which includes the channel and in line hydraulic structures of two ordinary watercourses, using site specific topographic and channel survey;
- » Build a model for the 2D domain of land drains and the floodplain;
- » Hydrodynamically link the channels to the land drains and floodplain;
- » Run the model for a range of storm events, from the 1 in 30-year event to the 1 in 1000-year event, including the latest climate change where appropriate;
- » Review the model results and compare to existing flood risk datasets; and,
- » Undertake sensitivity analysis on key model assumptions such as roughness and structure blockages.

1.2 Approach and Sources of Information

In order to achieve the study aims highlighted above, a new 1D/2D hydraulic model of the watercourses surrounding the A14, north of Bar Hill, within ESTRY/TUFLOW software was built.

The 1D model has been based on the following surveys, all undertaken by Storm Geomatics in 2024:

- » 24HD0022200_DCS_UNK01
- » 2750_DPP_WTR01
- » 2750_DPP_WTR02
- » 2750_DPP_WTR03
- » 2750_DPP_WTR05
- » 2750_DPP_WTR07
- » 2750_DPP_WTR08

A peak flow estimation has also been undertaken for the catchment using WINFAP v5.1 and ReFH2.3 software's, which are the latest available at the time of writing this model report.

Furthermore, the following sources of data were used to develop the hydraulic model:

- » Environment Agency (EA) Flood Map for Planning (FMfP);
- » EA Surface Water Flood Map;
- » EA Recorded Flood Outlines Dataset;
- » EA Fluvial Climate Change Allowances; and,
- » Light Detecting and Ranging (LiDAR) Composite Digital Terrain Model (DTM) (dated 2022) at 1m resolution.

The 2D domain of the model has been informed using LiDAR data, as well as the following surveys, all undertaken by Storm Geomatics in 2024:

- » Surveys informing watercourse extents:
 - » 2750_DPP_WTR04
 - » 2750_DPP_WTR05
 - » 2750_DPP_WTR06
- » Topographical surveys:
 - » 24HD0022200_DTO_Cambs.dwg
 - » 24TRI012367_DTO_A14 Topo_TP.dwg

All of the survey data is included in **Appendix A** and is discussed in further detail in **Section 4.3** and **Section 4.5** of this report.

2. Site Information

2.1 Site Location

The proposed development site consists of two separate parcels of land, both located to the north of the A14, Huntingdon Road, to the north of Bar Hill and northwest of Cambridge.

When discussed in isolation, the sites are defined as the College Land plot and the Wedd Land plot, and when grouped together, the plots are described as 'the site' herein this report. The site and plot boundaries are shown in **Figure 1** below.

The current site use is predominantly agricultural land, with some existing farm buildings located in the east.



Figure 1: Site Location

2.2 Watercourses

There are several, unnamed watercourses within and surrounding the site, which form the basis of this hydraulic model. The relevant watercourses are shown in **Figure 2** and described below.

There is an unnamed watercourse located to the west of the B1050, which flows in a northward's direction along the eastern boundary of the College Land site, which is referred to as the 'Longstanton Brook'.

To the west of the Longstanton Brook, there is an unnamed watercourse flowing in a northward's direction along the boundary of the College Land and Wedd Land sites, referred to herein as the 'Bar Farm Drain'. The Bar Farm Drain arises in the south of development site.

There is an unnamed watercourse to the east of the Longstanton Brook, rising approximately 500m to the east of the site boundary, which is referred to as the 'Wilson Drain'. The Wilson Drain acts as a tributary for the Longstanton Brook and flows in a northward's direction towards the village of Longstanton.

There is an unnamed watercourse arising near Lolworth Spring to the south of the A14, flowing a north westward's direction through the Wedd Land site. This watercourse is referred to as the 'Wedd Land Brook'.

Finally, there are two land drains flowing parallel to the A14 in a westward's direction, one to the north and one to the south of the A14. For the purpose of this report, and due to the size of the channels, the land drains have remained unnamed.



Figure 2: Watercourses surrounding and within the site

2.3 Environment Agency - Flood Map for Planning

The EA's Flood Map for Planning (**Figure 3** below) shows that the proposed development site is partially located within Flood Zone 1, however, there is evidence onsite of land located within Flood Zone 2 (Medium Probability).

In the College Land plot, the southwestern corner and the eastern half of the site are located in Flood Zone 2. In the Wedd Land plot, an area extending from the southeastern corner of the site is located in Flood Zone 2.

Furthermore, there is a small area of the College Land plot located in Flood Zone 3. The area of Flood Zone 3 is associated with the boundaries of the Longstanton Brook, which flows along the eastern boundary of the College Land plot.



Figure 3: EA Flood Map for Planning

2.4 Environment Agency - Surface Water Flood Map

The EA's Surface Water Flood Risk Mapping shows that a large proportion of the site is at a 'very low' risk of surface water flooding. However, **Figure 4** below indicates that there are areas throughout the site that are at 'low', 'medium', and 'high' risk of surface water flooding, corresponding to the annual chance of flooding of between 0.1% and 1%, between 1% and 3.3%, and greater than 3.3%, respectively.



Figure 4: EA Long Term Flood Risk Mapping

The areas at 'high' and 'medium' risk of surface water flooding are generally isolated through the site, and are indicative of ponding within low points associated with the onsite topography, or representative of fluvial flows within the onsite ordinary watercourses.

The areas of 'low' risk surface water flooding are more extensive throughout the site, and are representative of onsite surface water flow routes. There is one surface water flow route flowing in a northward's direction along the eastern boundary, and one flow route flowing in a north westward's direction towards the centre of the western boundary. There is also evidence of surface water flooding associated within the boundaries of the onsite watercourses, and this is understood to be representative of fluvial flows associated with the ordinary watercourses.

The EA's Surface Water Flood Risk Mapping is based on strategic level data that does not include a detailed representation of the channel and associated hydraulic structures such as culverts and bridges.

2.5 Historic Flooding

The EA's Recorded Flood Outlines dataset shows the site to be positioned beyond the extent of all previous historical flood extents, with the nearest area of flooding located approximately 995m to the north of the site. The EA's Historical Flood Map is shown in **Figure 5** below.



Figure 5: EA Historic Flood Map

3. Hydrological Modelling

A full hydrological analysis was undertaken as part of this study to derive the peak flow and hydrographs for the watercourses within the hydraulic model. Climate change has been applied by using the central allowance for the 2080s, as the site sits within the Upper and Bedford Ouse Management Catchment (19%).

The derived flows were applied to the hydraulic model using flow-tie (QT) boundaries, as discussed in **Section 4.3** below, and in the Flood Estimation Report.

The final peak flows can be found below in **Table 1** below.

Table 1: Catchment Peak Flows

Site Code	1 in 30-Year	1 in 100-Year	1 in 100-Year + 19% CC	1 in 1000-Year
LBD	5.47	6.93	8.25	12.03
LBU	2.95	3.76	4.47	6.58
BFD	0.65	0.83	0.99	1.46
WND	0.18	0.23	0.27	0.41
WLB	0.82	1.05	1.25	1.83

4. Hydraulic Modelling

TUFLOW's Heavily Parallelised Compute (HPC) Solver was used (version 2023-03-AC), which uses an adaptive timestep to solve equations, with single precision chosen, the most common for HPC models. TUFLOW's built in 1D component, ESTRY, was used to model the 1D domain.

An overall model schematic is available in **Appendix B**.

4.1 Model Files

The list of files for the model are as follows:

- » TUFLOW Control File (TCF): A14_~s~_~e1~_027.tcf (where 027 is the model version (i.e., 027 - version 27)
- » ESTRY Control File (ECF): A14_~s~_~e1~_027.ecf
- » TUFLOW Geometry Control File (TGC): A14_017.tgc
- » TUFLOW Boundary Conditions File (TBC): A14_020.tbc
- » TUFLOW Event File (TEF): A14_001.tef
- » TUFLOW Materials File (TMF): A14_002.tmf
- » Shapefiles: all referenced within the TCF, TGC and TBC.

4.2 Events and Scenarios

The model has been run for the baseline scenario, which represents the current site condition.

The modelled design events for the baseline scenario are presented in **Table 2**.

Table 2: Modelled Events

Return Period	AEP
1 in 30-Year	3.33%
1 in 100-Year	1%
1 in 1000-Year + 19% CC	1% + 19% CC
1 in 1000-Year	0.1%

4.3 1D Domain

The 1D domain for this hydraulic model encompasses the Longstanton Brook and Wedd Land Brook watercourses. The Bar Farm Drain and Wilson Drain were both included in the model in the 2D domain only, as the width of the channel matched the model grid size, as discussed in **Section 4.5** below.

See **Figure 6** below for the extent of the 1D modelled reach.



Figure 6: Schematic of 1D Model Extent

4.3.1 Longstanton Brook

The 1D domain of the Longstanton Brook extends from south of the A14, along the eastern boundary of the site, and north of the site to the point at which the watercourse enters a culvert that passes beneath the B1050. The total length of the 1D domain for the Longstanton Brook is approximately 2.75km.

The 1D domain for the Longstanton Brook was constructed using watercourse and structure-specific cross section survey data. The survey data used to construct the 1D domain of the Longstanton Brook is included in **Appendix A**. The survey data included in the 1D domain for the Longstanton Brook is detailed below, all provided by Storm Geomatics:

- » 24HD0022200_DCS_UNK01
- » 2750_DPP_WTR07
- » 2750_DPP_WTR08

Furthermore, LiDAR data was used to inform the 1D domain of the open channel for the reach of the Longstanton Brook that is located between the survey data 2750_DPP_WTR07 and 2750_DPP_WTR08, and the reach that is located upstream of the survey data included in 2750_DPP_WTR08. Cross sections of the channel were taken from the LiDAR DTM data across the width of the channel from the top of the left bank to the top of the right bank.

Figure 7 below represents the extent of the Longstanton Brook and highlights the data source for the varying sections of the channel.



Figure 7: Longstanton Brook Extent and Data Sources

4.3.2 Wedd Land Brook

The 1D domain for the Wedd Land Brook matches the coverage of the watercourse survey from upstream of the A14, near Lolworth Spring. The upstream extent of the Wedd Land Brook consists of 2 tributaries, which converge and flow northwards beneath the A14 in a rectangular shaped culvert. The domain then extends in a north westward's direction with the watercourse, and culminates where the watercourse intersects with Utton's Drive to the west of the site. The total length of the 1D domain for the Wedd Land Brook is 2.5km.

The survey data used to construct the 1D domain of the Wedd Land Brook is included in **Appendix A**. The survey data included in the 1D domain for the Wedd Land Brook is as follows:

- » 2750_DPP_WTR01
- » 2750_DPP_WTR02
- » 2750_DPP_WTR03
- » 2750_DPP_WTR05

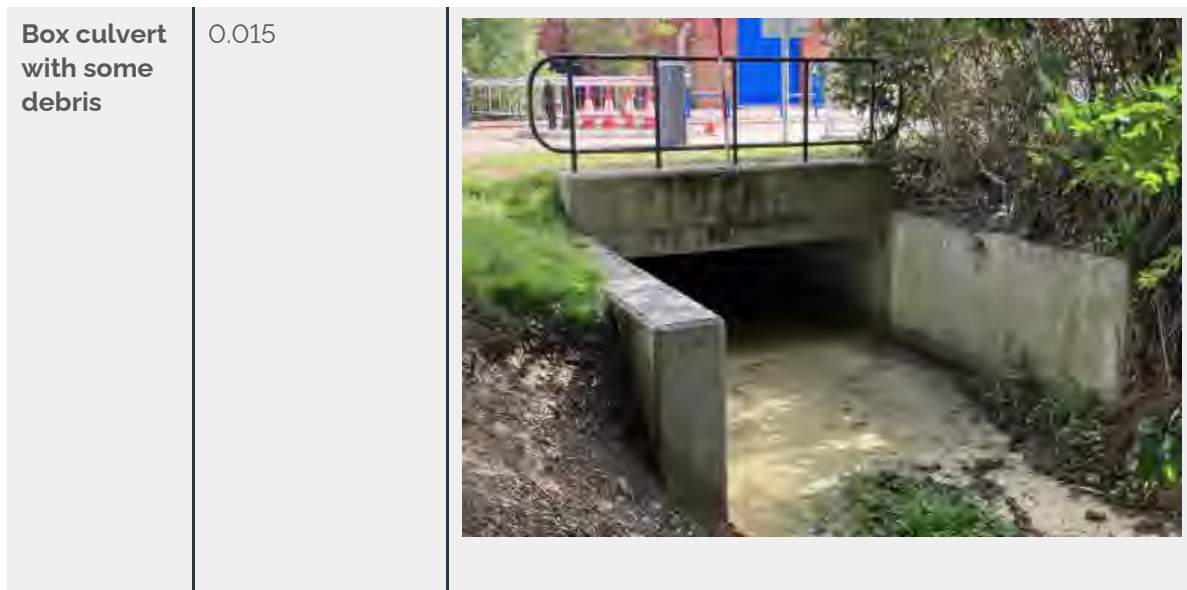
4.3.3 Roughness

Manning's n coefficients were used to defined the hydraulic roughness of the 1D domain based on the guidance set out in Chow (1959), where the river channel and structures were given a

value based on survey photographs based on bed material, vegetation, and sinuosity. Manning's n for each structure was provided in within the cross-section survey data, and engineering judgement was used to confirm this was an appropriate value. As a key parameter within the model, the Manning's n value has been sensitivity tested (see **Section 6** of this report). An example is shown in **Table 3**, however, values ranged from 0.011 to 0.035 across culverted reaches and open channels.

Table 3: Manning's n Example

Description	Manning's n Value	Photograph
Clean, straight, some stones and weeds	0.030	
Sluggish reaches, weedy, deep pools	0.07	



4.3.4 Boundaries

Boundaries were applied to the 1D domain for the Longstanton Brook as a flow-time (QT) point and region. The QT points provide the upstream inflows to the model, and the QT regions were used to evenly distribute the lateral inflows along the watercourse.

Boundaries were applied to the 1D domain for the Wedd Land Brook as flow-time (QT) points at the upstream extents of the watercourse. As the upstream extent of the Wedd Land Brook consists of two tributaries, QT points were applied for both tributaries with flows distributed based on the corresponding proportion of the catchment size.

4.3.5 Hydraulic Structures

A total of 23 hydraulic structures have been included in the hydraulic model.

Key information for these features was extracted from the watercourse surveys and other suppliers such as National Highways surveys. Further information regarding each structure is included in **Appendix C** of this report. This also contains information on any structure specific assumptions made during the modelling process.

4.3.6 Initial Conditions/Water Levels

A baseflow event was used to apply a steady state flow and allowing it to convey through the model. A TUFLOW restart file was then written a nominal time into the simulation and used for storm events to ensure that the channel was not dry during the first timestep.

4.4 1D/2D Links

The two domains were linked using HX links, which transfer the water level from the channel into the floodplain, providing that the levels of the cell they fall within is lower than the predicted flood level. The levels along the HX link were dictated by LiDAR. Cross sections were trimmed in the 1D domain at these levels (where the top of bank is located).

4.5 2D Domain

4.5.1 Grid size, Topography and Orientation

The selected grid size of 2m provided a fine resolution across the site whilst still achieving a good balance between resolution and model run times/output file sizes. The grid was orientated using a location line that was digitised in the predominant direction of flow, which for this site is north east.

The floodplain topography was based on a LiDAR Composite Digital Terrain Model (DTM) dated 2022, obtained at a 1m resolution. Two additional site-specific surveys, undertaken by Storm Geomatics in 2024, were utilised within the model to refine the topographic information with more accurate, site-specific information:

- » 24HD0022200_DTO_Cambs.dwg for the College Land plot; and,
- » 24TRI012367_DTO_A14 Topo_TP.dwg for the Wedd Land plot.

The topographical surveys were read into the .tgc as 2d_zsh regions and 2d_zsh points. The topographical surveys are included within the survey data in **Appendix A**.

4.5.2 2D Channels

As discussed in **Section 4.3** above, the Bar Farm Drain and Wilson Drain were both included in the model in the 2D domain due to them lying outside of the client's ownership and issues surrounding access to undertake detailed channel survey. Furthermore, the downstream extent of the Longstanton Brook, the land drains located to the north and south of the A14, and approximately 150m the upstream extent of the Wedd Land Brook to the south of the A14 were also modelled in the 2D domain. The width of these channels is equal to or smaller than the model grid size of 2m, and so the channels could not be accurately represented in the 1D domain.

The channels were modelled in the 2D domain using 2d_zsh layers to reinforce flows through the watercourses and land drains. For the Wilson Drain, the downstream extent of the Longstanton Brook and the Bar Farm Drain, the 2d_zsh layers comprise of a 2d_zsh line snapped to points that were informed by the LiDAR DTM to provide the elevation of the channel bed.

The topographical survey identified a circular pipe in the Bar Farm Drain, located in the upstream extent of the channel and in the centre of the site. This was directly linked to the 2D domain using SX lines.

For the land drains surrounding the A14, the 2d_zsh layers were informed by the following survey data:

- » 2750_DPP_WTR04
- » 2750_DPP_WTR05
- » 2750_DPP_WTR06

Figure 8 below highlights the location of the watercourses that have been modelled in the 2D domain, and identifies the source of information for each channel.



Figure 8: Channels modelled in the 2D domain and associated data sources.

4.5.3 Floodplain Roughness

Roughness in the floodplain was defined by the Manning's n coefficient, based on land use within the model active area and in line with guidance set out in Chow (1959). The land use was identified using Ordnance Survey MasterMap data purchased from BlueSky MapShop¹ to define use classes such as buildings, roads, woodland, farmland, etc. Where a value is not assigned by an overriding polygon, a global roughness of 0.035 was applied based on the dominant land use within the catchment. **Table 4** displays the values used within the TUFLOW Materials File (TMF).

Table 4: Manning's 'n' Roughness Values included in the TUFLOW Materials File

Land Use	Manning's n Value
Buildings	0.200
General Surface - Multi Surface	0.035
General Surface - Step	0.040

¹ [BlueSky Map Shop](#)

General Surface - Including agricultural land	0.060
Glasshouse	0.035
Inland Water	0.035
Landform - Natural Land/Slope	0.060
Natural Surface - Scrub/Non-coniferous trees/Rough grassland	0.100
Manmade Path	0.030
Road or Track	0.038
Structures	0.300
Unclassified	0.300

4.5.4 Initial Water Levels

There are multiple ponds within the 2D domain, all of which are located beyond the extent of the site boundaries. There are two larger ponds to the north of the site, located to the east of the B1050. Furthermore, there are two smaller ponds, with one located to the south of the site beyond the A14, and one to the west of the site.

An initial water level was added to ensure that the ponds are not dry during the first-time step. The water levels were informed by the LiDAR data, which provided an average water level across the surface of the lake.

4.5.5 Boundary Conditions

HQ boundaries were applied to the 2D domain in order to prevent the artificial raising of water levels, known as 'glass walling' and to allow water to flow out of the model. **Table 5** below provides information on the HQ boundaries included in the model, detailing the boundary name, location and slope.

Table 5: HQ Boundary Information

HQ Boundary Name	Boundary Location	Boundary Slope
2dDS1	Downstream extent of the Longstanton Brook watercourse, south of School Lane, Longstanton.	-0.01
2dDS2	Downstream extent of the 2D active code layer, located transecting the B1050 and Hatton's Road.	0.001
WTR_01	Downstream extent of Wedd Land Brook, to the east of Uttons Drove, south of land leading to Hill Farm.	0.0037

WTR_01

Downstream extent of Wedd Land Brook, to the east of Uttons Drove, north of land leading to Hill Farm.	0.0027
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A source-area (SA) boundary was also applied to the reach of the Longstanton Brook that is contained within the 2D domain, located downstream of the B1050, which was implemented to evenly distribute the lateral inflows along the 2D watercourses.

Finally, boundaries were applied to the 2D domain for the Bar Farm Drain and the Wilson Drain as watercourse-specific QT points at the upstream extents of each watercourse.

4.6 Assumptions and Limitations

- » The modelling exercise has made use of the available data at the time of construction and simulation. The model represents floodplain and channel conditions at the time of survey.
- » The model contains no formal representation of the conveyance within minor watercourses or ditches other than that captured within the 2D model grid as specified above and within the 1D model domain.
- » The 1m resolution of the LiDAR used within the model may negate any small-scale topographic features, although all significant features are believed to have been captured.
- » The baseline floodplain levels are derived from LiDAR, which has limited accuracy (+/- 0.15m). However, this is considered to be sufficient for the purpose of this exercise. The LiDAR data has also been supplemented with topographic surveys.
- » The bare earth DTM does not include for the presence of walls, buildings or other structures. Buildings have been modelled at ground level with an elevated roughness level in line with best practice.
- » This modelling exercise has been undertaken to produce a good representation of flood risk mechanism in and around the study site. It has not been designed to accurately map flooding in the wider catchment.

5. Model Warnings and Stability

5.1 Warnings

Prior to the simulation, the following warnings were observed during model initialisation:

- » *Warning 2583 - Material ID XXXX has a Manning's n value (0.200) greater than Wu n limit (0.100) - n value will be limited in Wu formulation.* The Wu eddy viscosity formulation is based on bed friction velocity, which in turn is dependent on manning's number. High manning's numbers produce very high viscosity values, which in turn can limit the model timestep through the diffusion or Peclet number (reported as "Nd" in the HPC output). In general, in areas where very high manning's numbers are used (for example the slowing effect of buildings may be represented as increased surface roughness), the flow velocity is much slower and the elevated viscosity has little effect, other than to slow the simulation down. An upper limit to the manning's number used in the Wu viscosity calculation was introduced in the 2023-03-AA release to limit the computed viscosity in regions of unusually high roughness. Note that this only affects the viscosity calculation, the momentum equation will continue to use the original roughness value (or lookup table) as defined in the materials file. This warning message indicates that one or more of the manning's values used exceed the limit imposed for Wu viscosity calculation. The default limit is 0.1.
- » *Warning 2073 - Object ignored. Only Points, Lines & Polygons used. GIS Object = Null shape.* This message is shown when there is a 'null' entry in the shapefile attribute table, however, this will not impact the model grid levels as are no geometries or attributes attached to these features. A review of the check files shows everything has been represented in the modelled extent
- » *Warning 1253 - Unused 1d_ta line with specified attributes.* This message is shown when an unused link to tabular input has been found. A review of the check files shows that everything has been represented in the modelled extent.
- » *Warning 1317 - WLL does not cross (2-point WLL only) or snap to 1d channel.* This message indicates that the WLL is being ignored as it does not cross a 1D network channel or snap to a vertex on the 1D network as required for a WLL with three or more vertices. This does not impact the model as the WLL is used to display 1D results in the map output.
- » *Warning 2118 - Lowered SX ZC Zpt to 1D node bed level.* A review of all structures presenting this warning identifies that this has been correctly represented and a review of the results show good stability and reasonable flows through the structure.
- » *Warning 1100 - Structure UNK01/1099C crest/invert (17.040) is below bed (17.042) of primary upstream channel UNK01_01149.* As this is due to the decimal precision of 2mm, it is not considered that any further action is required.

There were no warnings observed during the simulation.

5.2 Stability

The HPC solver used an adapted timestep to solve the equations to find a balance between model stability and run time. A timestep that is required to drop below 1/10th of the model grid size (in this instance 0.2s) would be indicative of poor model stability.

Figure 9 below shows that the timestep remained steady over the whole duration of the simulation, which is indicative of good model stability. Nu, Nc and Nd values were also checked

and shown to remain within the appropriate range. Flow and stage time series were checked throughout the model to ensure the continuity of flow and smooth hydrographs, with no issues observed that would compromise the results at the site.

Figure 7 also indicates that the timestep stabilises at approximately 0.45s and as such, given the timestep remains above 1/10th of the model grid size (in this instance 0.2s), the model is considered to be stable.

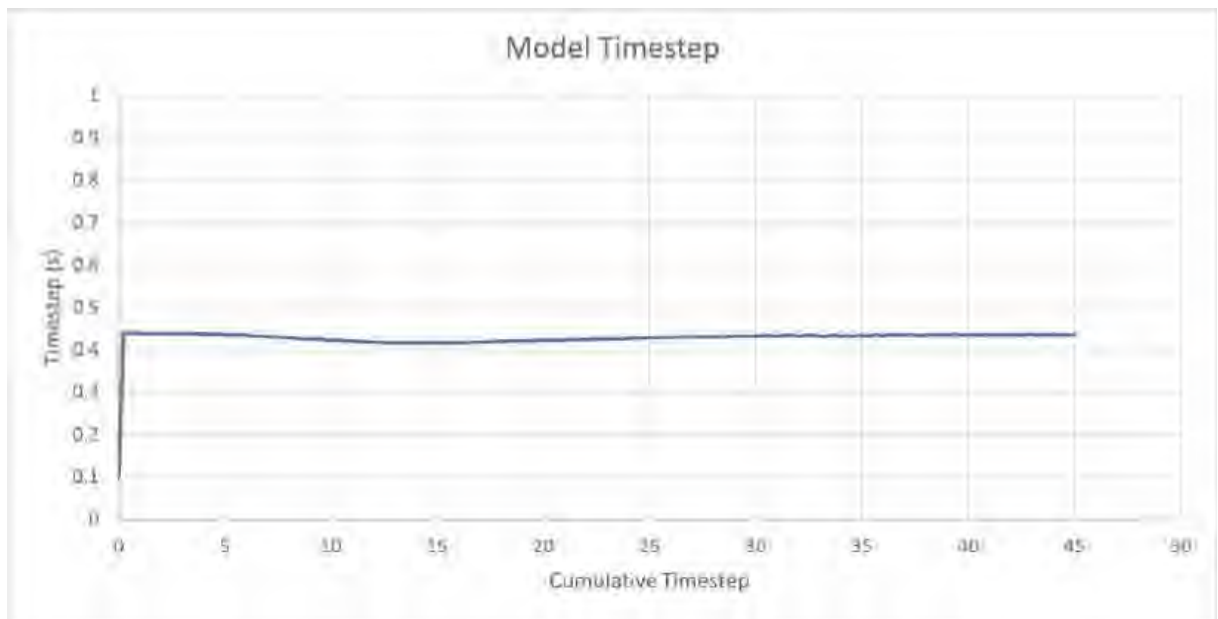


Figure 9: Model Timestep over the 100yr+19% simulation

6. Sensitivity Tests

A number of sensitivity tests were carried out on the 1 in 100-year + 19% CC event to understand how the model results would be impacted in the event that several of the assumptions/parameters are altered. These are each described in more detail within their associated section.

6.1 Manning's N Roughness Coefficient

6.1.1 -20% Manning's N Roughness Coefficient

The hydraulic roughness in both the channel and floodplain was reduced to provide an indication of the impact of seasonal conditions or if a flood event were to occur following channel maintenance i.e., where vegetation was sparser. This test resulted in slightly reduced water level within both the Longstanton Brook and Wedd Land Brook, with a reduction in in-channel peak water levels by up to 50mm. There was also a slight reduction in the extent of flooding within the Wedd Land plot, with a reduced area of flooding to the north of the channel.

Figure 10 below demonstrates the reduction in flood extent due to the 20% reduction in Manning's N roughness coefficient.



Figure 10: Flood Extent Comparison - 1 in 100 Year plus 19% Climate Change and 1 in 100 plus 19% Climate Change - 20% decrease in Manning's N roughness coefficient

6.1.2 +20% Manning's N Roughness Coefficient

The hydraulic roughness in both the channel and floodplain was increased to provide an indication of the impact of summer seasonal conditions or if a flood event were to occur following a period where the channel was not maintained i.e., where vegetation coverage was increased. This test resulted in an increase in the water level within the Longstanton Brook and Wedd Land Brook, which an increase in in-channel peak water levels by up to 50mm. There was also a slight increase in flood extents to the north of the Wedd Land Brook, however, flood depths in this area remain below 25mm.

Figure 11 below displays the increase in flood extent to the north of the Wedd Land Brook as a result of the 25% increase in Manning's N coefficient.



Figure 11: Flood Extent Comparison - 1 in 100 Year plus 19% Climate Change and 1 in 100 plus 19% Climate Change + 20% increase in Manning's N roughness coefficient

6.2 Downstream Boundary

The gradient of the downstream boundary was increased and decreased by 20% to understand if the model is sensitive to changes in downstream boundary conditions and what the potential backwater effect could be. The results showed that the model is not sensitive to changes in the gradient in the downstream boundary as the flood extents and flood levels remain constant throughout the site.

7. Baseline Results

7.1 Hydrock, now Stantec, Hydraulic Modelling Results

The baseline flood extents are presented in **Figure 12** below, and peak flood levels for the model extents are presented in **Table 6** below. More detailed mapping, including flood depths, is provided in **Appendix D**.



Figure 12: Baseline Floodplain Extents (including nodes to reference flood levels)

Table 6: Peak Flood Levels

Node	Peak Flood Level (1 in 30 Year) m AOD	Peak Flood Levels (1 in 100 Year) m AOD	Peak Flood Levels (1 in 100 Year + 19% CC) m AOD	Peak Flood Levels (1 in 1000 Year) m AOD
1	18.515	18.525	18.533	18.555
2	18.159	18.164	18.167	18.178
3	16.076	16.094	16.095	16.099
4	15.794	15.811	15.812	15.816
5	N/A	15.415	15.417	15.421

6	N/A	15.178	15.178	15.180
7	14.350	14.368	14.386	14.423
8	13.680	13.703	13.725	13.771
9	N/A	N/A	N/A	14.781
10	N/A	N/A	N/A	15.631
11	N/A	N/A	16.523	16.591
12	18.049	18.057	18.064	18.073
13	17.077	17.082	17.094	17.100
14	15.412	15.419	15.425	15.448
15	N/A	N/A	N/A	16.997
16	N/A	N/A	N/A	16.012
17	N/A	N/A	N/A	15.520

As is shown in **Figure 12** above, flooding is largely contained within the banks of the Longstanton Brook and Bar Farm Drain within the site boundaries. However, there is some evidence of flooding onsite to the left bank of the Longstanton Brook during the 1 in 1000-year fluvial flood event.

There is evidence of fluvial flooding along the south and southwest of the Wedd Land site for all of the modelled flood events. This fluvial flooding is associated with the Wedd Land Brook and local topography, as the ground profile slopes in a south westward's direction towards the western extent of the site.

Furthermore, there is also evidence of flooding through the centre of the site, corresponding to the location of the Bar Farm Drain.

7.2 EA Data Comparison

The site-specific hydraulic model shows a general reduction in flood extent surrounding the Longstanton Brook in comparison to the EA Flood Map for Planning, as is shown in **Figure 13** below. Furthermore, there is a decrease in the overall flood extent through the centre of the site.

There is, however, an increase in the flood extent surrounding the downstream extent of the Wedd Land Brook.

The differences in the flood extents are likely due to the improved representations of the channel geometries collected during the watercourse surveys, as well as the incorporation of the structures in both the Longstanton Brook and Wedd Land Brook. On this basis, the site-specific model results are preferred.

A comparison between the modelled flood extents and EA Flood Zones is provided in **Figure 13** below for clarity.



Figure 13: Modelled V EA Flood Zones

8. Conclusions

Hydrock, now Stantec, have been commissioned to undertake detailed hydraulic modelling of numerous watercourses on land surrounding the A14, near Ball Hill and Longstanton, Cambridgeshire.

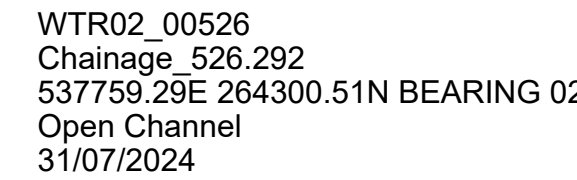
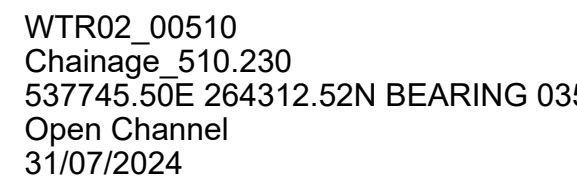
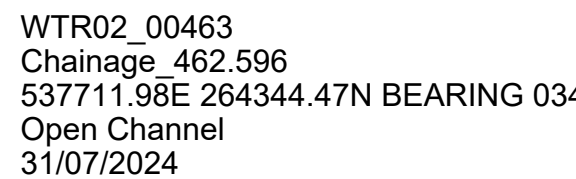
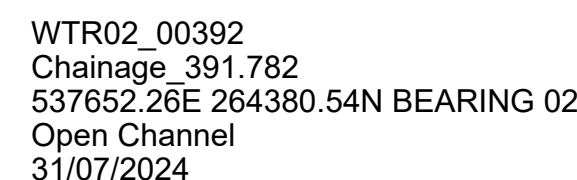
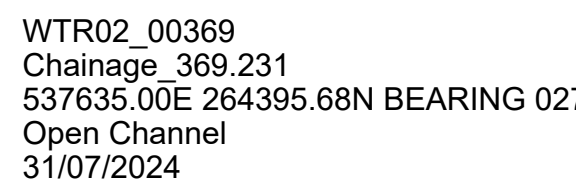
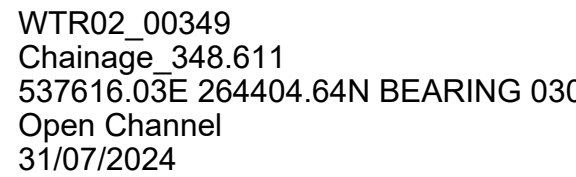
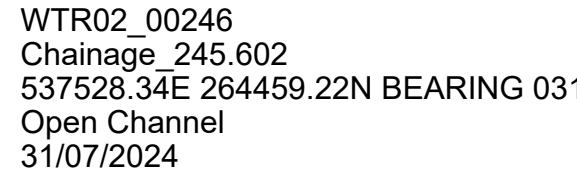
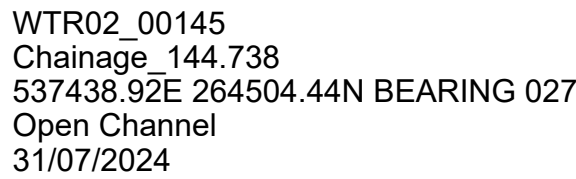
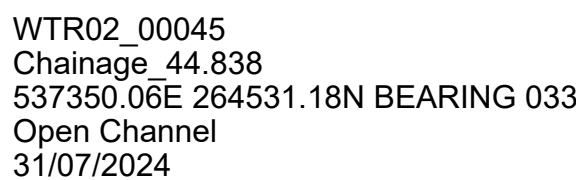
The two watercourses included in the 1D domain of the hydraulic model are the Longstanton Brook and the Wedd Land Brook, and there are several smaller watercourses included in the 2D domain, including the Bar Farm Drain and the Wilson drain, as well as 3 further unnamed land drains.

When considering the aims and objectives in **Section 1.1**, the following conclusions can be made:

- » The 1D/2D model has been constructed based on multiple watercourse surveys provided by Storm Geomatics and LiDAR DTM;
- » The model has been run for a range of storm events from 1 in 300-year through to 1 in 100-year, with the latest climate change included on the 1 in 100-year event (i.e., 19%).
- » The baseline model shows that there is a reduction in the flood extent surrounding the Longstanton Brook and through the centre of the site, however, there is an increase in flood extent surrounding the Wedd Land Brook in the west of the site. The improved accuracy is expected given the increased resolution and detail provided by the site-specific model e.g., geometry of the channel and hydraulic structures.

Following a range of sensitivity analyses, the results are not overly sensitive to the change in the parameters in the downstream boundary gradient. There was a slight change in flood extent caused by a 20% change in the Manning's N roughness values.

Appendix A Survey Data



NOTES: ALL CROSS SECTIONS VIEWED IN A DOWNSTREAM DIRECTION UNLESS OTHERWISE STATED.
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ALL CONDUITS & CHIMNEYS ARE IN METERS UNLESS OTHERWISE STATED.

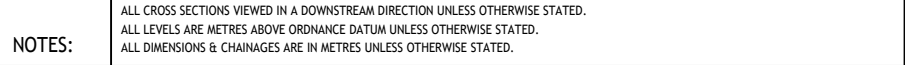
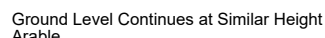
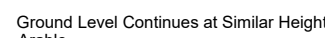
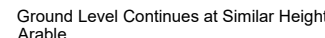
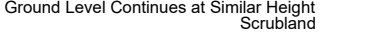
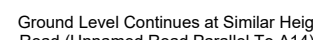
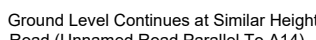
REV.	AMENDMENT	DEM	CHRD	DATE

STORM
GEOMATICS
Tel: 01608 664910
mail@storm-geomatics.com
www.storm-geomatics.com

PROJECT A14 South Cambs

SURVEYED BY: Storm Geomatics Ltd	Project Ref: 24TR012325
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REV	AMENDMENT	REV	CHKD	DATE
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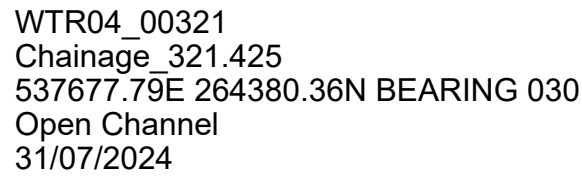
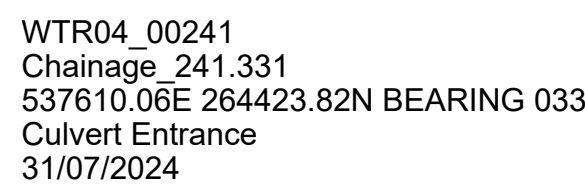
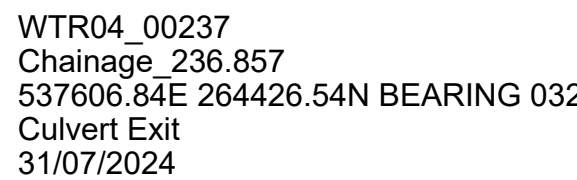
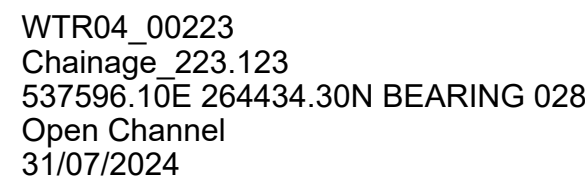
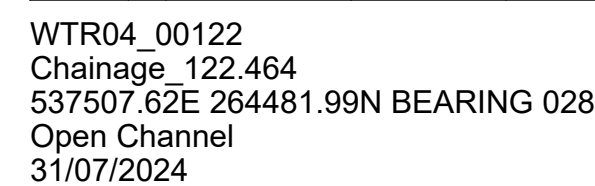
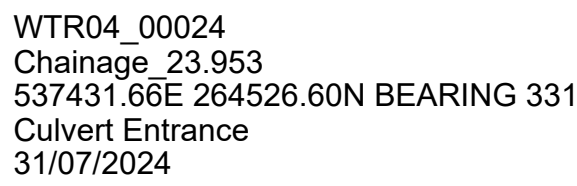


SITE

SUPPLIED BY: Storm Composites Ltd Project Ref: 24TD012325

SCALE: 1:100 (AO Sheet)	DRN: IM	CMKD: LW
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NOTES: ALL CROSS SECTIONS VIEWED IN A DOWNSTREAM DIRECTION UNLESS OTHERWISE STATED.
ALL LEVELS ARE METRES ABOVE ORDNANCE DATUM UNLESS OTHERWISE STATED.
ALL DIMENSIONS & CHAINAGES ARE IN METRES UNLESS OTHERWISE STATED.

[illegible]

REV.	AMENDMENT

DESCRIPTION	Easting	Northing	Height
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STORM
GEOMATICS

Tel: 01608 664910
mail@storm-geomatics.com
www.storm-geomatics.com

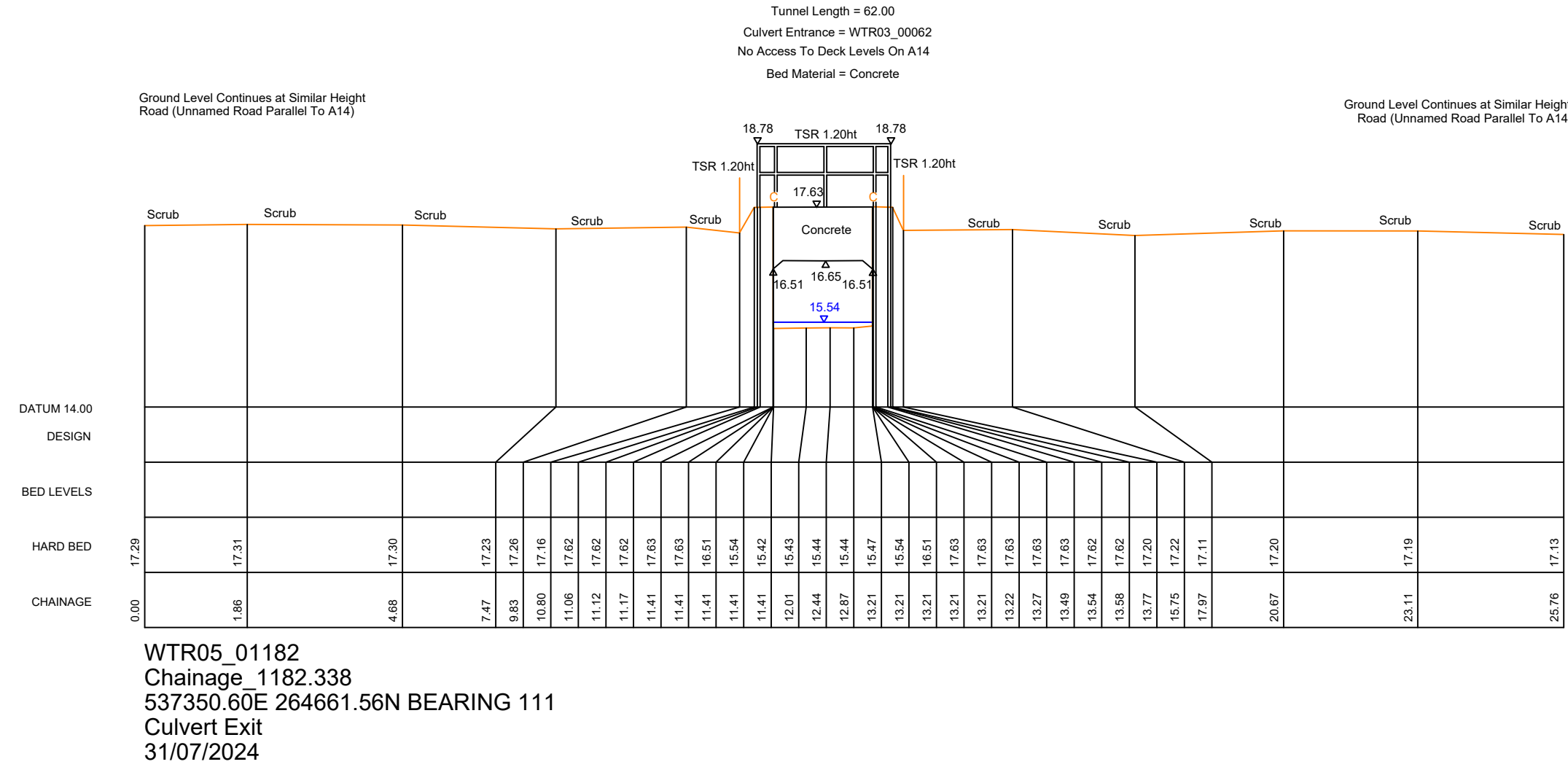
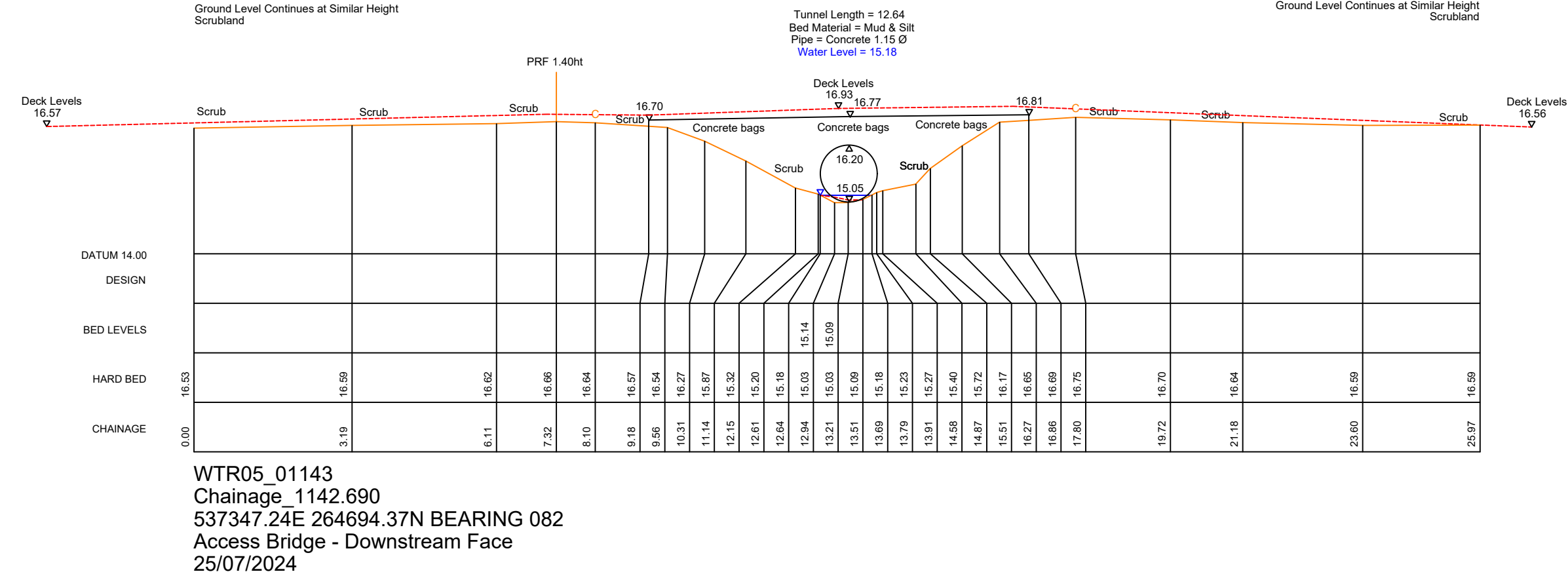
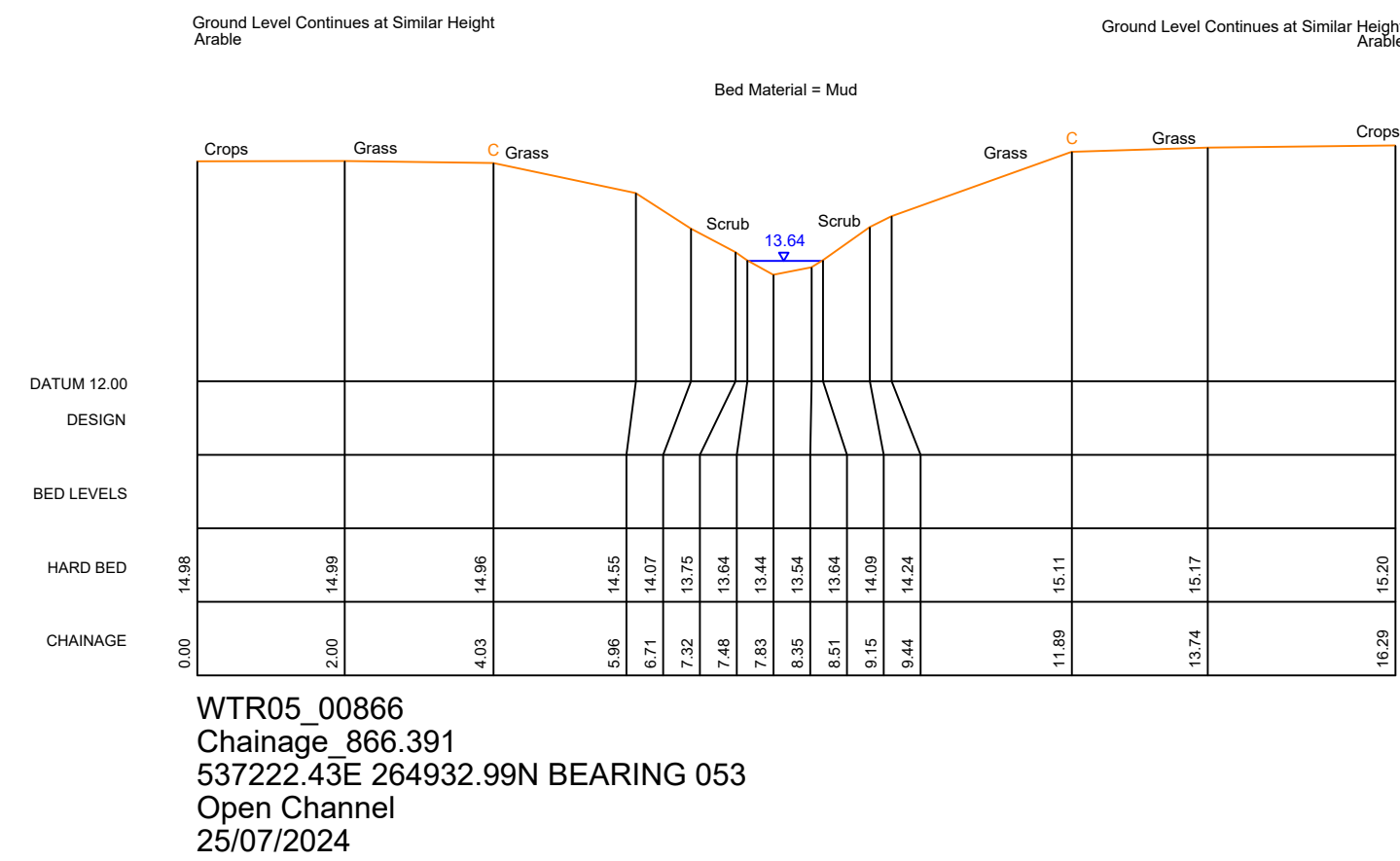
   

Tritax Symmetry

PROJECT **A14 South Cambs**

Watercourse 4
Lolworth, Cambridge
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Sheet 1 of 1

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CROSS SECTION KEY:

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BED LEVEL —————

SILT LEVEL - - - - -

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BL	BILL	GC	GEORGE	ND	ND	ND	ND
BR	BRIAN	GL	GLENN	NR	NR	NR	NR
BU	BURT	GR	GRACE	OR	OR	OR	OR
CH	CHARLIE	GS	GRACE	OT	OT	OT	OT
CL	CLAY	GU	GUY	PT	PT	PT	PT
CO	COLE	GV	GUY	RD	RD	RD	RD
CR	CHRIS	HA	HARVEY	RE	RE	RE	RE
CS	CARL	HE	HELEN	RF	RF	RF	RF
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DA	DAVE	HR	HARRY	RO	RO	RO	RO
DE	DEAN	HT	HENRY	RR	RR	RR	RR
DI	DIANE	HU	HUGH	RS	RS	RS	RS
DO	DOUG	HY	HYMAN	RT	RT	RT	RT
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EN	EDITH	JC	JACOB	SR	SR	SR	SR
EO	EDITH	JD	JACOB	SS	SS	SS	SS
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FX	EDITH	JK	JACOB	FW	FW	FW	FW
FX	EDITH	JL	JACOB	FX	FX	FX	

ID	DESCRIPTION	Easting	Northing	Height
S-1	MAG Nail	536957.684	265992.946	11.124



Tel: 01608 664910
mail@storm-geomatics.com
www.storm-geomatics.com

Tritax Symmetry

PROJECT **A14 South Cambs**

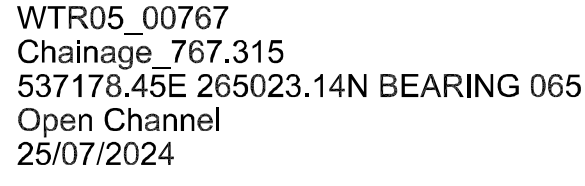
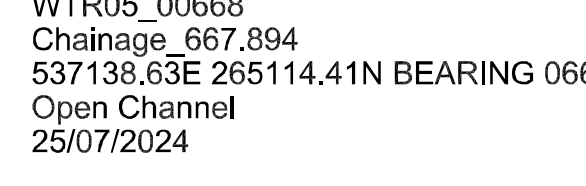
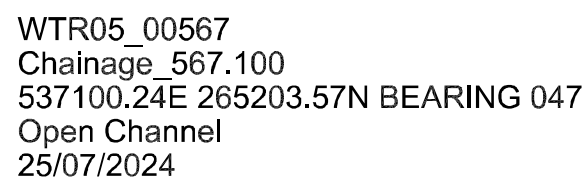
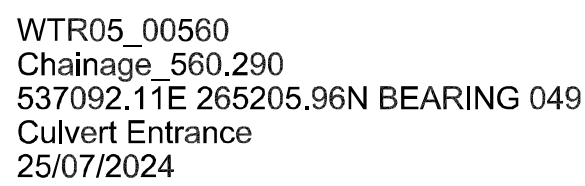
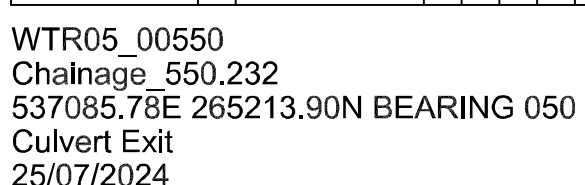
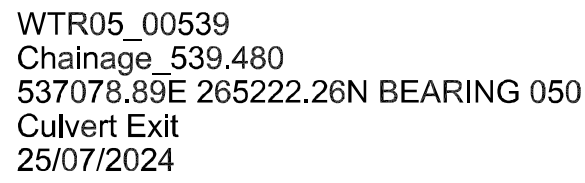
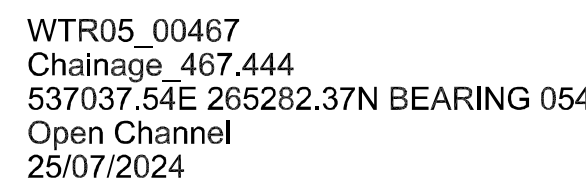
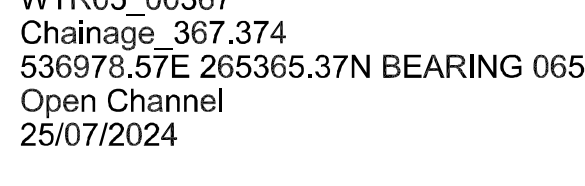
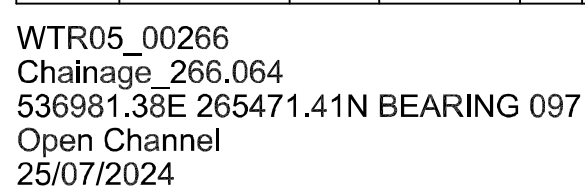
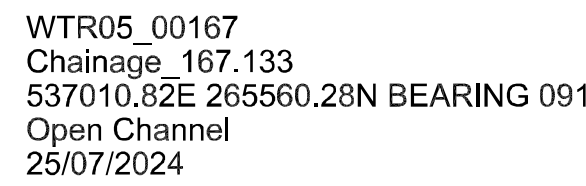
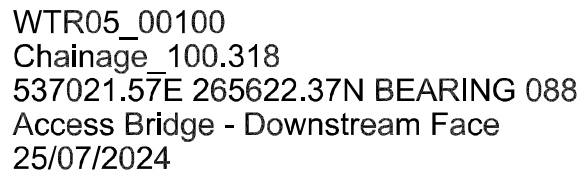
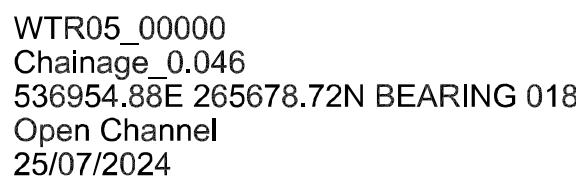
Watercourse 5
Lolworth, Cambridge
WTR03_00833 to WTR03_01182
Sheet 2 of 2

SURVEYED BY: Storm Geomatics Ltd *Project Ref: 24TR012325*

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[illegible]

REV.	AMENDMENT	REV	CHG	DATE

ID	DESCRIPTION	Existing	Northing	Height
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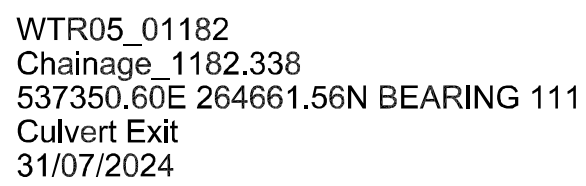
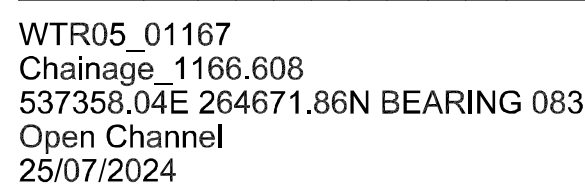
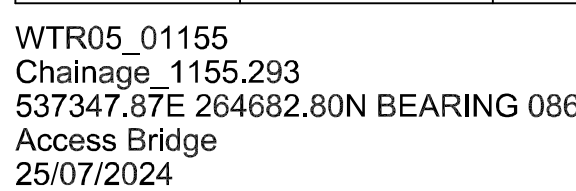
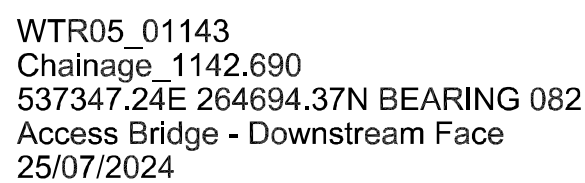
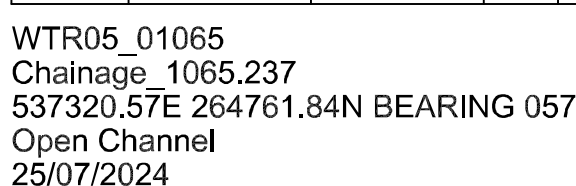
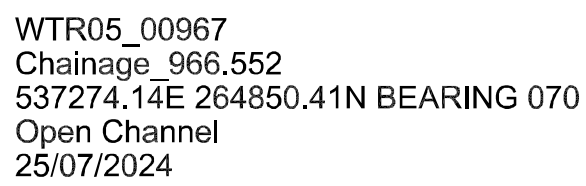
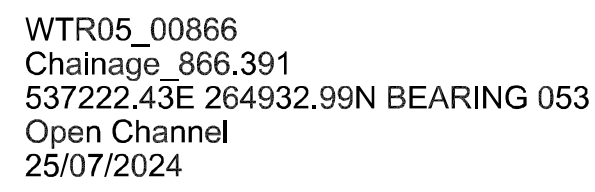
Tritax Symmetry

A14 South Cambs

Watercourse 5
Lolworth, Cambridge
WTR05_00000 to WTR05_00767
Sheet 1 of 2

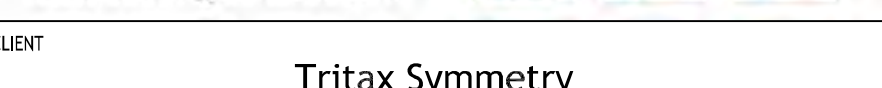
SURVEYED BY: Storm Geomatics Ltd Project Ref: 24790012325

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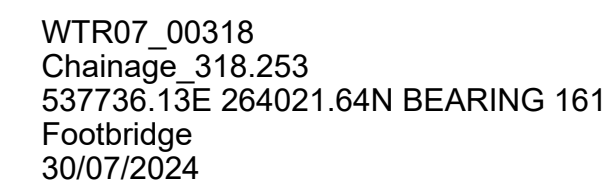
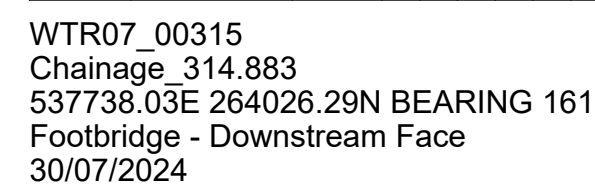
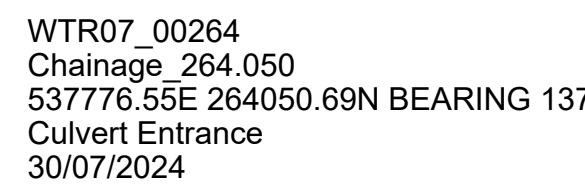
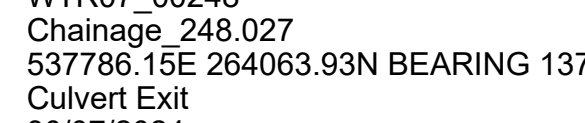
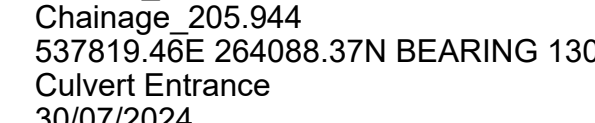
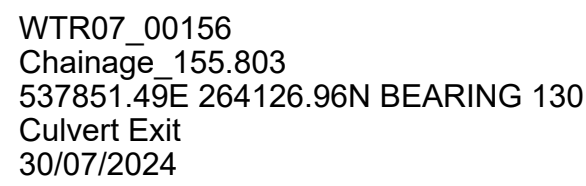
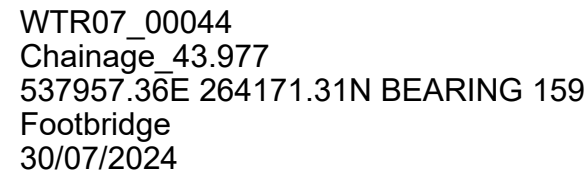
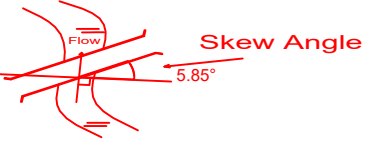
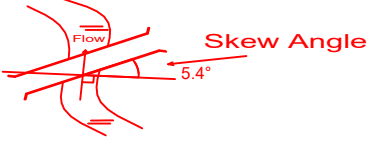
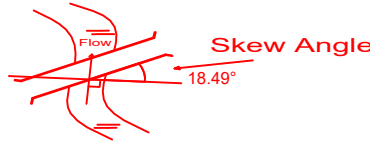
ALL CROSS SECTIONS VIEWED IN A DOWNSTREAM DIRECTION UNLESS OTHERWISE STATED.
ALL LEVELS ARE METRES ABOVE OCEAN SURFACE UNLESS OTHERWISE STATED.

REV.	AMENDMENT	DRN	CHRD	DATE

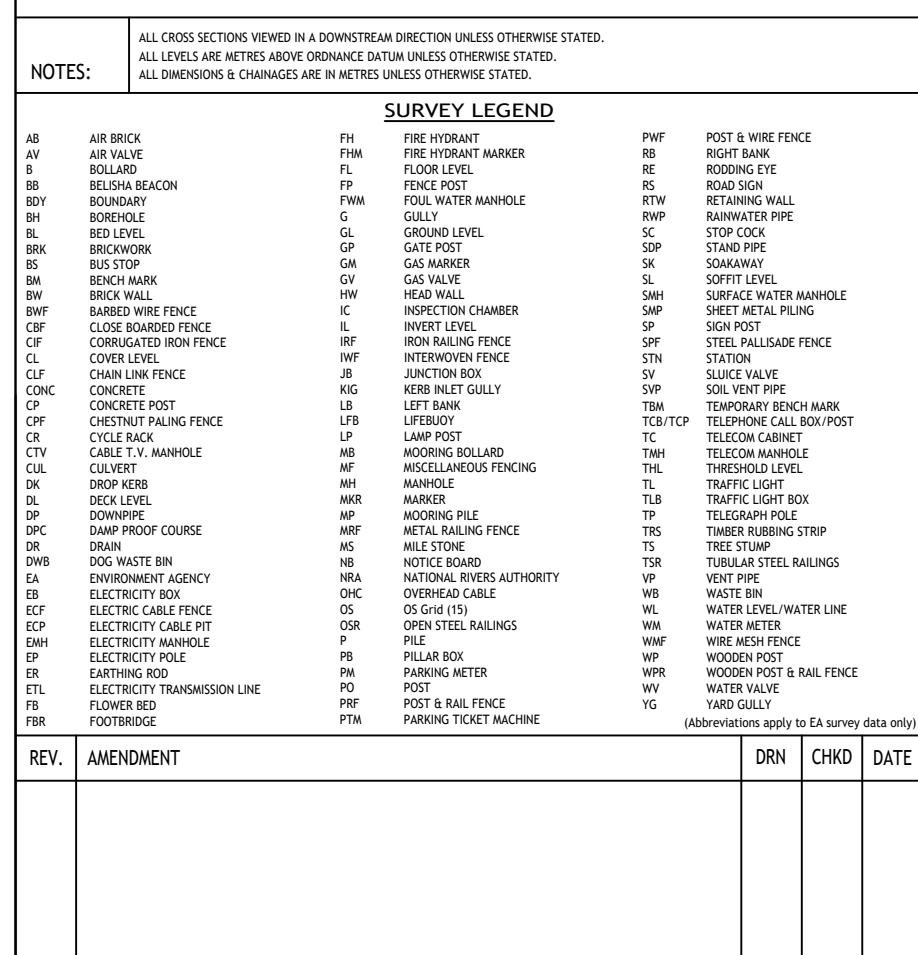
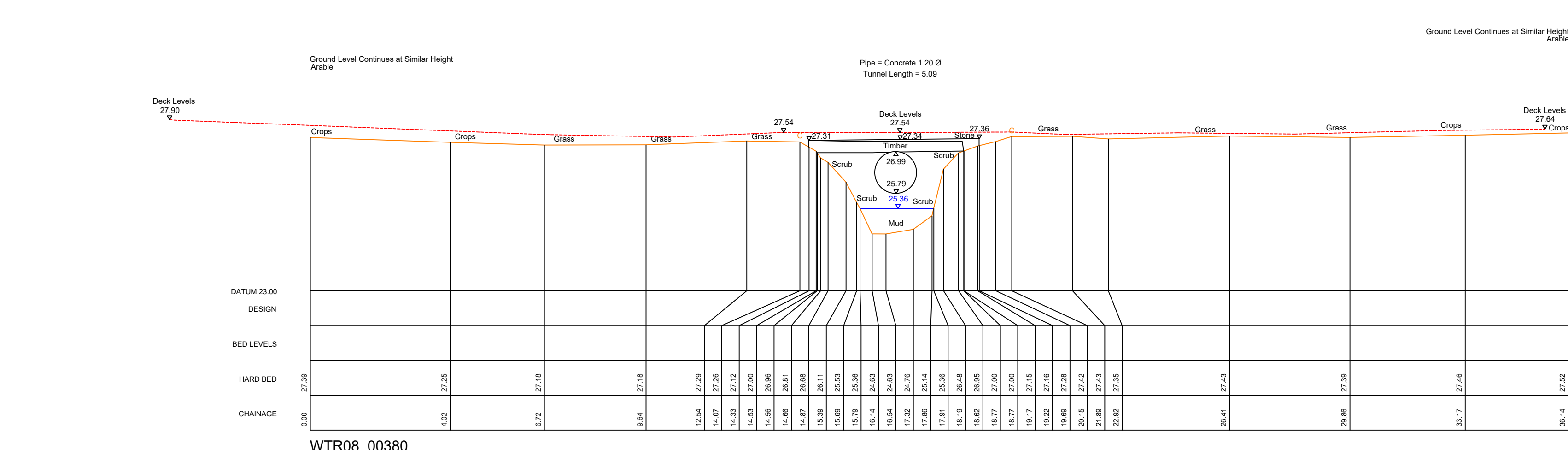
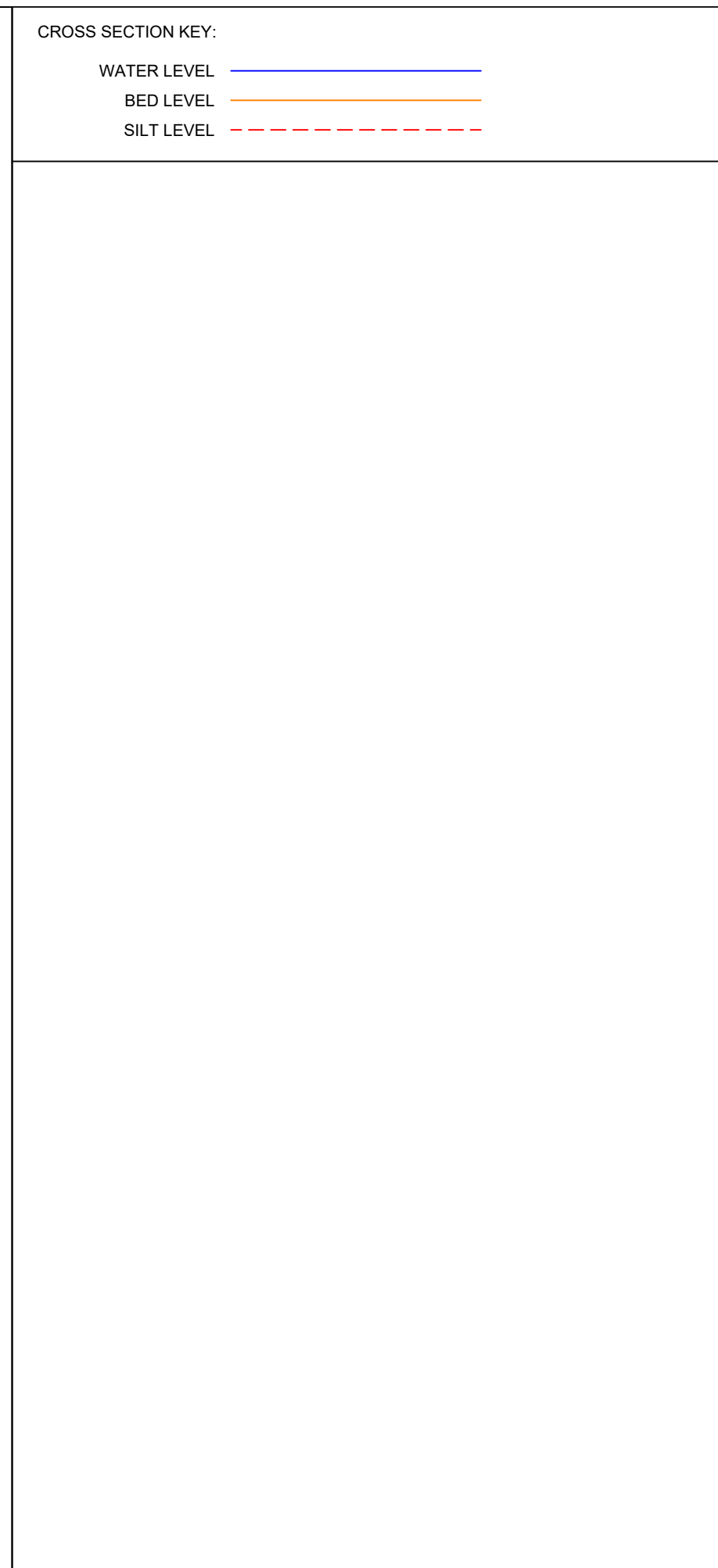
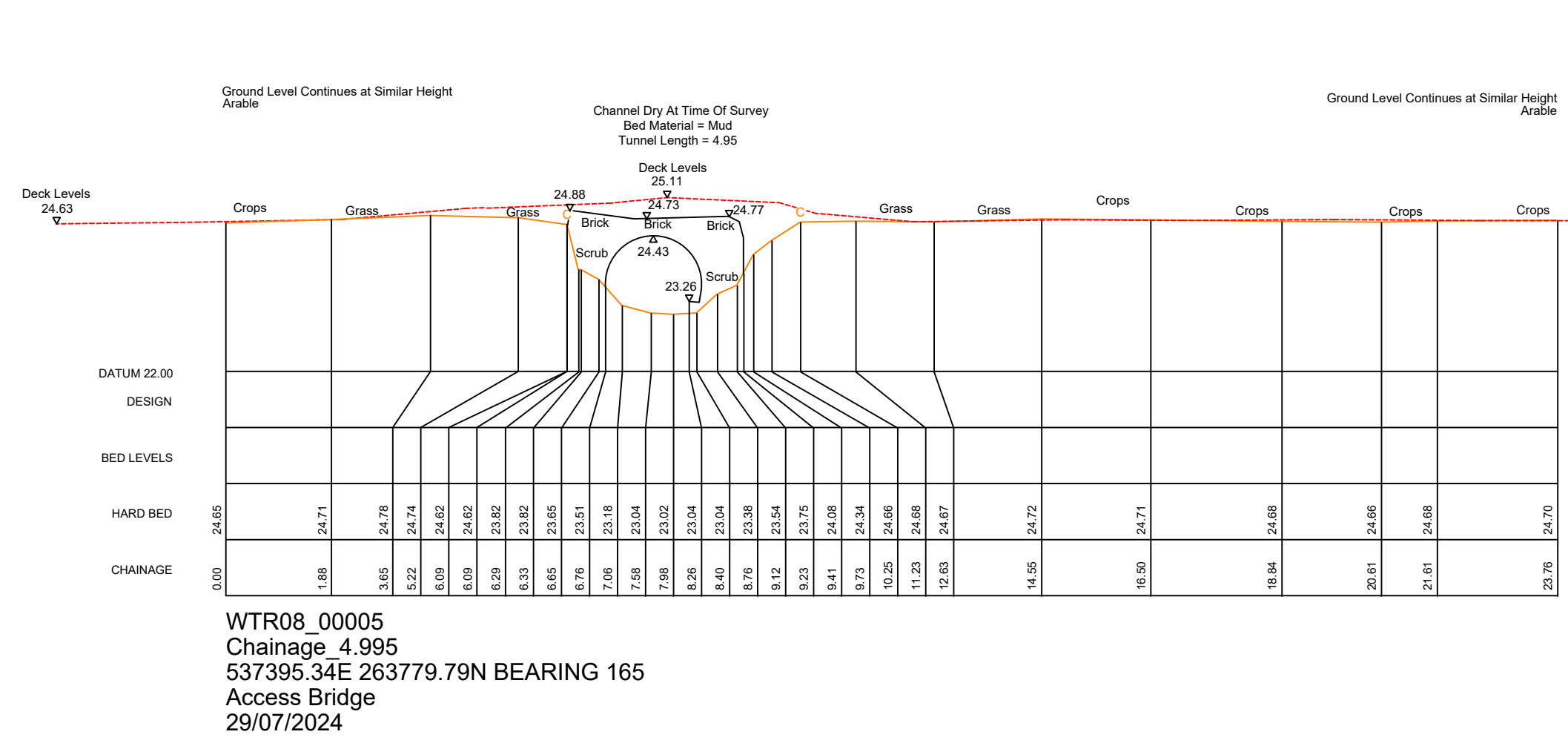


Watercourse 5
Lolworth, Cambridge
WTR03_00833 to WTR03_01182
Sheet 2 of 2

SURVEYED BY: Storm Geomatics Ltd		Project Ref: 247R012325	
SURVEY DATE: July 2024			
SCALE: 1:100 (A0 Sheet)		DRN: JH	CHKD: LW
DATUM: OS Newlyn (15)		DATE: 09/08/2024	DATE: 12/08/2024
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ID	DESCRIPTION	Easting	Northing	Height
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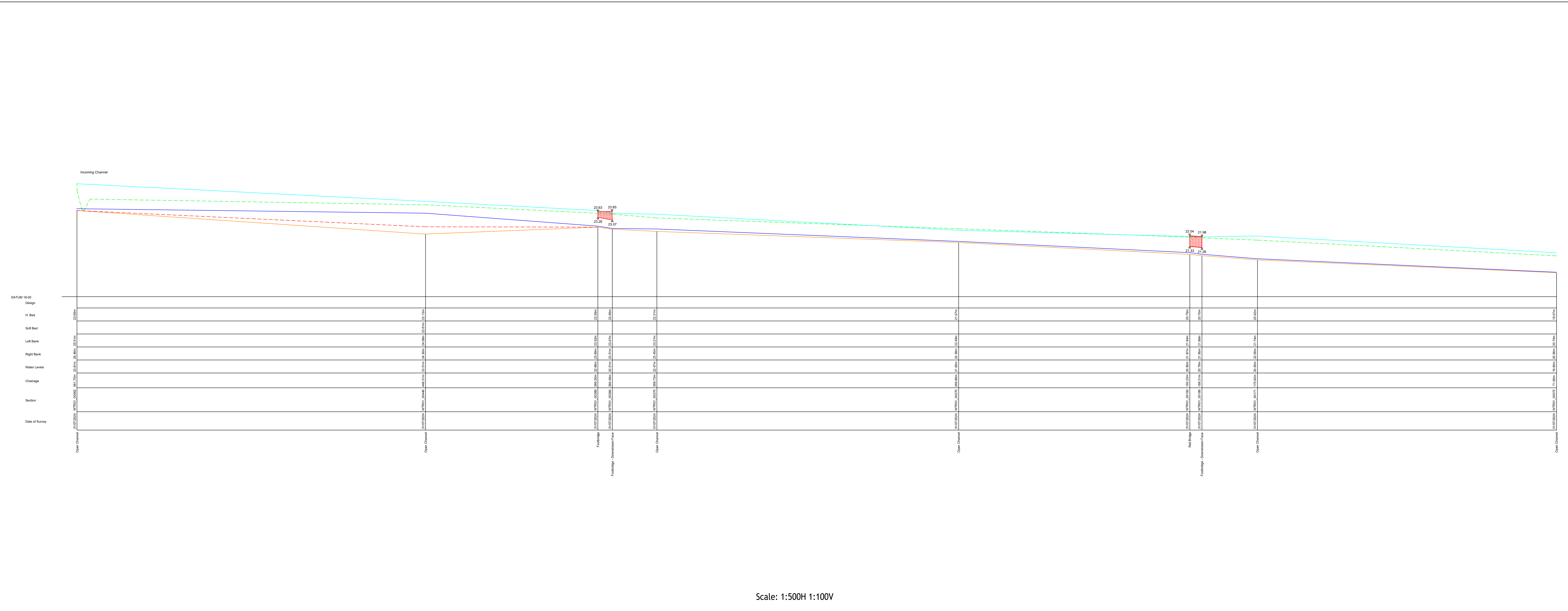
STORM
GEOMATICS

Tel: 01608 664910
mail@storm-geomatics.com
www.storm-geomatics.com

CLIENT	Tritax Symmetry		
PROJECT	A14 South Cams		
SITE	Watercourse 8 Lutworth, Cambridge WTR08_00000 to WTR08_00385 Sheet 1 of 1		
SURVEYED BY: Storm Geomatics Ltd		Project Ref: 24TR002125	
SURVEY DATE: July 2024		DRIN: JH	CHKD: LW
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LONG SECTION KEY:

- WATER LEVEL
- BED LEVEL
- SILT LEVEL
- STRUCTURES
- RIGHT BANK
- LEFT BANK

NOTES:

ALL LEVELS ARE METRIC UNLESS OTHERWISE STATED UNLESS OTHERWISE STATED.

ALL DIMENSIONS & COORDINATES ARE IN METRIC UNLESS OTHERWISE STATED.

REV. AMENDMENT

CONTROL USED:

STORM GEOMATICS

Client: Tritax Symmetry

Project: A14 South Cambs

Site: Watercourse 1, Lolworth, Cambridge, Long Section & Location Plan, Sheet 1 of 1

SURVEYED BY: Storm Geomatics Ltd

SURVEY DATE: July 2024

SCALE: As Shown (A0 Sheet)

DATE: 09/08/2024

CRID: OS Grid (15)

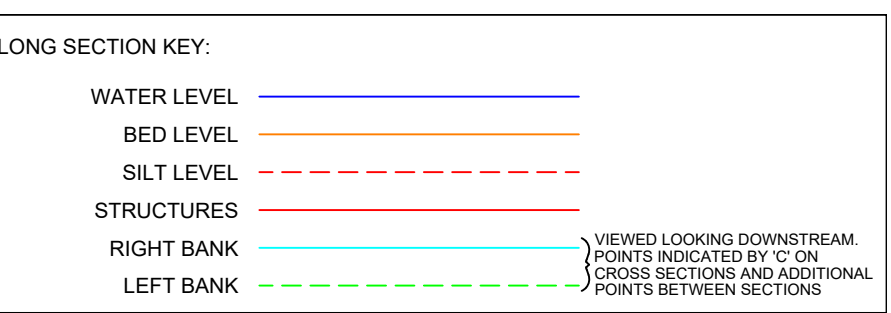
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DRN: JH

CHKD: LW

DATE: 12/08/2024

2750_02



Scale: 1:500

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REV.	AMENDMENT	DRN	CHD	DATE

ID	DESCRIPTION	Easting	Northing	Height
5-1	MAG Nail	536957.684	265992.946	11.124

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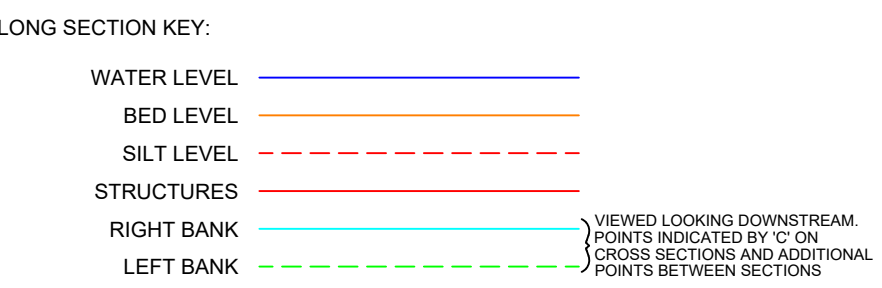
Tel: 01508 664910
mail@storm-geomatics.com
www.storm-geomatics.com

Tritax Symmetry			
PROJECT A14 South Cams			
SITE Watercourse 2 Lolworth, Cambridge Long Section & Location Plan Sheet 1 of 1			
SURVEYED BY: Storm Geomatics Ltd			
Project Ref: 24R002325			
SURVEY DATE: July 2024			
SCALE: As Shown (A0 Sheet)		CHKD: LW	
DATUM: OS Newlyn (15)		DATE: 09/08/24	
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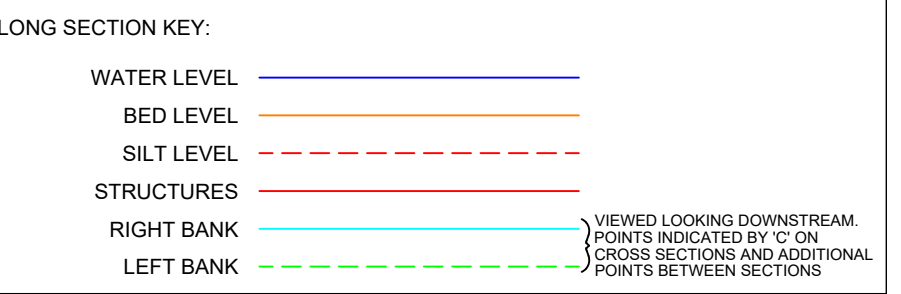
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Watercourse 3
Lolworth, Cambridge
Long Section & Location Plan
Sheet 1 of 1

SURVEYED BY: Storm Geomatics Ltd		Project Ref: 24TR012325	
SURVEY DATE: July 2024			
SCALE: As Shown (A0 Sheet)	DRN: JH	CHKD: LW	
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Scale: 1:500



REV.	AMENDMENT	DRN	CHRD	DATE

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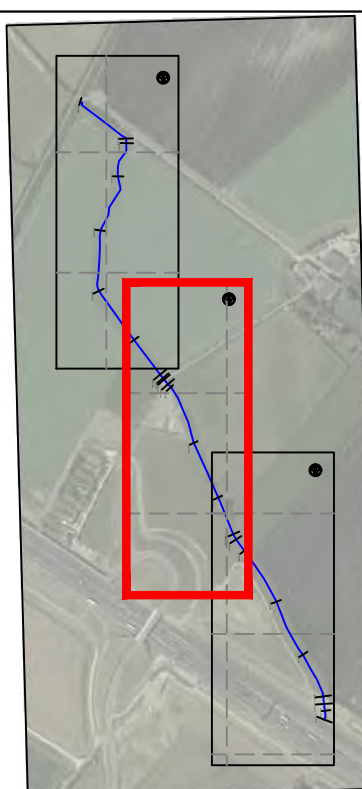
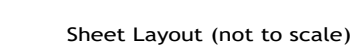
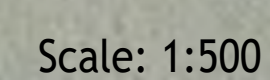
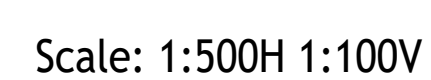
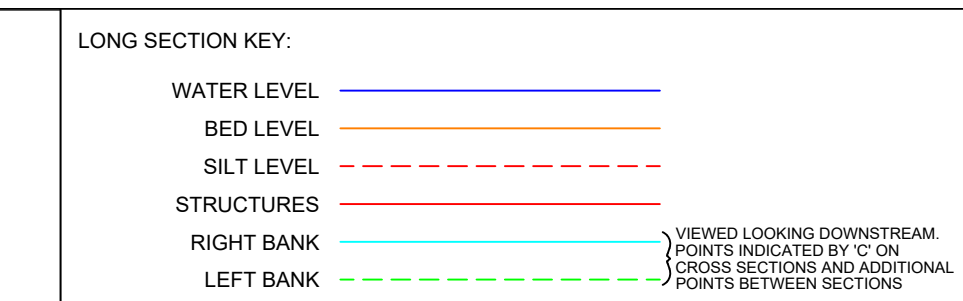
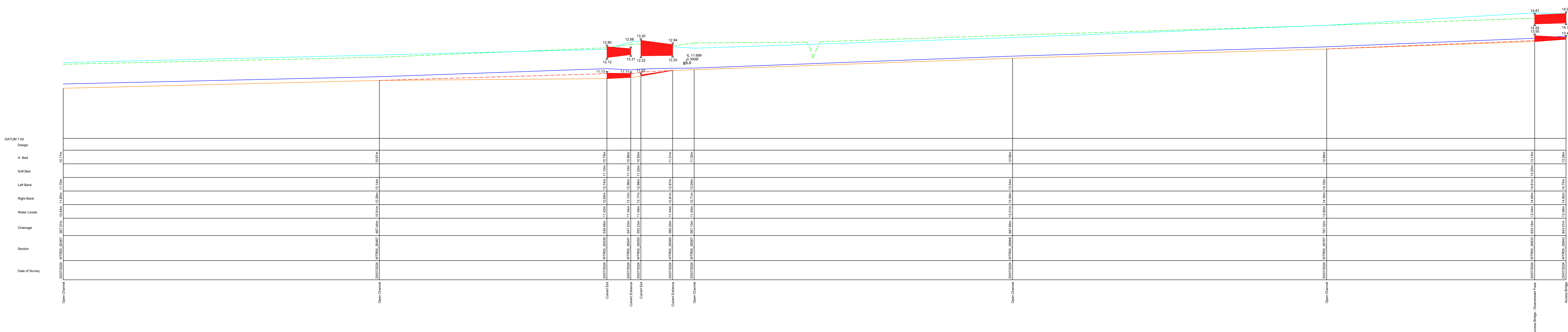
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A14 South Cambs

SURVEYED BY: Storm Geomatics Ltd		Project Ref: 24TR0012325	
SURVEY DATE: July 2024			
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NOTES: ALL LEVELS ARE METRES ABOVE ORDNANCE DATA UNLESS OTHERWISE STATED.
ALL DIMENSIONS & CHAINAGES ARE IN METRES UNLESS OTHERWISE STATED.

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REV.	AMENDMENT	SRN	CHD	DATE

ID	DESCRIPTION	Easting	Northing	Height
EG-1	MAG Nail	536957.684	265992.946	11.124

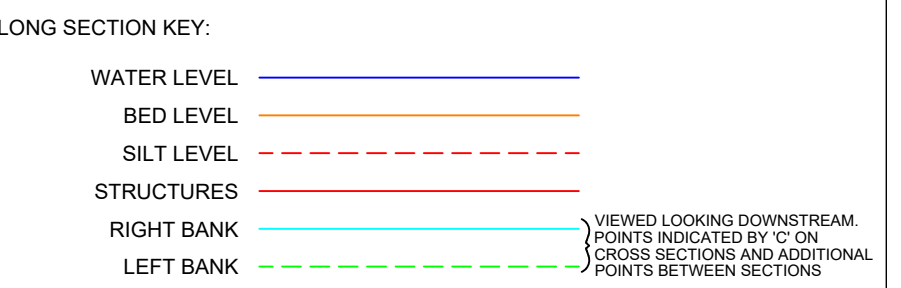
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mail@storm-geomatics.com
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CLIENT Tritax Symmetry

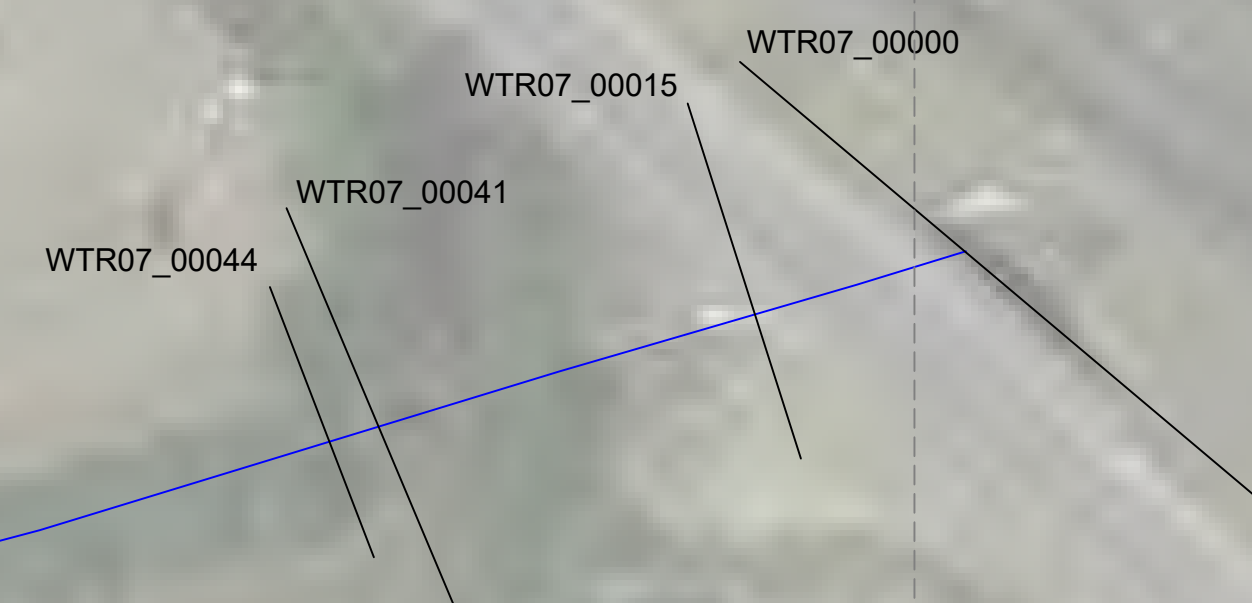
PROJECT	A14 South Cambs
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Watercourse 5
Lolworth, Cambridge
Long Section & Location Plan
Sheet 2 of 3

SURVEYED BY: Storm Geomatics Ltd		Project Ref: 24/R0012325	
SURVEY DATE: July 2024			
SCALE: As Shown (AO Sheet)	DRN: JH	CHKD: LW	
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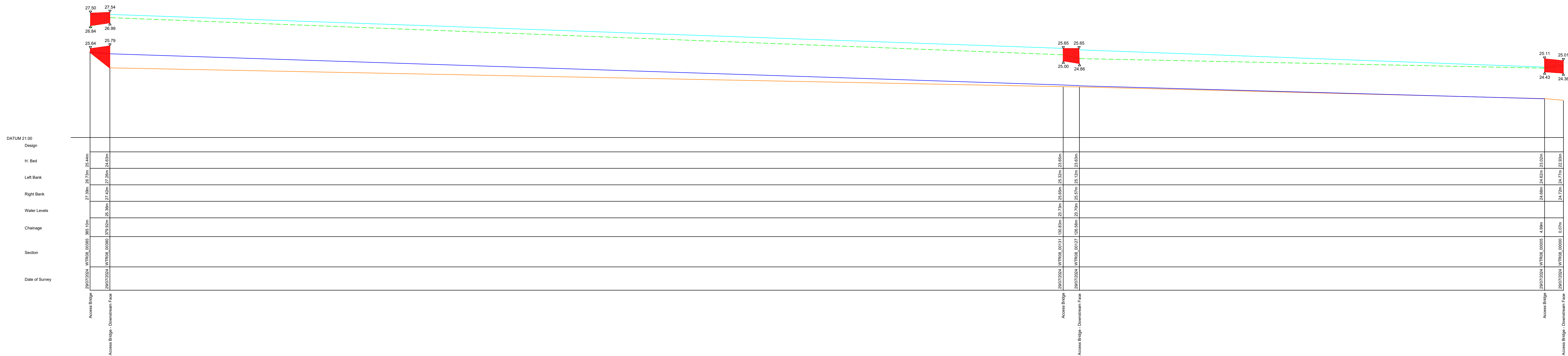
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PROJECT DETAILS		PROJECT INFORMATION		PROJECT STATUS		PROJECT HISTORY	
REV.	AMENDMENT	DATE	BY	CHKD	DATE	CHKD	DATE

ID	DESCRIPTION	Easting	Northing	Height
5-1	MAG Nail	536957.684	265692.946	11.124

CLIENT	Tritax Symmetry
PROJECT	A14 South Cams
SITE	Watercourse 7 Lolworth, Cambridge Long Section & Location Plan Sheet 1 of 1

SURVEYED BY: Storm Geomatics Ltd		Project Ref: 24TR012325	
SURVEY DATE: July 2024			
SCALE: As Shown (A0 Sheet)	DRN: JH	CHKD: LW	
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Scale: 1:500H 1:100V



LONG SECTION KEY:

- WATER LEVEL
- BED LEVEL
- SILT LEVEL
- STRUCTURES
- RIGHT BANK
- LEFT BANK

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NOTES:

SURVEY LEGEND:

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PP	PP	PP	PP
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PS	PS	PS	PS
PT	PT	PT	PT
PU	PU	PU	PU
PV	PV	PV	PV
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QE	QE	QE	QE
QF	QF	QF	QF
QG	QG	QG	QG
QH	QH	QH	QH
QI	QI	QI	QI



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SYMBOL KEY

	WIND		Electricity Pipe
	TOP OF BANK		High Pond
	WIND		Drain
	POSSIBLE LINE		Water Vein
	CONCRETE		Joist Plan
	REINFORCING		Scum
	BOTTOM OF BANK		Thermal Load
			Air Brack

TREE - Trunk Diameter = Species

SLOPE SYMBOL

TREE STUMP

GATE

DITCH LEVEL

HIGH RIDGE LEVEL

WATER LEVEL

JOIST LEVEL

SCUM LEVEL

THERMAL LEVEL

AIR BRACK

[illegible]

REV.	AMENDMENT	DRN	CHRD	DATE

	Easting	Northing	Height
1	538519.422	264574.670	17.418
2	538108.891	264260.667	19.719

STORM
GEOMATICS

Tel: 01608 664910
Email: mail@storm-geomatics.com
www.storm-geomatics.com

 **RICS**
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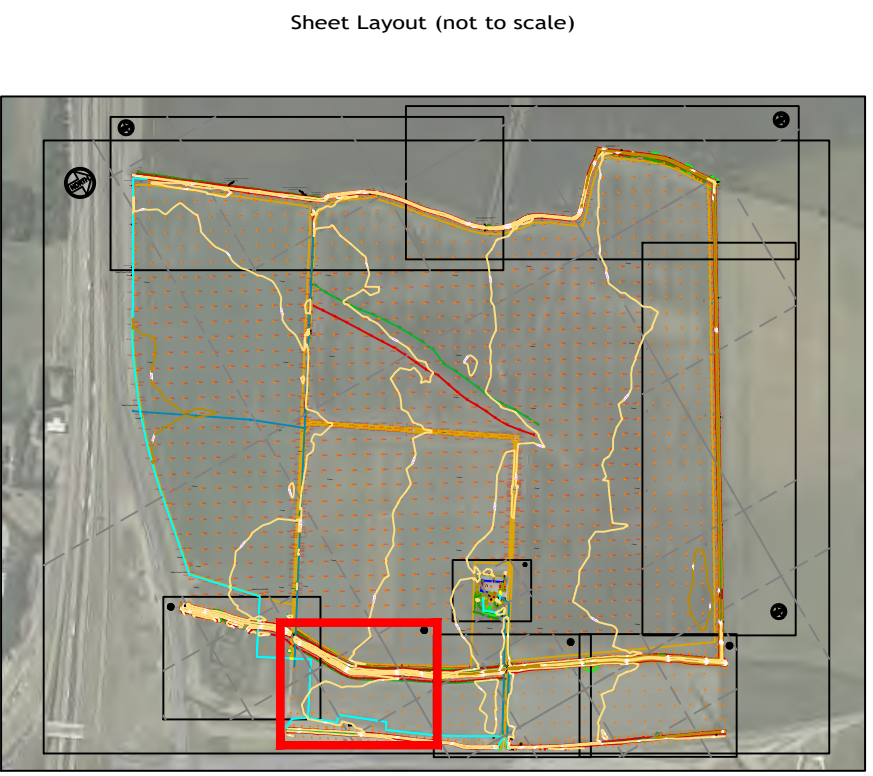
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Registered in UK

Tritax Symmetry

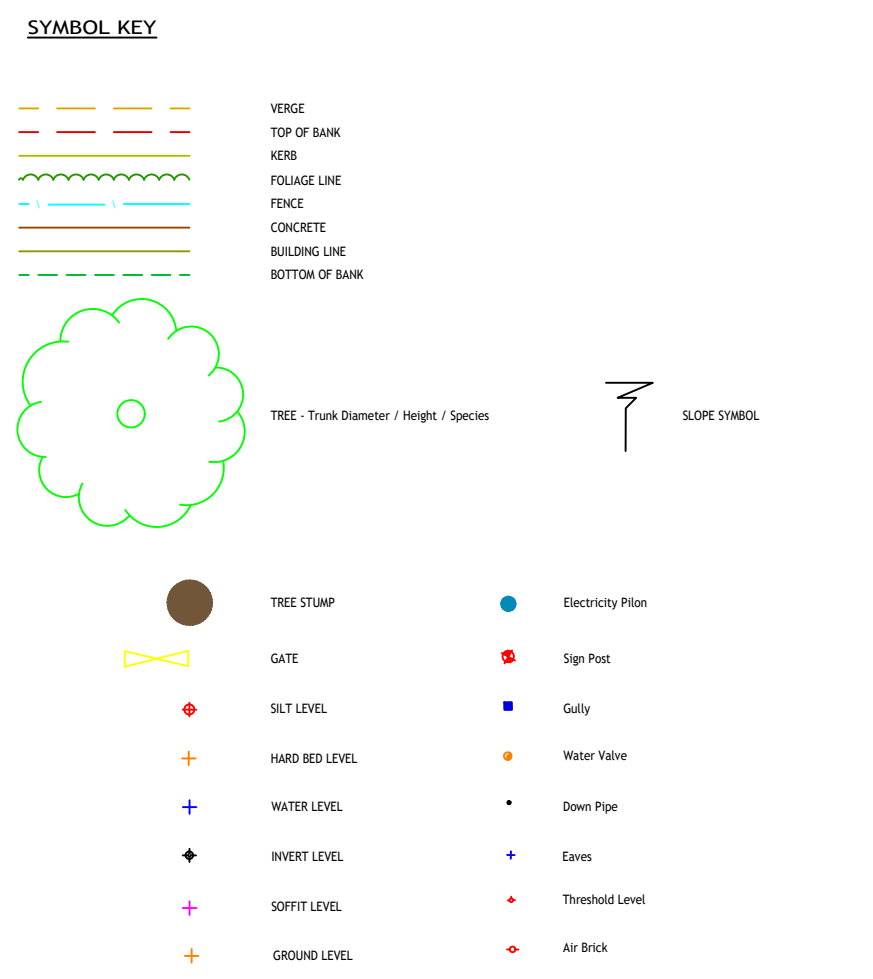
PROJECT
A14 South Cambs Channel & Topographic Survey

Fields Adjacent to B1050,
Longstanton, Cambridge
Topographical Survey
Sheet 2 of 8

SURVEYED BY: Storm Geomatics Ltd		Project Ref: 24HD0022200	
SURVEY DATE: April 24			
SCALE: 1:200 (AO Sheet)	DRN: TA	CHKD: ARP	
ATUM: 05 Newlyn (15)	DATE: 11/04/2024	DATE: 16/04/2024	
RID: 05 Grid (15)	DRAWING NO.	REV.	
D FILENAME: 24HD0022200_DTO_Corros.dwg	24HD0022200/05	-	



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NOTES:
ALL LEVELS ARE METRES ABOVE ORDNANCE DATUM UNLESS OTHERWISE STATED.
ALL DIMENSIONS & CHANGEOVER ARE IN METRES UNLESS OTHERWISE STATED.

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REV.	AMENDMENT	DEN	CHD	DATE

CONTROL USED:				
	D	Easting	Northing	Height
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6-2	538108.891	264260.667	19.719	

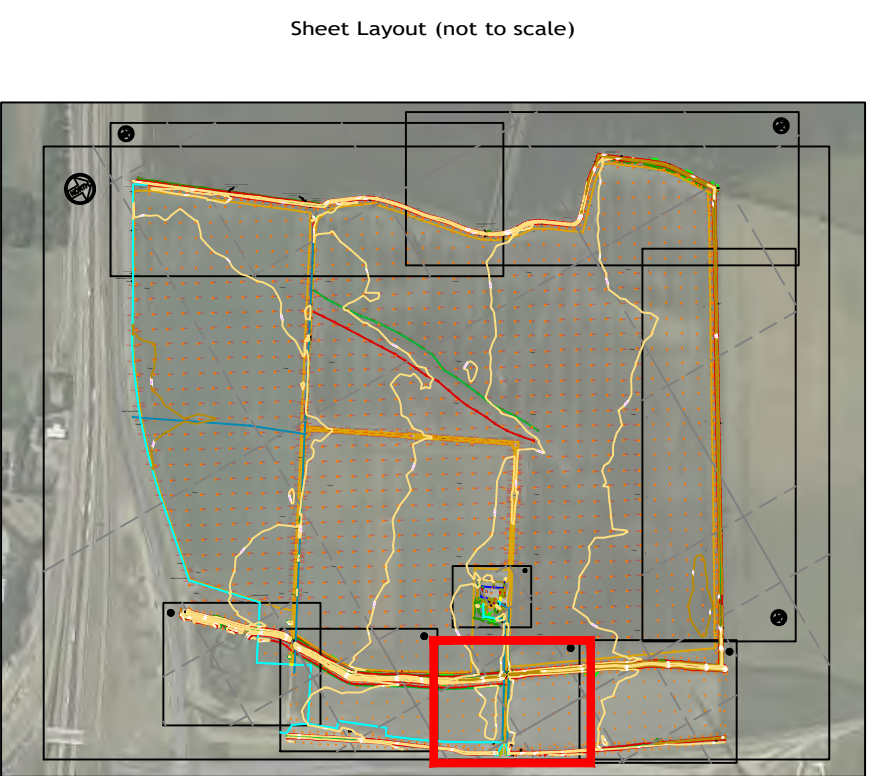


Tritax Symmetry

PROJECT

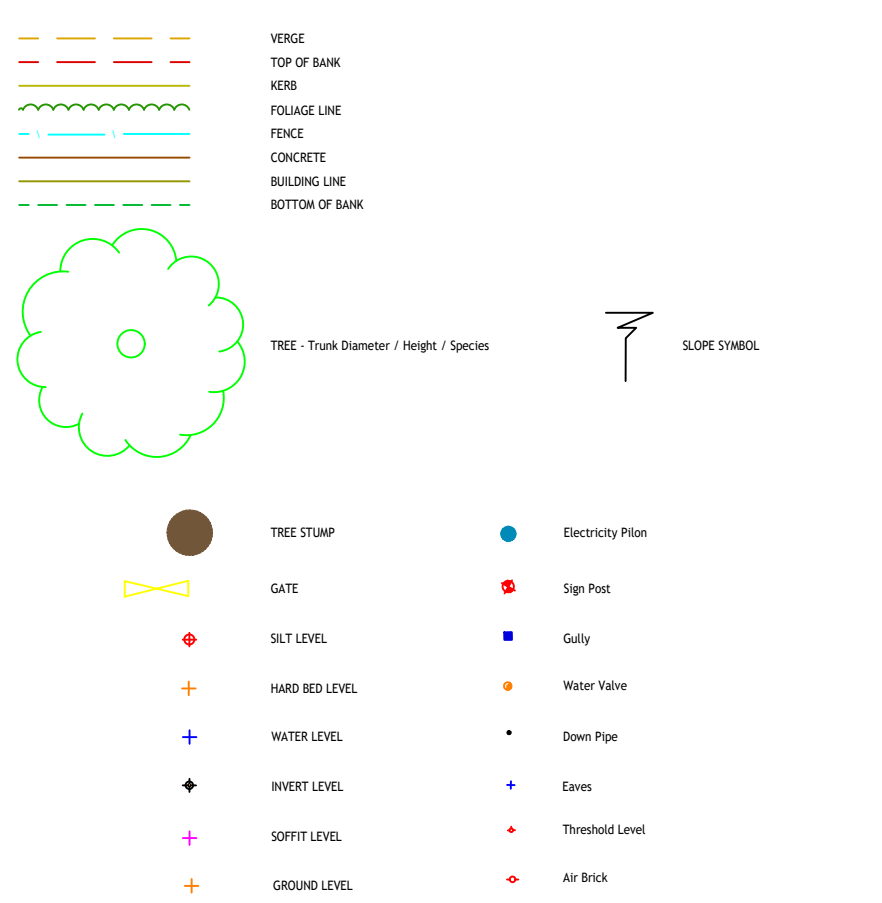
Fields Adjacent to B1050,
Longstanton, Cambridge
Topographical Survey
Sheet 3 of 8

SURVEYED BY: Storm Geomatics Ltd		Project Ref: 24HD0022200	
SURVEY DATE: April 24			
SCALE: 1:200 (A0 Sheet)	DRN: TA	CHKD: ARP	
DATUM: OS Newlyn (15)	DATE: 11/04/2024	DATE: 16/04/2024	
GRID: OS Grid (15)	DRAWING NO.		REV.
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SYMBOL KEY



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SURVEY LEGEND

[illegible]

REV.	AMENDMENT	DRN	CHRD	DATE

CONTROL USED:

ID	Easting	Northing	Height
56-1	538519.422	264574.670	17.418
56-2	538108.891	264260.667	19.719



Tel: 01608 664910
mail@storm-geomatics.com
www.storm-geomatics.com



Tritax Symmetry

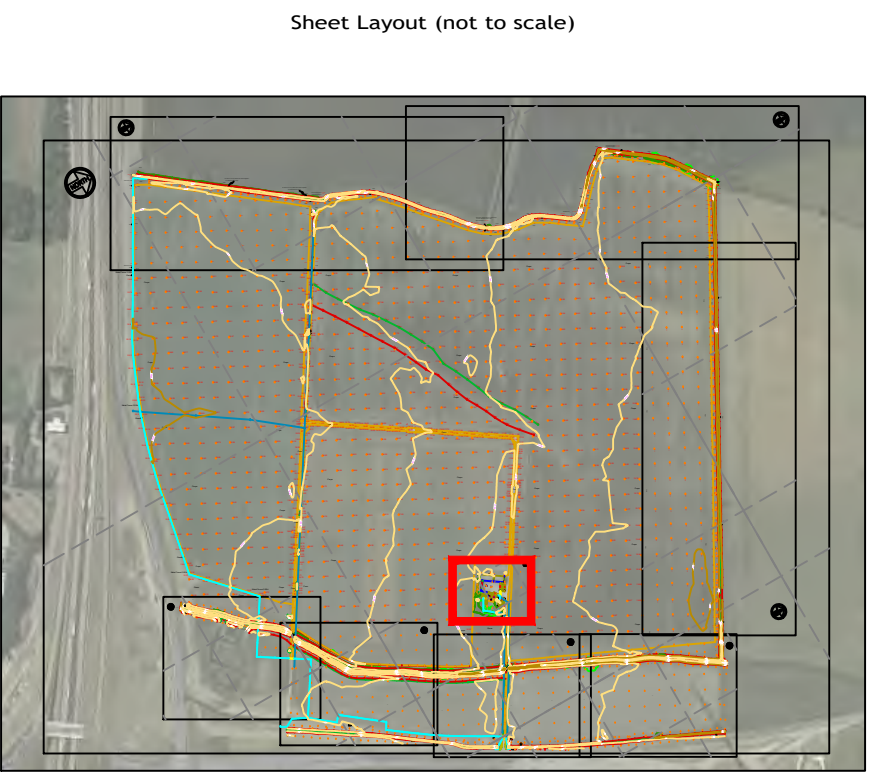
PROJECT
A14 South Cambs Channel & Topographic Survey

Fields Adjacent to B1050,
Longstanton, Cambridge
Topographical Survey
Sheet 4 of 8

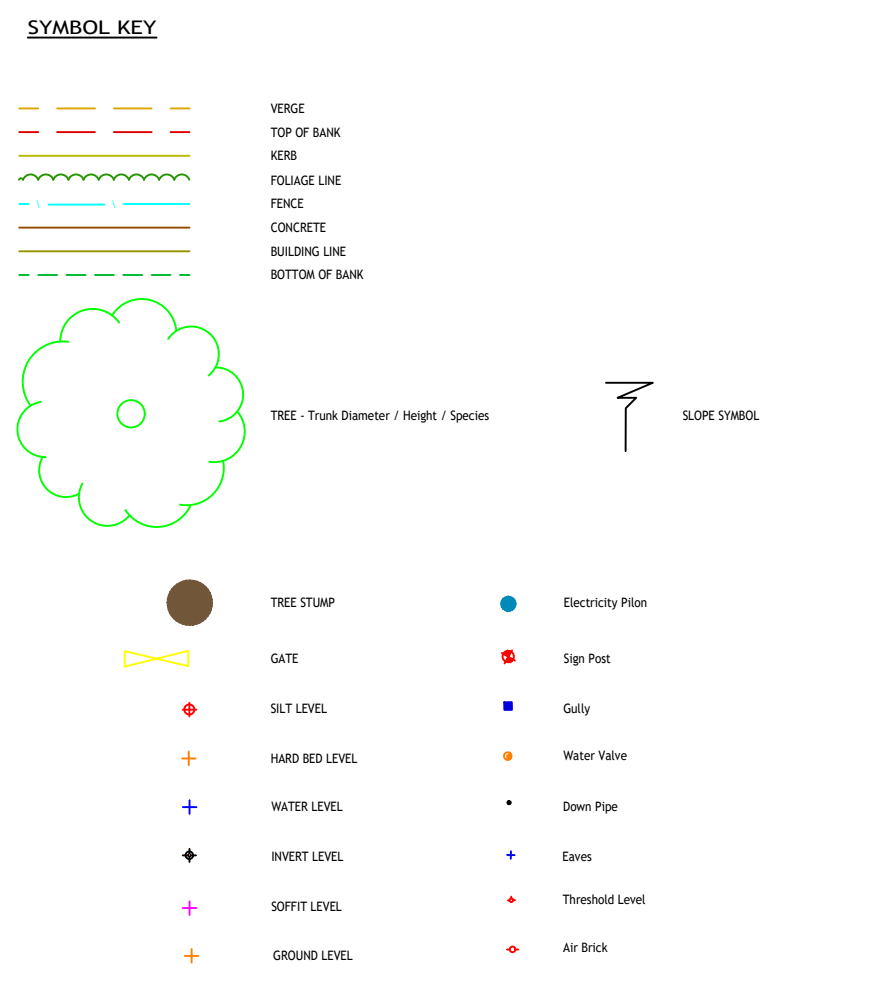
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Project Ref: 24/00022200

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AD_FILENAME: 24HD0022200_DTO_Corrob.dwg		24HD0022200/07	-



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ALL LEVELS ARE METRES ABOVE ORDNANCE DATUM UNLESS OTHERWISE STATED.
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[illegible]

REV.	AMENDMENT	DEF	CHD	DATE

CONTROL USED:				
	D	Easting	Northing	Height
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6-2	538108.891	264260.667	19.719	

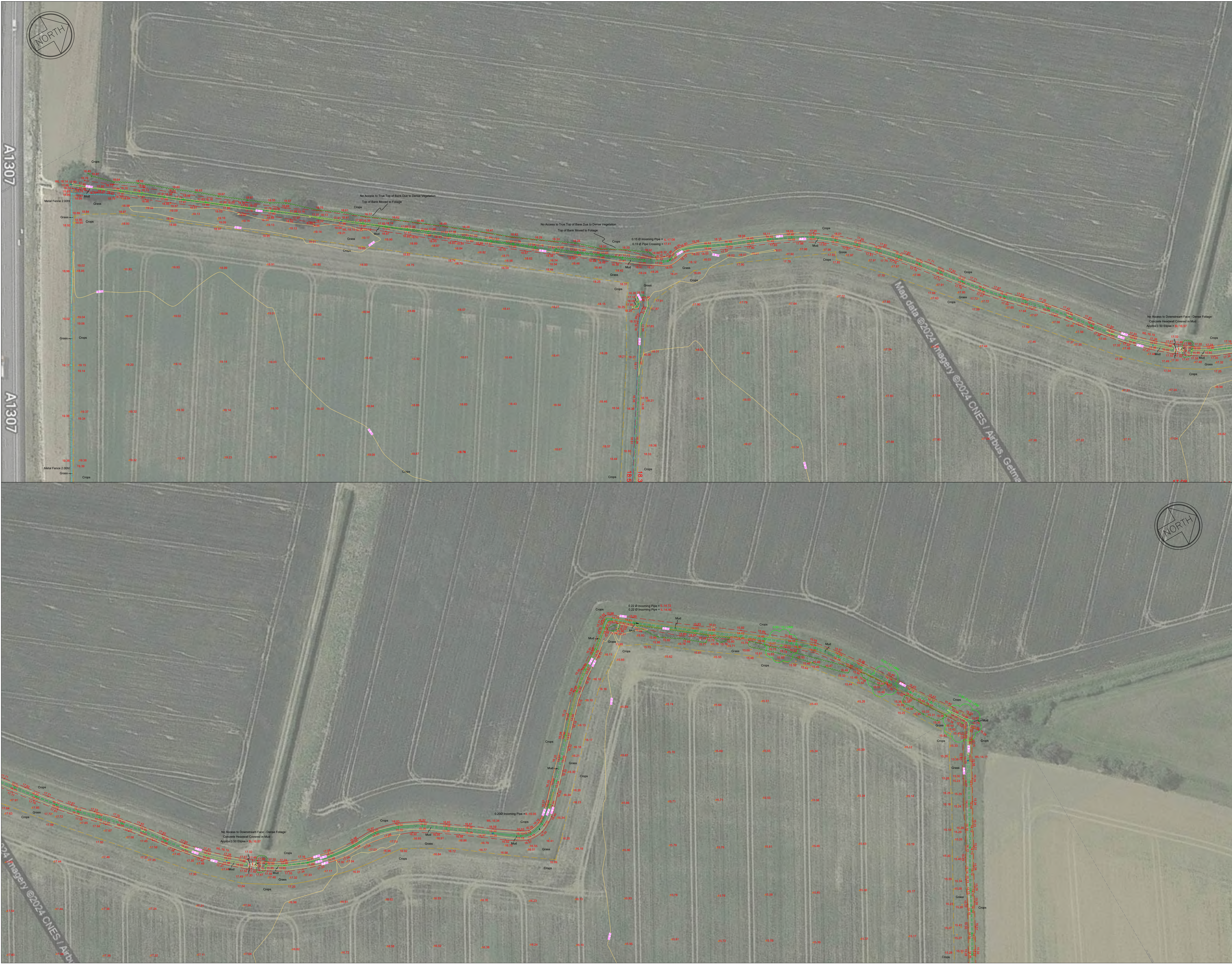


Tritax Symmetry

PROJECT
A14 South Cambs Channel & Topographic Survey

Fields Adjacent to B1050,
Longstanton, Cambridge
Topographical Survey
Sheet 6 of 8

SURVEYED BY: Storm Geomatics Ltd		Project Ref: 24HD0022200	
SURVEY DATE: April 24			
SCALE: 1:100 (AO Sheet)	DRN: NA	CHKD: ARP	
DATUM: OS Newlyn (15)	DATE: 11/04/2024	DATE: 16/04/2024	
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Sheet Layout (not to scale)

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SYMBOL KEY

WHITE	TOP OF BANK
RED	POINCE LINE
GREEN	POINCE LINE
BLUE	POINCE LINE
YELLOW	POINCE LINE
PINK	POINCE LINE
ORANGE	POINCE LINE
BROWN	POINCE LINE
BLACK	POINCE LINE

SYMBOL KEY

WHITE	TOP OF BANK
RED	POINCE LINE
GREEN	POINCE LINE
BLUE	POINCE LINE
YELLOW	POINCE LINE
PINK	POINCE LINE
ORANGE	POINCE LINE
BROWN	POINCE LINE
BLACK	POINCE LINE

NOTES

ALL LINES ARE METRIC UNLESS OTHERWISE STATED (UNLESS OTHERWISE STATED)
ALL DIMENSIONS & CHANNELS ARE IN METRIC UNLESS OTHERWISE STATED

SURVEY LEGEND

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CONTROL USED:

6-1 53819.422 264574.670 17.418
6-2 538108.891 264260.847 19.719

STORM GEOMATICS

Tel: 01608 664910
mail@storm-geomatiks.com
www.storm-geomatiks.com

QUINT

Trintax Symmetry

PROJECT

A14 South Cambs Channel & Topographic Survey

SITE

Fields Adjacent to B1050,
Longstanton, Cambridge
Topographical Survey
Sheet 7 of 8

SURVEYED BY: Storm Geomatics Ltd

SURVEY DATE: April 24

SCALE: 1:500 (A0 Sheet)

DATUM: OS Newlyn (15)

GRID: OS Grid (15)

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CHKD: ARP

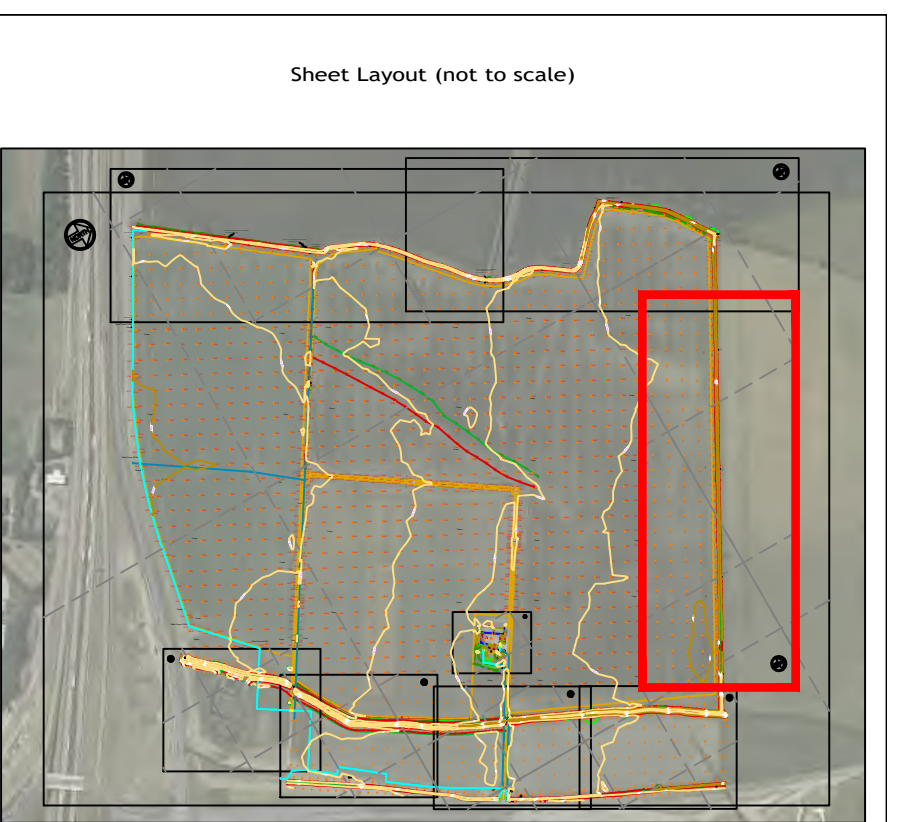
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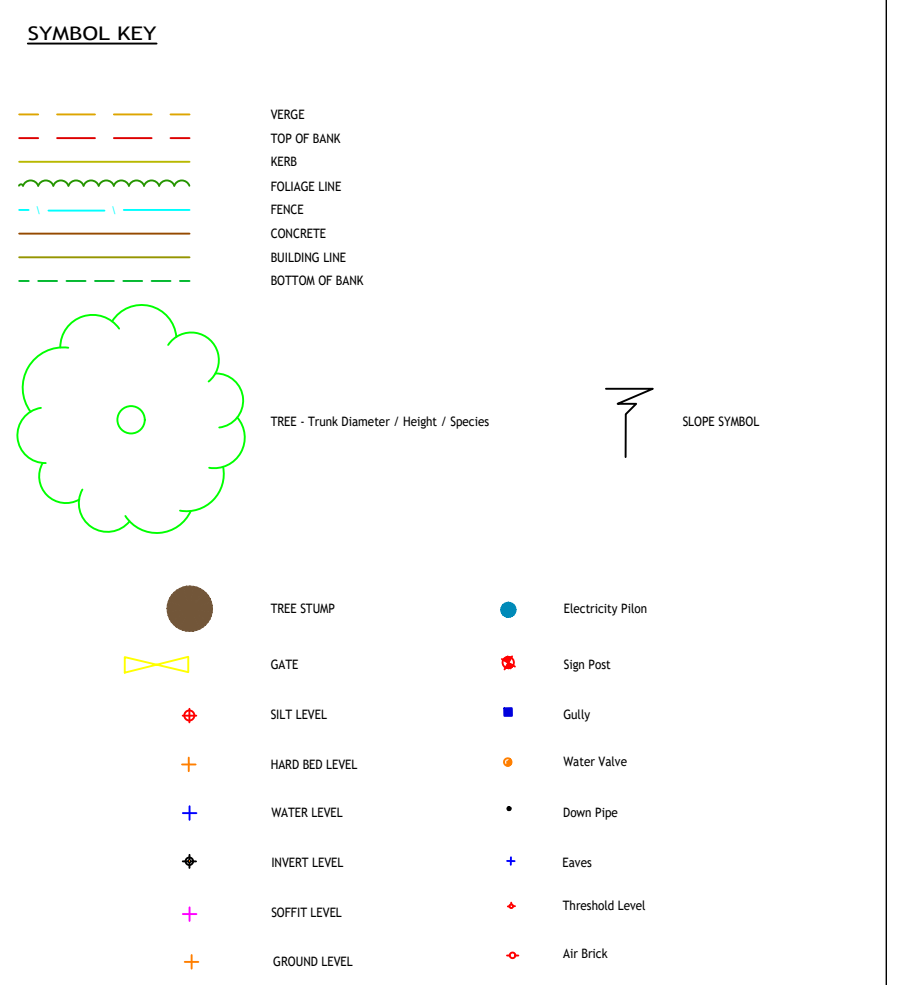
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REV.:

24HD0022200/10



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NOTES: ALL LEVELS ARE METRES ABOVE ORDNANCE DATUM UNLESS OTHERWISE STATED.
ALL DIMENSIONS & CHAINAGES ARE IN METRES UNLESS OTHERWISE STATED.

[illegible]

REV.	AMENDMENT	DEN	CMD	DATE

CONTROL USED:				
	D	Easting	Northing	Height
6-1	538519.422	264574.670	17.418	
6-2	538108.891	264260.667	19.719	



Tritax Symmetry

PROJECT	A14 South Cambs Channel & Topographic Survey
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Fields Adjacent to B1050,
Longstanton, Cambridge
Topographical Survey
Sheet 8 of 8

SURVEYED BY: Storm Geomatics Ltd		Project Ref: 24HD0022200	
SURVEY DATE: April 24			
SCALE: 1:500 (AO Sheet)		DRN: TA	CHKD: ARP
DATUM: OS Newlyn (15)		DATE: 11/04/2024	DATE: 16/04/2024
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