NORTH LINCOLNSHIRE GREEN ENERGY PARK

Planning Act 2008

Infrastructure Planning

North Lincolnshire Green Energy Park

9.5 Written summaries of oral submissions put at Issue Specific Hearing 2

PINS reference: EN010116

December 2022

Revision number: 0

CONTENTS

1. INTRODUCTION

1.1 The Development Consent Order (**DCO**) application for the North Lincolnshire Green Energy Park (**NLGEP**) was submitted on 31 May 2022 and accepted for examination on 27 June 2022.

1.2 The second Issue Specific Hearing (**ISH2**) for the NLGEP DCO application was a blended event which was held in person at Forest Pines Spa and Golf Resort, Ermine Street, Broughton, Brigg, DN20 0AQ and virtually by Microsoft Teams on Thursday 17 November 2021 at 10.00am.

1.3 The Examining Authority (**ExA**) invited the Applicant to respond to the matters raised and the Applicant confirmed it would respond in writing after the hearing.

1.4 This document seeks to fully address the representations made by the Interested Parties at the ISH2.

1.5 The Applicant has responded to the issues raised by each attending party and provided cross-references to the relevant application or examination documents in the text below. The document is supported by the following Appendix:

1.6 Appendix 1 – NLGEP: Geoarchaeological Borehole Evaluation and Deposit Model Report.

2. THE APPLICANT'S SUBMISSIONS IN RESPONSE TO MATTERS RAISED AT ISH2

Ref	Questions / Issues Raised at ISH2 and Hearing Action Points	Summary of Applicant's Response at ISH2	Applicant's Written Response
Agenda Item 3: Articles and Schedules of the DCO (excluding Articles 42, 43 and 44, Schedules 2 and 14)			
	The ExA asked the Applicant to provide a very brief overview of each part of the DCO.	The Applicant latest version of the DCO is the draft submitted in September (document reference **AS-006**). The draft Order is a statutory instrument, as required, and includes provisions and drafting to enable to DCO to be constructed, commissioned and operated. The DCO has 7 Parts with 47 main articles and 14 schedules setting out matters of detail referred to in the articles. The Applicant briefly outlined the main provisions in the Order, cross referring to the schedules where relevant. **Part 1 – Preliminary** Part 1, Preliminary, contains three articles. Articles 1 provides for the final Order's name and the date it will come into force. Article 2 defines a number of terms used in the Order. Article 3 deals with electronic communications. **Part 2 – Principal Powers** Part 2 contains the principal powers. This is the key operational part of the Order, particularly Article 4, which provides development consent for the authorised development, and Articles 6 and 7 which provide for its maintenance and operation. Schedule 1 defines the authorised development, which is split into work numbers and shown on the Works Plans (documents **APP-016** to **APP-018**). Article 5 deals with the limits of deviation in relation to the works,	The Applicant has no further comments.

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		which cross refer to the works plans, the parameters table in Schedule 1 and vertical parameters plans (document reference **APP-032**). Development consent is subject to the Requirements in Schedule 2. Article 8 allows the undertaker to apply for future planning permissions pursuant to the Town and Country Planning Act 1990 for other material operations within the Order limits without breaching the Order. Articles 9 and 10 identify that it is principally the undertaker who has the benefit of the Order and set out how and to whom the benefit of the Order can be transferred. Article 10 provides a standard mechanism for the transfer of the benefit of the Order with the consent of the Secretary of State. No consent is required for a transfer to: • the holder of an electricity generating licence; • the relevant statutory undertaker or licence holder in relation to utility or other infrastructure connection works; or • a highway authority responsible for the highways within the Order limits where the transfer relates to highway works. **Part 3 – Streets** Part 3 deals with streets and articles 11 to 21 set out the powers in relation to streets. Article 11 allows the undertaker to carry out street works for the purposes of the authorised development without having to obtain a separate licence from the street authority. Schedule 3 sets out the streets that are to be subject to street works and the nature of those works. Article 12 allows for alteration of the layout of streets for the purposes of construction and maintenance of the authorised development, with the consent of the street authority.	

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		Article 13 provides for permanent stopping up of streets where a substitute is to be provided. This relates to stopping up of part of Stather Road, with details set out in Schedule 4, and shown on the Rights of Way and Access Plans (document reference **APP-015**), of the extent of the stopping up and the new highway to be provided in substitution. Articles 14 and 15 provide for the temporary stopping up of streets, and creation and temporary stopping up of public rights of way, as set out in Schedule 5 and shown on the Rights of Way and Access Plans. Article 16 provides the power for the undertaker to form and lay out private accesses (permanent or temporary) or improve existing private accesses for the purposes of the authorised development, and to close certain private accesses without a substitute being provided. The detail is set out in Schedule 6 and shown on the Rights of Way and Access plans. Article 17 provides for creation of new clearway and waiting restrictions, with details set out in Schedule 7 and shown on the TRO drawings (document reference **APP-033**). Articles 18 and 19 provide for the classification of, and setting of a speed limit for, the new access road, as detailed in Schedules 8 and 9 and shown on the Rights of Way and Access plans and TRO drawings. Article 20 makes provision for new permanent and temporary Traffic Regulation Orders, with the consent from the relevant traffic authority, as may be necessary for the construction, operation or maintenance of the authorised development. Article 21 allows the undertaker to enter into agreements with the street authority relating to the construction of a street or the carrying out of works in the street, and the alteration and diversion of the street. **Part 4 – Compulsory Acquisition**	

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		Part 4 allows the undertaker to acquire land and rights, and take temporary possession of land, required for the scheme. The way in which the powers can be exercised is controlled by the drafting of the articles and the related details in Schedules 10 and 12, and the land is described in the Book of Reference (document reference **APP-010**) and shown on the Land Plans (document reference **APP-014**). The articles set out how and when the powers can be used, including in relation to statutory undertakers. The drafting reflects the optionality in relation to the district heating and private wire network, confirming that the undertaker may only acquire land and/or rights for either option A or B, not both. Article 22 requires the undertaker to ensure adequate financial security is in place in relation to compensation liability before compulsory acquisition powers are exercised. Article 24 imposes a 7 year time limit from the coming into force of the Order for these powers to be exercised. The justification for this is due to the complexity and scale of the project, construction of which Construction is intended to take six years. **Part 5 – Supplemental Powers** Part 5 is supplemental powers, which are standard powers included in a DCO, with provisions governing: • the discharge of water into watercourses, sewers and drains; and • authority to survey and investigate land shown within the Order limits or which may be affected by the authorised development. **Part 6 – Operations** Part 6, operations, includes powers to:	

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		• fell or lop trees and shrubs in certain circumstances; and • remove the hedgerows set out in Schedule 13 and shown on the Hedgerow Plans (document reference **APP- 022**) or, with the consent of the local authority, to remove and relocate any other hedgerows within the Order limits. **<u>Part 7 – Miscellaneous and General</u>** Part 7, contains the miscellaneous and general provisions in relation to matter such as: • The non-application of landlord and tenant law; • Operational land; • Defence to proceedings for statutory nuisance; • Service of notices for the purpose of the Order; • Procedure in relation to approvals required by the Order; and • Arbitration It also gives effect to the Protective Provisions in Schedule 14 and deals with the Certification of documents listed in Article 44.	
	The ExA asked for "TRO" to be defined in the draft DCO.	The Applicant confirmed this is a traffic regulation order and that the amendment will be made in the next version of the DCO.	The Applicant has no further comments.
	The ExA queried why the 7 year time limit for exercise of compulsory purchase powers (article 24) was longer than normally expected and longer than the Applicant's phasing strategy and construction programme.	The Applicant explained that the compulsory acquisition powers relate to various landowners affected by different aspects of the scheme. The 7 year time limit gives the Applicant flexibility to exercise those rights later if certain components of the development are delivered later on or in the event parts of the development are delayed. For example, the Explanatory Memorandum (document reference **APP-009 page 22**) refers to the district heating and private wire networks	The Applicant notes that the ExA has raised this point as a written question in the ExQ1 and so will respond to this question in further detail at Deadline 2.

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	ExA asked for an explanation. ExA understands seeking flexibility but in light of construction phasing and agreeing a phasing strategy with council, still not clear how can have a phasing strategy less than the CA time as doesn't make sense	which may be built later on, as they tie in to heat end users. Therefore the 7 year time period for exercising CA powers would give flexibility to continue to be able to exercise compulsory acquisition powers if some elements do not come on stream as quickly as the other elements. It is also important in terms of when the construction programme is commenced, as CA powers would need to be exercised to commence the relevant part of the development, so this allows flexibility if commencement of any aspect is delayed.	
	Simon Nicolson (RAIN) asked why the timelines from the initial proposals had doubled, stating that the Applicant intended to break ground in 2023 and commission in 2026. He also queried why the project is now extended to possible 7 years and was concerned about local disruption as a result.	The Applicant explained that the 7 year time period relates to the exercise of compulsory purchase powers and this is not the time it takes to deliver the development.	The Applicant has no further comments.
Agenda Item 4: Article 42 of the dDCO – Operational Land			
	The ExA asked the Applicant to provide an overview of the article.	The Applicant explained that this article is a model provision which provides that, for the purposes of section 264(3)(a) of the Town and Country Planning Act 1990, the development consent granted by the Order is to be treated as a specific planning permission. The effect of the provision is that the Order land is treated as "operational land" within the meaning of section 263 of the 1990 Act.	The Applicant has no further comments.

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		As a result, permitted development rights for operational land under the Town and Country Planning (General Permitted Development) Order 2015 will apply in relation to the Authorised Development. The rationale for incorporating this, is that the Applicant will become a statutory undertaker once it receives its electricity generating licence, so the provisions ensure they have certain limited and defined permitted development rights. This article is based on article 23 of the South Humber Bank Energy Centre Order 2021 and similar provisions have been included in other made Orders including the Hirwaun Generating Station Order 2015, the Progress Power (Gas Fired Power Station) Order 2015 and the Wrexham Gas Fired Generating Station Order 2017.	
	The ExA explained that the way the article is drafted gives permitted development rights for the entire site. The ExA wanted clarity on how the EIA has assessed this and whether it is right to have those rights on the entirety of the Order Land. The ExA asked North Lincolnshire Council (**Council**) to consider what area of land they feel the article should relate to and for the Council and	The Applicant confirmed that the article (as drafted) relates to the entirety of the Order Land and will look at that and consider whether it is appropriate to constrain the article.	The Applicant notes that the ExA has raised this point as a written question in the ExQ1 and so will respond to this question in further detail at Deadline 2.

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	Applicant to include in the statement of common ground between them details of what each party is seeking		
Agenda Item 5: Article 43 of the dDCO – Defence to Proceedings in respect of Statutory Nuisance			
	The ExA asked the Applicant to provide an overview of the article and the justification for excluding all categories of nuisance.	The Applicant confirmed it has considered the different types of nuisances. The Statutory Nuisance Statement (document reference **APP- 040**) seeks to go through each category of nuisance referred to in Section 79 of the Environmental Protection Act 1990. Section 3 of the Statutory Nuisance Statement deals with those aspects. The Applicant confirmed that it will look again at the list of nuisances in Section 79 of the Environmental Protection Act 1990 and consider whether each should be included and consider whether to amend Article 43 to include a restricted list of nuisances.	Based on the fact that the Statutory Nuisance Statement notes that the only matters addressed by the Environmental Protection Act 1990 that have been assessed as having the potential for significant effects in respect of the project are air quality (construction dust and operational emissions), noise, visible plumes (water vapour from stacks or coolers) and artificial lighting, then the Applicant agrees to limit the list of nuisances referred to in article 43 to s79(1): 1. (b) smoke emitted from premises so as to be prejudicial to health or a nuisance; 2. (c) fumes or gases emitted from premises so as to be prejudicial to health or a nuisance; 3. (d) any dust, steam, smell or other effluvia arising on industrial trade or business premises and being prejudicial to health or a nuisance;

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			4. (fb) artificial light emitted from premises so as to be prejudicial to health or a nuisance; 5. (g) noise emitted from premises so as to be prejudicial to health or a nuisance. The Applicant will make this amendment in the version of the DCO to be submitted at Deadline 2.
Agenda Item 6: Article 44 of the dDCO – Documents and Plans to be Certified			
	The ExA asked why the Design and Access Statement (DAS) and Navigation Risk Assessment (**NRA**) are not included as certified documents and whether they should be. As part of the submissions made by the Applicant at ISH1, the NRA and the DAS were being relied on and the ExA wanted to understand how the Applicant will ensure the DCO delivers on content from both of those documents if they are not included in the DCO as	The Applicant explained that the list of certified documents has been compiled by cross referring to Schedule 2 (Requirements) to ensure that if a document is referred to in a requirement it is a certified document. The Design and Access Statement (DAS) (document reference **APP – 037**) and Navigation Risk Assessment (NRA) (document reference **APP – 073**) are not referred to within the requirements and so have not been included as certified documents. The design principles and codes is a certified document and requirement 3 sets out that the detailed design must be in accordance with this. The Applicant will clarify how the design principles and codes draws out the key principles of design within the DAS and confirm whether or not there is therefore a need for the DAS to be referred to and included as a certified document.	The Applicant notes that the ExA has raised this point as a written question in the ExQ1 and so will respond to this question in further detail at Deadline 2.

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	certified plans or reference materials. The ExA wanted to understand how the design principles and code links to the DAS and brings through the explanation of the design approach that is set out in the DAS. The ExA wanted to see how good design has been demonstrated. In respect of requirement 3 (submission of design details), the ExA wanted to understand how the Applicant will achieve the design as is visualised and represented in the DAS through the current design principles and codes.		
Agenda Item 7: Schedule 2 of the dDCO – Requirements and Procedure for Discharge of Requirements			
	The ExA asked the Applicant to provide an overview of the Requirements.	The Applicant provided a brief overview as follows: Requirement 2 specifies a 5-year limit for commencement of the authorised development. This is standard practice for this type of development. This requirement also covers phasing. The rationale was that notification of commissioning relates to each part of the development.	The Applicant has no further comments.

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		Requirement 3 specifies that no development may commence, other than preliminary works, until design details have been submitted and approved by the LPA. The design details must accord with design principles and codes and take account of preliminary ground investigations. Requirement 4 requires LPA approval of permitted preliminary development works Construction Environmental Management Plan (CEMP) and subsequent approvals of CEMPs for each phase, to be in accordance with Code of Construction Practice (CoCP) Requirements 5-9 are standard requirements requiring approval of details for operational lighting, landscaping, landscape and ecology management, surface water and foul water drainage. Requirement 10 specifies submission and approval of the Construction Traffic Management Plan and construction workers travel plan. Requirement 11 Archaeology - requires approval of a programme of works. Since drafted we have submitted the WSI for trial trenching – the Applicant understands it is substantially agreed but is awaiting approval. The Applicant has carried out auguring and reporting and carbon dating and reporting. Requirement 12 requires submission and agreement of a flood management plan prior to commissioning. Requirement 13 requires submission and agreement of an operational travel plan.	

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		Requirement 14. This was discussed during ISH1. It requires no commencement of energy park works, and railway reinstatement works, until the new access road has been constructed to base course level. Requirement 15 controls fuel to RDF only. Requirement 16 specifies a decommissioning plan within two years of the date the undertaker decides to end commercial operation. Requirement 17 requires approval of a scheme for and delivery of the CHP prior to coming into operation of ERF. Requirement 18 specifies that notice of commissioning must be given and requires the CCUS to be constructed and commissioned within 6 months of commissioning of ERF; and the Concrete Block Manufacturing Facility to be constructed and commissioned within 12 months of commissioning of the CCUS. Requirement 19 specifies a minimum level of CO2 capture to circa 55,000 tonnes. Requirements 20-21 relate to any amendments that may be subsequently approved by LPA. Requirement 22 specifies that approval must be given in writing. Requirement 23 allows for provision of early information before the Order coming into force.	
	The ExA queried whether "preliminary works" is the correct wording to use, as it is outside of the	The Applicant explained that "preliminary works" is a defined term in the DCO, including things like site clearance and removal of minor structures. There is also a separate definition of "commence", which takes the standard approach of referring to "material operations" as set	The Applicant has no further comments.

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	legislative framework – the ExA asked if "preliminary works" is appropriate, whether it is sufficiently defined and whether it would be more appropriate to refer to works prior to a material operation. The ExA noted that there is activity which would not necessarily require the submission of another construction environmental management plan (**CEMP**) and thought it would become easier to draft the requirements if the definition was presented in "pre-commencement" terms	out in section 155 of the Planning Act 2008 and does not seek to make any exceptions as to what will be a material operation for the purposes of the DCO. The Applicant's approach seeks to achieve the same outcome as that suggested by the ExA. The Applicant explained that there is a requirement to have a preliminary development works construction environmental management plan (**PPDW CEMP**) prior to commencing the preliminary works. This is required according to requirement 4(1).	
	In relation to requirement 3(1)(a), the ExA asked whether this needs to state "following commissioning" and whether archaeology should be included in requirement 3(2).	The Applicant confirmed this will be considered.	The Applicant agrees to delete reference to the wording "following commissioning" in requirement 3(1)(a). The Applicant agrees to include reference to archaeology in requirement 3(2). The Applicant will make these amendments in the version of the DCO to be submitted at Deadline 2.

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	In relation to requirement 4, the ExA asked whether it was intended that a PPDW CEMP for the preliminary works be submitted for the entire scheme or parts. The ExA asked whether the PPDW CEMP for the preliminary works covers the entire Order Land.	The Applicant explained that the intention is there will be a separate PPDW CEMP in terms of preliminary works (requirement 4 (1)). In relation to the main CEMP (requirement 4(2))., the reference to "part of the authorised development" is in case elements of the development come forward separately. This wording is to provide flexibility. The Applicant confirmed that there will be one plan submitted for the entirety of the preliminary works across the Order Land.	The Applicant has no further comments.
	In relation to requirement 5 (submission of indicative lighting strategy), the ExA asked whether this deals with both proposed new lighting and existing lighting.	The Applicant confirmed that the Indicative Lighting Strategy does address existing lighting and proposed lighting but will consider again the wording of the requirement.	The Applicant agrees to amend requirement 5 to delete reference to the wording "to be installed", so that the scheme to be submitted relates to "all permanent lighting" (which would cover existing lighting to be retained as well as proposed lighting). The Applicant will make this amendment in the version of the DCO to be submitted at Deadline 2.
	In relation to requirement 7 (submission of landscape and biodiversity management plan), the ExA asked if it should include wording that development is carried out in accordance with the approved scheme.	The Applicant confirmed this wording should be included and will amend the DCO at Deadline 2.	The Applicant has no further comments.

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	In relation to requirement 10(4), the ExA asked whether this should refer to the construction worker travel plan as well.	The Applicant confirmed it will check this.	The Applicant will make an appropriate amendment in the version of the DCO to be submitted at Deadline 2 and respond to the ExQ1 on this point.
	In relation to requirement 12 (flood management plan), the ExA was concerned about timing of the submission of the flood management plan as prior to commissioning as this will need to be dealt with in a timely manner for it to be effective, which the ExA thought would need to be in advance of final design and commissioning.	The Applicant cross referred to the works that tie into the physical works that provide the flood protection. These are Work No. 13 flood defences and SUDs (document reference **APP- 016**) and Work No. 5 new access road and highway improvements (document reference **APP- 016**).	We will respond further at Deadline 2 to the ExQ1 on this point.
	The Environment Agency (**EA**) asked for clarity on when the detailed flood scheme will be submitted for approval. It is not clear whether this covered in the requirement relating to submission of the CEMP or whether by requirement 12. The EA is concerned if this is under requirement 12 then the pre-	The Applicant confirmed as part of the CEMP there will be a separate flood management plan during construction. Requirement 4(2) states that no development may commence, (except preliminary works), until a CEMP for that part has been submitted to and approved by the relevant planning authority following consultation with the Environment Agency. Requirement 4(3)(e) requires that the CEMP will incorporate a construction flood management plan. The Applicant will consider the timescale for submission.	The Applicant can address this further in the statement of common ground with the EA.

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	commissioning stage is not soon enough to allow them to approve the scheme before actually being built. The ExA asked that the EA and the Applicant include information on this in the statement of common ground between the two.		
	The ExA asked when additional information regarding archaeology is expected.	The Applicant confirmed that the augering and carbon dating work can be provided at Deadline 1. The Applicant is in discussion with the Council about the written scheme of investigation and if this is agreed will submit it into the examination.	The Applicant has no further comments, although see Appendix 1.
Agenda Item 8: Schedule 14 of the dDCO – Protective Provisions			
	The ExA asked for an update on progress between parties regarding protective provisions.	The Applicant has included generic protective provisions in DCO for electricity, gas, water and sewerage undertakers and operators of electronic code networks. The Applicant has also received requests for bespoke protective provisions with certain parties. These are being negotiated. The parties who have requested protective provisions are: Network Rail Infrastructure Limited – the Applicant has received copies of bespoke protective provisions and these have been reviewed and are	The Applicant has no further comments.

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		in the early stages of negotiation. The Applicant expects to have agreed protective provisions before the end of examination. Anglian Water – draft protective provisions have been reviewed and the Applicant's comments on these are with Anglian Water for consideration. Northern Powergrid – the Applicant has received copies of bespoke protective provisions and these have been reviewed and are in early stages of negotiation. The Applicant expects to have agreed protective provisions before the end of examination. National Highways – the Applicant notes a late relevant representation was made by National Highways and they have requested bespoke protective provisions. The Applicant has not yet received draft protective provisions and is in beginning discussions to understand what they require.	
	The ExA noted that Associated British Ports has not requested protective provisions and asked the Applicant to obtain confirmation from them that they are not looking for protective provisions as navigation or port authority.	The Applicant confirmed it will contact Associated British Ports.	The Applicant has no further comments.
	Simon Nicholson (RAIN) asked for an update on protective provisions with Cadent Gas as they have	The Applicant confirmed it is aware of the gas main and has made attempts to contact Cadent Gas to query whether Cadent Gas requires protective provisions. A response is awaited and the Applicant is chasing.	The Applicant has no further comments.

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	a gas main which runs across the site.		
	The ExA asked whether the Applicant has engaged with British Steel as they have apparatus which is affected by the proposed development.	The Applicant confirmed it is aware of the apparatus and looking into that further. The Applicant is liaising with British Steel to resolve any issues and would look to agree any points with the in the statement of common ground.	The Applicant has no further comments.
	The ExA asked whether, as British Steel is not a statutory undertaker, the ExA would be provided with a copy of any private agreement reached or if the Applicant would just provide an update that agreement has been reached.	The Applicant confirmed this will be discussed with British Steel and an update will be provided to the ExA in due course.	The Applicant has no further comments.
Agenda Item 9: Consents, Licences and Other Agreements			
	The ExA asked the Applicant to provide an update of progress and timescales for completion in relation to the consents, licences and agreements listed in the Consents & Licenses document (**APP-042**)	The Applicant confirmed the Consents and Licences document (document reference **APP-042**) sets out the consents, licences and agreements required. There have not been any significant updates on these consents and licences since submission, however the Applicant is able to provide an update on the environmental permit required from the Environment Agency (EA) and the section 111 agreement with the Council. The Applicant has engaged with the EA. A formal pre-application meeting was held on 17 October 2022 with the EA and various items	The Applicant has no further comments.

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		were discussed. A formal response was received on 4 November 2022 in terms of the EA's pre-application advice. There is a further meeting scheduled to take place on 22 November 2022. A formal application is not likely to be lodged in the next few months and as such it is unlikely that there will be a determined result prior to the close of examination as the EA takes approximately 8-12 months to deal with applications. This is not unusual and a lot of the assessment information for the permit has been provided as part of the submitted Environmental Statement. The Applicant confirmed that, in terms of planning obligations, the Applicant is liaising with the Council in respect of a draft section 111 agreement relating to contributions to highway works in the vicinity of Neap House. The draft agreement (document reference **APP- 047**) was sent to the Council in September 2022 and a response is awaited from the Council.	
	The ExA asked for an update on the licence with the neighbouring land owner regarding the area of land which is not suitable for compulsory acquisition but would contribute towards biodiversity net gain.	The Applicant confirmed this land is part of the Normanby Estate. The Applicant is in negotiations and expects to have a signed agreement shortly. The Applicant confirmed a redacted copy will be provided once this has completed.	The Applicant has no further comments.
Agenda Item 10: Statements of Common Ground relevant to the DC			
	The ExA asked the Applicant to provide an	The Applicant is engaging with the various parties to agree a SoCG as soon as possible. The Applicant has made contact with all the parties and updates are as follows:	The Applicant has no further comments.

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<tr><th>Ref</th><th>Questions / Issues Raised at ISH2 and Hearing Action Points</th><th colspan="2">Summary of Applicant's Response at ISH2</th><th>Applicant's Written Response</th></tr>
<tr><td></td><td>update on Statements of Common Ground (SoCG).</td><td colspan="2"><table>
<tr><th><u>Party</u></th><th><u>Current Position</u></th></tr>
<tr><td>Anglian Water (AW)</td><td>The Applicant and AW had a meeting on 31 October to discuss the SoCG. A draft SoCG was issued by the Applicant on 11 November. A further meeting is scheduled on 28 November to discuss this. The Applicant hopes to submit a draft SoCG at Deadline 1.</td></tr>
<tr><td>Northern Powergrid (NPG)</td><td>The Applicant provided an update earlier in respect of protective provisions. The SoCG only cover limited points, however the Applicant will progress that as well.</td></tr>
<tr><td>Cadent Gas</td><td>The Applicant has made several attempts to contact Cadent Gas, however, is struggling to get the right contact. The Applicant will continue to attempt to make contact.</td></tr>
<tr><td>BT plc and Open Reach</td><td>The Applicant is engaging with BT plc and Open Reach in relation to protective provisions. The SoCG is not advanced but the Applicant will do its best to have a SoCG ready to submit as quickly as it is able to.</td></tr>
<tr><td>Network Rail</td><td>The Applicant has been engaging with Network Rail and now has the details of a confirmed contact. The Applicant will be sharing the draft SoCG shortly and will provide an update at Deadline 1.</td></tr>
<tr><td>Scunthorpe and Gainsborough Water</td><td>Matters have been fairly well progressed. A meeting was held on 11 November and the Applicant will share a draft of the SoCG with the SGWMB this</td></tr>
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		Management Board (**SGWMB**)	week and hopes to be able to submit the draft at Deadline 1.	
		National Highways	The Applicant is waiting for an appropriate contact at National Highways in order to progress the SoCG and will do its best to agree a SoCG as quickly as possible.	
		Severn Trent Water	The Applicant provided an update earlier in respect of protective provisions. The SoCG may only cover limited points but the Applicant will progress that with them as well.	
		Environment Agency	A draft SoCG has been prepared and will be shared with the EA shortly. A meeting between the parties is scheduled to take place on 22 November. The Applicant reserves its position in relation to submission of this SoCG at Deadline 1 until it has had this meeting.	
		Historic England	Historic England has confirmed it is happy to have a SoCG. There are limited matters Historic England has commented on, so the SoCG will cover these. The SoCG may not be ready for submission at Deadline 1.	
		Natural England	A draft SoCG has been prepared and will be shared with Natural England shortly. The Applicant has a meeting with Natural England scheduled on 24 November. The Applicant reserves its position in relation to submission of this SoCG at Deadline 1 until it has had this meeting.	

Ref	Questions / Issues Raised at ISH2 and Hearing Action Points	Summary of Applicant's Response at ISH2		Applicant's Written Response
		North Lincolnshire Council	A draft SoCG is with the Council for comments and the Applicant had meeting with the Council on 16 November 2022 to discuss the SoCG. The Applicant hopes to have a working draft for submission at Deadline 1.	
		Humberside Fire and Rescue Authority	The Applicant has engaged with Humberside Fire and Rescue Authority throughout consultation and is attempting to make contact with them in respect of a SoCG.	
		Associated British Ports (humber)	The Applicant is in regular contact with Associated British Ports. The Applicant will ensure that a SoCG is prepared and submitted as soon as possible.	
		British Steel	The Applicant is in contact with them and will be drafting a SoCG.	
		Rainham Steel	The Applicant is in contact with them and will be drafting a SoCG.	
		Jotun Paints (Europe) Limited	The Applicant is in contact with them and will be drafting a SoCG.	
		AB Agri Limited	The Applicant had a recent meeting with AB Agri Limited and is engaging on a SoCG.	
		Bagmoor Wind Limited	The Applicant is having difficulty finding out who is the owner of the wind farm and is attempting to find the right person and will provide an update at Deadline 1.	

<table>
<tr><th>Ref</th><th>Questions / Issues Raised at ISH2 and Hearing Action Points</th><th colspan="2">Summary of Applicant's Response at ISH2</th><th>Applicant's Written Response</th></tr>
<tr><td></td><td></td><td>National Grid Carbon Limited</td><td>The Applicant has made contact with National Grid Carbon Limited and will be progressing a SoCG.</td><td></td></tr>
<tr><td></td><td></td><td>UKWIN</td><td>The Applicant is in the process of finalising the draft SoCG internally and will share with UKWIN shortly.</td><td></td></tr>
<tr><td></td><td></td><td>Enfinium Limited</td><td>The Applicant has not made substantive progress in agreeing a SoCG but is in contact with Enfinium.</td><td></td></tr>
<tr><td colspan="5">Agenda Item 11: Review of issues and actions arising.</td></tr>
<tr><td></td><td>The ExA stated that he has not kept a comprehensive list of issues arising and will rely on the Applicants' notes.</td><td colspan="2">The Applicant confirmed it will prepare a schedule of changes and submit a DCO in tracked changes at Deadline 2.</td><td>The Applicant has no further comments.</td></tr>
</table>

APPENDIX 1

NLGEP: Geoarchaeological Borehole Evaluation and Deposit Model Report

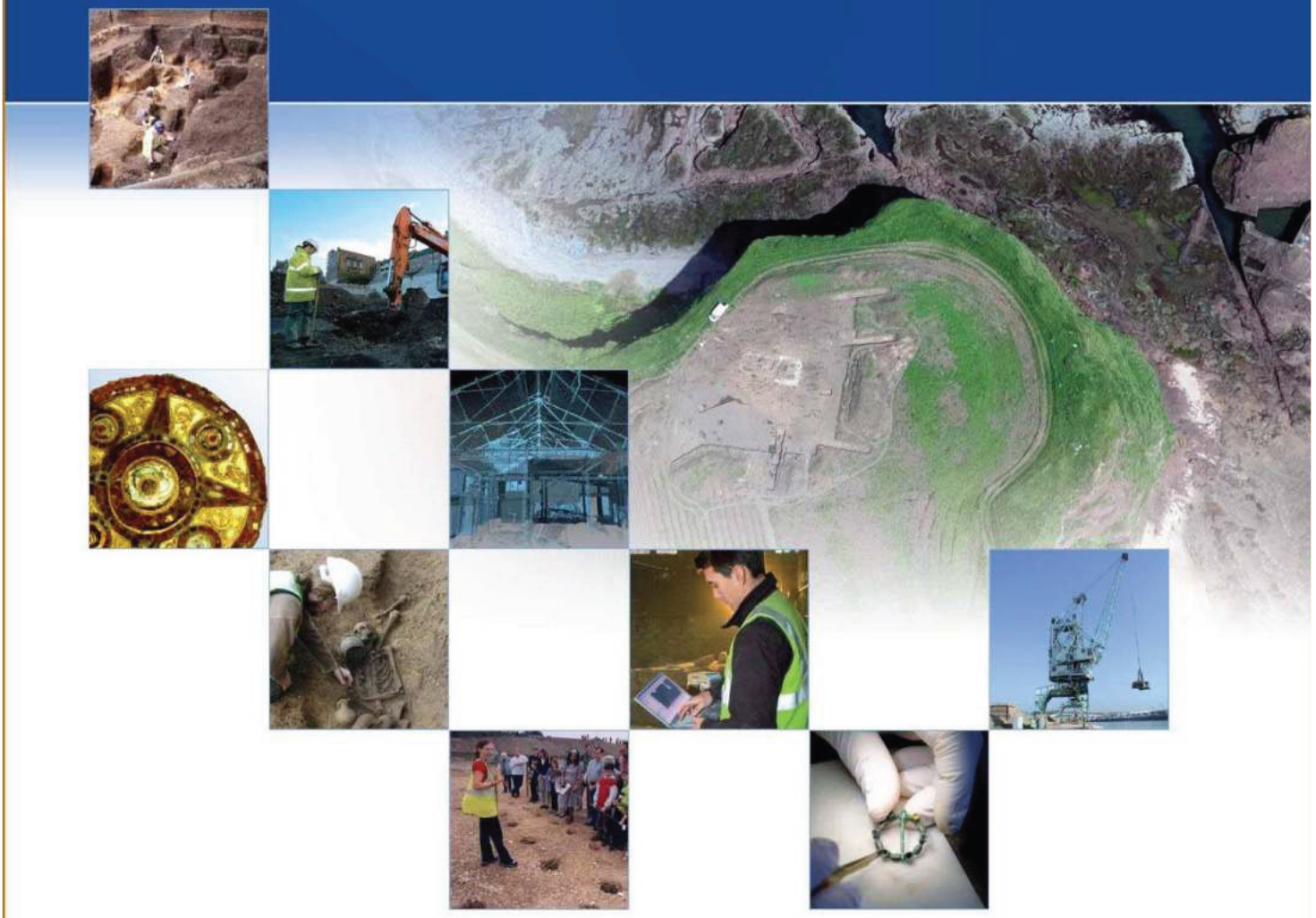
NLGEP: Geoarchaeological Borehole Evaluation and Deposit Model Report

AOC Project No: 53056

Site Code: AOCSOL21

National Grid Reference Number: 486862 413617

Date: October 2022



AOC Archaeology Group

ARCHAEOLOGY | HERITAGE | CONSERVATION

Solar 21: Geoarchaeological Borehole Evaluation and Deposit Model Report

On Behalf of:	**The North Lincolnshire Green Energy Park** Regent Court Princess St Hull, East Yorkshire HU2 8BA
Consultant:	**ERM** 2nd Floor Exchequer Court, 33 St Mary Axe, London EC3A 8AA
National Grid Reference (NGR):	**TA 1676 6108 (centre)**
AOC Project No:	**53056**
Prepared by:	**Jessica Taylor**
Illustration by:	**Jessica Taylor**
Date:	**November 2022**

This document has been prepared in accordance with AOC standard operating procedures.

Author: Jessica Taylor	**Date: 4th November 2022**
Approved by: Virgil Yendell	**Date: 4th November 2022**
Draft/Final Report Stage: Draft	**Date: 4th November 2022**

Enquiries to: AOC Archaeology Group
Unit 7
St Margaret's Business Centre
Moor Mead Road
Twickenham
TW1 1JS

Tel. 020 8843 7380
Fax. 020 8892 0549
E-mail. london@aocarchaeology.com

NON-TECHNICAL SUMMARY

A geoarchaeological evaluation was undertaken on 26th-30th September 2022 on the land adjacent to the Flixborough Industrial Estate, situated at Stather Road, Flixborough, Scunthorpe (NGR TA 1676 6108). The work was undertaken by AOC Archaeology Group for the consultancy ERM on behalf of the client, the North Lincolnshire Green Energy Park (NLGEP).

This document summarises the stratigraphic sequence of geoarchaeological remains and discusses the results in relation to their archaeological and palaeoenvironmental potential. The principal objective of this report is to present the results, refine the research objectives of the project in light of the findings, and make recommendations concerning any subsequent archaeological investigations in order to address these research objectives.

The geoarchaeological evaluation comprised the drilling of 17 purposive geoarchaeological boreholes to a maximum depth of c. 6 to 12m bgl, and the extraction and retention of the cored samples. Geoarchaeological and geotechnical deposit data can be used to identify areas of archaeological potential by characterising the probable nature and depth of sub-surface deposits.

To be completed (add dating results and ERT)

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1 INTRODUCTION

1.1 This document details the results of a geoarchaeological borehole evaluation at the site of the land adjacent to the existing Flixborough Industrial Estate, Scunthorpe (NGR: TA 1676 6108, Figure 1). The work was commissioned from AOC by ERM on behalf of the client, the North Lincolnshire Green Energy Park (NLGEP).

1.2 The proposed development site (henceforth "the Site") will be situated at Stather Road, Flixbrough, Scunthorpe, on the land adjacent to the Flixborough industrial Estate. The associated District Heat and Private Wire Networks (DHPWN) will run from the NLGEP site and terminate at two locations; the first located in Scunthorpe town centre, at the offices of North Lincolnshire Council, and the other at land adjacent to the M181, to the west of Scunthorpe.

1.3 This report consists of a Stage 3, geoarchaeological borehole evaluation, in order to evaluate the potential of the site to contain significant archaeological remains and to produce a report inclusive of a deposit model. The report follows up on a previous interim report on 11 hand auger locations and 4 boreholes (AOC, 2022b). Samples have been collected and retained in order to facilitate possible later geoarchaeological/palaeoenvironmental specialist assessment, but an assessment of this nature is not included at this stage so that the need for further fieldwork can be commented on in a timely manner.

Table 1 Generic stages of geoarchaeological investigation for guidance

Stage	Stage number
Consultancy: Desk based and impact assessment	1
Fieldwork: Geotechnical monitoring	2
Fieldwork: Trench evaluation / borehole evaluation	3
Fieldwork: Watching brief / excavation / mitigation boreholes	4
Post-excavation: Specialist geoarchaeological / palaeoenvironmental assessment	5
Post-excavation: Specialist geoarchaeological / palaeoenvironmental analysis	6
Publication	7

1.4 The geoarchaeological evaluation comprised the drilling of 17 purposive geoarchaeological boreholes to a maximum depth of *c.* 12m bgl, and the extraction and retention of the cored samples (Figure 1). Geoarchaeological and geotechnical deposit data can be used to identify areas of archaeological potential by characterising the probable nature and depth of sub-surface deposits.

1.5 As such, this report will provide recommendations on how investigations pertaining to these works should proceed and how such work will be integrated into the wider findings from the area. The works reported on here were carried out under the Written Scheme of Investigation (WSI, AOC 2022a) for the site. Subsequent stages of investigation may be required dependant on the results of this report.

2 PLANNING BACKGROUND AND PROPOSED DEVELOPMENT

2.1 The site has been subject of a previous Written Scheme of Investigation (WSI, AOC 2022a), and

interim report (AOC, 2022b). The following has been outlined previously within those documents, and is taken from the WSI (AOC, 2022a).

2.2 The Applicant is proposing a new Energy Recovery Facility (ERF) and Associated Development (the Project) which constitutes a thermal combustion combined heat and power plant with a potential power output capacity of up to 100 MWe from a total thermal capacity of 316 MWth together with Associated Developments. The location of the project is illustrated on Figure 1.

2.3 The NLGEP will be located on land adjacent to the existing Flixborough Industrial Estate, situated at Stather Rd, Flixborough, Scunthorpe. The associated District Heat and Private Wire Networks (DHPWN) will run from the NLGEP site and terminate at two locations; the first located in Scunthorpe town centre, at the offices of North Lincolnshire Council, and the other at land adjacent to the M181, to the west of Scunthorpe. Full details on the project description are presented within the Preliminary Environmental Impact Report (PEIR), specifically in Volume 1, Chapter 3: Project Description.

2.4 The Site lies within the administrative area of North Lincolnshire Council. Alison Williams provides archaeological advice to North Lincolnshire Council.

2.5 The WSI (AOC, 2022a) sets out the methodology for a geoarchaeological borehole survey in order to assess the presence or absence of archaeological remains and palaeoenvironmental deposits, and to investigate their extent, nature, quality, date, and character.

3 LOCATION AND PROPOSED IMPACTS

Here follows a summary of the location of the development areas as they relate to the proposed development works, and as outlined within the WSI (AOC, 2022a). There are six development areas (Figure 2), outlined below.

3.1 Area 1 (A1) is located at the southwestern corner of the current Flixborough Industrial Estate and the proposed developments include:

- The energy recovery facility (ERF), including carbon capture, utilisation and storage CCUS facility. The Bunker Hall lies within this facility will require the excavation of a shaft up to 10m bgl. Additional impacts are expected from piling associated with the ERF and related tower cranes.

3.2 Area 2 (A2) is located between Stather Road and the B1216 and the proposed developments include:

- A concrete block manufacturing plant and ash treatment facility in the north and from which the main below ground impacts are expected to be from piling.
- A plastic recycling facility, also in the north and from which the main below ground impacts are expected to be from piling.
- A visitor centre, also in the north and from which the main below ground impacts are expected to be excavation of the building footprint to formation level (depth currently

unspecified).

- A railhead along the western edge of the northern part and from which the main below ground impacts are expected to be excavation of the footprint to formation level (depth currently unspecified).
- A utilities corridor, aligned north-south from Stather Road, connecting to the hydrogen facility and AGI in the north of Area 3 and continuing to the B1216 in the south, with an east-west aligned section connecting to the railhead terminus.
- Several large ponds associated with the wetland conservation area (depth currently unspecified).

3.3 Area 3 (A3) Stretches from just north of the B1216 southwards down to the B1450 and the proposed developments include:

- A Gas network connection (nature and depth of impact currently undefined).
- A hydrogen production facility (nature and depth of impact currently undefined).
- A hydrogen refuelling facility (nature and depth of impact currently undefined).
- A battery storage facility (nature and depth of impact currently undefined).
- EV vehicle charging facility (nature and depth of impact currently undefined).
- Utilities corridor (nature and depth of impact currently undefined).
- Access roads (nature and depth of impact currently undefined).
- Laydown areas (nature and depth of impact currently undefined).
- The southern district heating and private wire network (DHPWN), consisting of linear impacts alongside existing roads (depth currently undefined).

3.4 Area 4 (A4) is located in the east and north of the Site. The south eastern part of Area 4 is immediately east of the Flixborough Industrial Estate, in a field to the south of First Avenue and the proposed developments include:

- An electrical substation (footprint excavation to unknown depths)
- A hydrogen and natural gas above ground installation (AGI) (nature and depth of impact currently undefined);

The proposed development in the central eastern and northern parts of Area 4 consists of:

- Landscaping (below ground impact currently unknown).

3.5 Area 5 (A5) runs along the A1077 from the Skippingdale Roundabout to Phoenix Parkway and the proposed developments include:

- The northern DHPWN, consisting of linear impacts alongside existing roads (depth

currently undefined).

3.6 Area 6 (A6) is located just over 300m north of the Skippingdale Retail Park and the proposed developments include:

- The construction of a flood bund over the whole footprint of the area.

4 GEOLOGY AND TOPOGRAPHY

4.1 The following is taken from the WSI (AOC, 2022a).

4.2 A north-south aligned mudstone ridge dominates the geology of the study area, upon which the historic settlements of Flixborough, Crosby and Scunthorpe are situated. The mudstone and Ironstone bedrocks are shallow to full marine deposits from the Triassic (c. 251-201 Mya) and Jurassic (c. 201-145 Mya). The mudstone ridge forms the eastern edge of the meandering Trent Valley, which is filled with deep Holocene (12,000 years ago – present) alluvium (clay, silt, sand, and peat) and overall represents uniform to varied riverine deposition across a floodplain. The eastern edge of the valley and west side of the mudstone ridge is characterised by thick drifts of 'windblown sand', which appear to have derived from late glacial sands (BGS 2022) and in some cases are overlain by alluvium. The sand, occasionally classified as Sutton Sand Formation, is a fine silty sand formed during the Devensian to Holocene (115 thousand years ago onwards) and represents an aeolian or wind-blown redeposition of underlying glaciolacustrine deposits or bedrock.

4.3 The superficial deposits recorded across the area also consist of clay and silt Warp (BGS 2022), which Burke et al (2015) describe as "an artificially deposited silt and clay sequence formed in the last two or three centuries by controlled flooding to raise the land level and improve the quality of agricultural land." Warping is part of a programme of labour-intensive and largescale engineering, evidenced by historical accounts and relic engineering/drainage features (Van de Noort 2004). However, definitively applying the term to strata primarily based on lithological description of deposits alone may be problematic. The BGS themselves say, that lithologically, Warp is indistinguishable from any other 'natural' tidal deposit (Burke et al 2015). This highlights the specific difficulty of identifying at what depth a unit of Warp begins and ends. As such, this term appears to be of limited use in initially categorising or interpreting deposits without supporting chronostratigraphy, evidence of relic engineering/drainage features, and specific historical accounts.

4.4 The British Geological Survey (BGS 2022) indicates that A1 and A2 are underlain by bedrock of Mercia Mudstone. This is a predominantly red siltstone, of a semi-terrestrial to shallow marine origin, which formed approximately 52 to 247 Mya in the Early Triassic Period, and now rises to form the north-south ridge.

4.5 A4 is underlain by the Scunthorpe Mudstone and Penarth Group limestones (c. 206-201 Mya, BGS 2022), of brackish and fully marine origin, and Scunthorpe Mudstone of marine origin (also c. 206-201 Mya).

4.6 The superficial deposits across A1 and A2 mostly consist of alluvial deposits and are identified as being in the region of 3 to 17m thickness (BGS borehole SE81SE21). Limited deposits of windblown sands are identified as being approximately 3m in thickness and lie in the south of the development

area between A1 and the B1216 (BGS borehole SE81SE77).

4.7 In A4 the superficial deposits include some limited Hemingbrough Glaciolacustrine Formation. The later was probably deposited in a low energy, pro-glacial lake environment that developed during the Devensian (c. 0.116 to 0.0118 Mya), ahead of the southward advancing ice sheet (Ford et 2003). As well windblown sand formed during the Devensian to Holocene (115 thousand years ago onwards) as underlying glaciolacustrine deposits or bedrock was reworked.

4.8 The British Geological Survey (BGS 2022) indicates that most of the northern Laydown area is underlain by the marine Charmouth Mudstone Formation (c. 199-182 Mya). To the west and east lie the Frodingham Ironstone Member and Pleistocene Ironstone, marine shoal/shallow marine deposits of the early Jurassic, which formed c. 199-190 Mya. The superficial deposits to the east and west of the northern Laydown area consist of Devensian to Holocene (115 thousand years ago onwards) windblown sands, however, within the northern Laydown area the superficial deposits were previously removed by the cutting for the Dragonby Railway.

4.9 The British Geological Survey (BGS 2022) indicates that the southern Laydown area, within A3, is entirely underlain by Mercia Mudstone Formation. The superficial deposits across the southern Laydown area, within A3, consists mostly of Warp with some very limited alluvial survival in the south.

5 ARCHAEOLOGICAL AND HISTORICAL BACKGROUND

5.1 The following background is taken from the WSI (AOC, 2022), which should be referred to for the HER and figure references. This information was originally derived from Chapter 12 of the PEIR Archaeology and Cultural Heritage Assessment and the DCO (pers. comm. ERM 04/08/21). This should be read in conjunction with these documents.

Prehistoric and Roman Evidence (Pre AD410)

5.2 A single Palaeolithic asset is located approximately 780m outside the nearest part of the Order Limits. It comprises the findspot of a tanged flint blade of Late Upper Palaeolithic date, i.e., from the end of the Palaeolithic period. It was said to have been found on windblown sand at Risby Warren/Crosby Warren, along with a cache of obliquely backed points. These artefacts may indicate the site of a temporary hunting camp. Early prehistoric activity is known within the region through pollen analysis, which indicates that forests were beginning to be cleared during the Mesolithic period. Evidence for seasonal occupation during the Mesolithic and Neolithic period is also evident in environmental remains and flint scatters. Many of the Mesolithic flint scatters in the vicinity of the Site, are located on or immediately adjacent to (and reference sandy contexts in their descriptions) deposits of wind-blown sand depicted in BGS data. These sandy deposits mantle the high ground overlooking the Trent Valley. Notable Neolithic to Bronze Age flints and Roman pottery have been found in Willow Holt Sand Quarry, immediately to SE of A4 (PEIR Chapter 3). There is considerable evidence of human activity dating from the Mesolithic onwards, comprising findspots, evidence of occupation sites and the potential for significant peat deposits and palaeoenvironmental remains to be buried under alluvium.

Early Medieval and Medieval (AD 410-1485)

5.1 The scheduled monument of Flixborough Saxon nunnery and site of All Saints medieval church and burial ground is located adjacent to the Order Limits and was partially excavated between 1989

and 1991. Excavations uncovered parts of 40 buildings, 39 of which were of early medieval date. During the 8th and earlier 9th centuries, two rows of modest buildings arranged end to end stood either side of a shallow depression in which accumulated a large amount of refuse. This asset was first observed in section in a commercial sand pit. Prior to archaeological excavation, two metres of windblown sand overburden (aeolian reworking of post-glacial sands) had to be removed my mechanical excavation from above the archaeological remains. This overburden preserved but also concealed the site from view before it was exposed by sand quarrying. The scheduled monument also contains the site of the church that served the deserted village of North or Little Conesby. A hoard of Middle-Saxon woodworking tools (DBA asset 221) deposited within two lead tanks was found during sand quarrying at Flixborough in 1994 adjacent to the southwestern side of the scheduled monument, adjacent to where early medieval occupation remains were excavated in 1933 ahead of destruction for sand extraction.

5.2 During the late medieval period, a worsening climate (known as the 'Little Ice Age') and poor rural economic stability, along with outbreaks of the Bubonic Plague, reduced the quantity and quality of grain production, leading to land being lain to pasture and creating opportunity to encourage peasant migration to urban centres. Deserted settlements are relatively common within the region, including those found at the village of North or Little Conesby and Swalcliffe. Flixborough Stathe was the historic river port linked to Flixborough on the high ground to the east by road. Shallow buried remains of the medieval port are likely to have been disturbed by twentieth century development of the wharf.

Post-Medieval and Modern (AD 1485-Present)

5.3 The study area comprises expanses of 20th century light industrial activity, agricultural activity, including evidence of historic agricultural practices; including field patterns, hedgerows, tracks, and post-medieval and modern housing; including commercial buildings and road and rail infrastructure; and Flixborough Staithe river port.

5.4 On 1 June 1974, an explosion in a cyclohexane plant at Nypro UK (a chemical plant) occurred at the Flixborough industrial estate, resulting in the deaths of 28 people, with 36 people seriously injured. At the time of the disaster, Nypro UK produced the chemical caprolactam, used in the production of nylon, from cyclohexanone. Cyclohexanone was produced by partially oxidising hot liquid. The HSE website summarises the incident 'The cyclohexane formed a flammable mixture and subsequently found a source of ignition. At about 16:53 hours there was a massive vapour cloud explosion which caused extensive damage and started numerous fires on the site". Fall-out from the explosion is a potential source of historical contamination.

5.5 The ERF facility is being developed on a site at Flixborough Stathe, formerly occupied by a series of large round storage tanks, which are likely to have contained fuels, other process chemicals, and where large quantities of coal and other solid fuels were also formerly stored.

6 GEOARCHAEOLOGICAL AND PALAEOENVIRONMENTAL BACKGROUND

6.1 The following was previously outlined within the WSI (AOC, 2022).

6.2 The character and distribution of past human activity can be better understood through the consideration of the past landscape or environmental context. The topography and nature of the ancient land surface during the early Holocene, the current geological epoch and equivalent to the

early Mesolithic (c. 11,500 BP or 10,000 BC), is dictated by and inferred from the surface of the Pleistocene superficial deposits (the previous epoch) and older solid geology (e.g. gravel or chalk). Overlying the Pleistocene - or older - deposits, Holocene deposits may preserve palaeoenvironmental evidence (e.g. pollen, diatoms, ostracods) of landscape development, from local channel migration and vegetation change to regional effects of climate and relative sea level change. In combination, likely preservation of palaeoenvironmental remains and deposit data (e.g. depth and character) provides a comparative framework to assess archaeological potential. Peat represents vegetated and waterlogged landscapes (e.g. marshland) which developed, within local or regional fluctuations of hydrology. The anaerobic and acidic conditions of the deposit are particularly conducive to organic preservation. Palaeoenvironmental remains from floodplain deposits, especially peat, provide information on the nature and timing of environmental change and the interplay with past human activity (HE 2015a, 2015b).

6.3 During the latter stages of the last (Devensian) Ice Age (18000BP), Lincolnshire was covered by an ice lobe (North Sea Lobe) extending down the eastern margins of the North Sea Basin as far as North Norfolk, depositing extensive till and glaciofluvial sands and gravels across the region. The ice lobe blocked the Humber Gap and thus the natural drainage eastwards and northward to the North Sea was prevented. This prevention of drainage into the sea resulted in the formation of a large ice-dammed lake known as Lake Humber within which deposits of lacustrine clays, silts and sands were laid down some of which are mapped by the BGS to extend into the north-east of the Site. The cold dry conditions of the late Devensian period also resulted in the aeolian (windblown) transportation of fine-grained silt sized material which was deposited on to the Lincoln Edge east of the Site. The melting of the ice sheet at the end of the Devensian led to the gradual silting up of Lake Humber. By c11000BP the flow of the River Trent north across the lacustrine deposits towards the North Sea was re-established. The River Trent was initially characterised by braided channels. There was limited vegetation cover and the sediments on the floodplain were susceptible to wind erosion which in turn led to the deposition of aeolian sands. At the start of the Holocene as sea level began to rise, rivers incised through the lake deposits to reach base level. The channels thus transformed from wide braided stream to narrow single channels. As sea levels continued to rise the river channels aggraded and the deeply incised river valleys became infilled with the alluvium which now covers the Trent valley floor (Ellis 1998 10-12). Gaunt (1994) estimates the depth of channel incision and fill to be in excess of 20m in the area. Climatic amelioration and continued rising sea levels results in the development of wetlands at about 5000BP. A combination of impeded runoff and overbank flooding led to the development of extensive floodplain peats during the later prehistoric and early historic periods. No absolute dates are currently available for the onset of peat development in the lower Trent valley north of Gainsborough. Extensive areas of floodplain mire peats and alluvium would have characterised the Trent floodplain from the mid-Holocene until the introduction of drainage and warping on the post-medieval periods.

6.4 The study area lies at no more than 4.5m AOD and the wider landscape is notable for its vast expanses of flat featureless terrain. There is a paucity of securely dated paleoenvironmental analyses from the lower Trent valley. Limited detailed information exists about the nature extent and depth of the depositional sequences in the lower Trent valley. The influence of riverine alluviation and the exact location of abandoned meanders required further elucidation. The spatial and temporal development of the wetlands and the nature of the pre-wetland landscape remain poorly understood. The paleoenvironmental record for the earliest part of the Holocene in the Trent valley is sparse, with data available from Girton, Bole Ings (Dinnin 1997) and Lake L1 of the

Lincolnshire Lakes Project. Radiocarbon dating in correlation with pollen samples from the Lincolnshire Lakes project east of the southern part of A3 dates the lower pollen samples to approximately 7000BP, and upper samples to approximately 300BP. Comparable organic deposits in the lower Trent Valley began to accumulate around the same time as channel stabilisation approximately 8500BP (Stein 2014). Correlation between the depth and date of deposits at different locations across the Lake L1 Site proved to be somewhat variable, suggesting that either peat accumulated at different rates at different locations, or perhaps material has become truncated through erosion (AOC 2017).

6.5 Bole Ings, located towards Nottinghamshire provides a comparable early Holocene pollen record (Brayshay and Dinnin 1999; Dinnin 1997) dating from 8240 ± 60 BP to 2780 ± 60 BP. Zone 1 of the sequence (8240±60 BP to 6280 ±70 BP) provides evidence of a landscape dominated by Pinus, Ulmus, and Corylus with some Quercus. These species represent a wooded environment, with a dense deciduous woodland canopy (Brayshay and Dinnin 1999, 119). A similar landscape dominated by woodland is also found in the sequences from Lake L1 (AOC 2017).

6.6 The presence of Corylus, and gradual rise in Alnus at Bole Ings, also indicates an increasingly wet environment. Corylus frequently inhabits dry and basic pH level soils suggesting that Corylus was occupying drier areas of the wetland margin and the surrounding landscape (Brayshay and Dinnin 1999, 119). Alnus and Corylus were found to be consistently present at Lake L1 and gradually increase throughout the sequence suggesting a similar wet environment (AOC 2017).

6.7 Marine environments continued to reach into the Lower Trent Valley throughout the Mesolithic, as evidenced by alternating marine and freshwater deposits as far upstream as Gainsborough (Knight and Howard 2004, 31; Lillie and Neumann 1998, 22). Pollen sequences from this period demonstrate expanding reed swamp and fen carr landscapes, with additional evidence of densely wooded areas on dryer land (Knight and Howard 2004, 31). A similar stabilising riverine environment continued into the Neolithic with dense woodland located on drier land. Evidence of occupation from as early as the Mesolithic has been recovered from the area of Flixborough including a large concentration of Late Mesolithic and Neolithic flint found at Sand Pits, Flixborough in 1928.

6.8 Coring undertaken at Flixborough as part of the Humber Wetlands Project (Lillie 1998 45-52) revealed a complex stratigraphic sequence of intercalated peats and clays which documented periods of alluvial deposition and periods of stabilisation. Similarly, archaeological evaluation and coring at the Lake L1 site east of the southern section of A3 as part of the Lincolnshire Lakes project revealed a complex sequence of interbedded peats and clays overlain by warped sediments. Numerous layers of buried organic peats, and finely laminated sections containing sands and clays were apparent. Changes appeared to be abrupt with no gradual transition between varying deposition types. This was interpreted as a possible indication that the sediments had been truncated or eroded, but it was also considered possible that rapid environmental change took place e.g. inundation of marine waters (AOC 2017).

6.9 It is possible that occupation of the lower areas of the Trent valley was intermittent prior to the postmedieval period due to the nature of the wetland environment and the rise and fall in sea level, and therefore settlements of medieval or earlier date would often be situated on slightly higher ground. However, periods of low sea level allowed regular cultivation and exploitation of this resource-rich environment which can be seen from previous finds of tools and pottery.

Palaeoenvironmental survey undertaken as part of the Humber Wetlands Project indicated that some of the wetlands dried out during the Mesolithic period (Van de Noort et. al., 1995: 359) allowing for a wider range of land use, and woodland clearance during the Bronze Age indicates a shift towards agriculture (ibid). A bog-body is known from the Amcotts area (Lillie 1998,45).

6.10 Roman occupation of the area is known from various finds including Romano British pottery on the modern surface of the floodplain at Amcotts (Lillie 1998, 52).

6.11 The Early Medieval site at Flixborough provides ample evidence for the exploitation of the River Trent floodplain into the historical period. Historically there have been brick and tile manufacturers operating at various scales along the Trent and the nearby Keadby Canal.

6.12 Fletcher writing in 1858 about the course of the River Trent in the vicinity of the Site notes that it had considerably altered its course in the 18th century noting that 'in earlier times' it was at this point a large expanse of water that during the ebb of the tide occupied more than one channel. In 1836, between Hook Staithe and the Amcott windmill, on the western side of the modern River Trent, an old staithe was excavated and removed. It appears that this staithe and associated embankment were built to alter the course of the river and reclaim the land for the estate as farmland. A borehole transect excavated as part of the paleoenvironmental survey of the lower Trent valley revealed deposits relating to alluvial channel infill near Amcott and thus likely relate to this earlier channel (Lillie 1998, 48). Pollen and diatom samples taken from deposits within this channel provide some evidence of the channel environment and diatoms indicate that both freshwater and brackish flow was present in this channel from the middle Mesolithic until 1858.

6.13 Sir Cornelius Vermuyden, born Tholen, Netherlands in 1590, was a Dutch engineer who carried out the initial drainage and recovery of the land in the vicinity of the Site. This was started in 1626, by means of digging drainage dykes and leading them to nearby rivers, in order to drain the land. The land was more workable but swampy and boggy areas remained in many places. Makin Durham was commissioned under the first Dun Drainage Act of the 1830s, to warp certain areas of Yorkshire and Lincolnshire, as he had perfected the adequate and technical procedure of 'warping' (Armstrong 1981, 20).

6.14 Large-scale drainage of the area was undertaken during the post-medieval period and by the nineteenth century, with the construction of drains such as the Burton and Flixborough Drain and the Lysaght's Drain along with the warping of fields, the area was successfully transformed from wetland into farmland (Lillie, 1998b 103). Warping was the practice of letting turbid river water flood onto arable land, so that its suspended sediment could settle to form a fertile layer, before letting the water drain away. In this way poor soils were covered with fine silt, and their rentable value was increased (Smith 2014, 83). Two types of warping were employed within the vicinity of the Site; flood warping and cart warping. Flood warping involved enclosing the fields within embankments and allowing flooding of the field over several years in order to deposit silt and raise the level of the land to reduce the flood risk (Shephard, 1976). Cart warping involved the manual excavation of alluvial sources such as an infilled palaeochannel and its deposition or spreading across the ground surface. Warping in the vicinity of the Site was commenced in 1835 from the inlet of the Neap House drain, with warping on the south side of the drain carried out between 1840 and 1845, and on the north side between 1845 and 1850 (Lillie 1998b 110). Further records for the Flixborough area record evidence of the Sheffield family employing additional cart warping to further improve higher ground within the Site to the north of Neap House in 1869 (Lillie 1998b 104).

6.15 Deposits of warp also served to mask the peaty and acidic soils that had developed on the alluvial deposits either side of the Trent. The warping also helped to reduce the impact of waterlogging that resulted from seasonal tidal regimes (Lillie 1998b 103). Deposits up to 2.5m in depth have been recorded between Flixborough and the Flixborough Industrial Estate with deeper deposits extending eastwards within the Site towards the modern channel where depths of up to 6m of warp have been recorded.

6.16 Drainage and ploughing within the Site in the post medieval and modern periods resulted in changing water regimes and likely desiccation of Holocene organic deposits. To date, the most recent part of the paleoenvironmental record spanning the last 200 years has received only limited investigation (Lillie and Neumann 1998).

6.17 The flat land adjacent to the Trent with ample cooling water and excellent communication links with the Yorkshire coalfields provided ideal sites for the large power station at Keadby and also the chemical plant at Flixborough which in 1974 was the site of Britain's worst industrial explosion.

Previous Works

6.18 During the course of the Humber Wetland project, a borehole transect was placed across the Trent and extended into the north part of the Site. A total of 24 boreholes were excavated over a distance of just over 5km from borehole SE827140 north-west of Amcotts Grange to Flixborough at SE875142 (Lillie 1998, 45).. On the western side of the River Trent near Amcott the boreholes excavated revealed evidence for the aforementioned earlier channel of the Trent. On the eastern side of the modern course of the River at Flixborough 13 boreholes were excavated and provided insight into the nature of the floodplain.

6.19 The BGS has recorded a wide range of boreholes in the vicinity of the Site. Boreholes SE81SE41-SE81SE53 located between A2 and A3 were all sunk to depths of less than 5m and revealed a topsoil overlying organic clays with some peat which in turn overlay medium to fine sand deposits. Boreholes sunk at the jetty at Flixborough Stather (SE81SE214- SE81SE217) revealed a stratigraphy of peaty clay and sand with a basal gravel resting on Mercia Mudstone at c -15m AOD.

6.20 Further works were undertaken in the vicinity of Flixborough Stather within A1 by Ian Farmer Associates in 2018. Six boreholes, designated BH1 to BH6 were sunk in this area. Made Ground was encountered in all boreholes to a maximum thickness of 2.10m and consisted of a gravelly sand/sandy gravel with brick, concrete, slag, sandstone and mudstone content. The alluvial deposits consisted of soft laminated sandy clays often found to contain peat fibres and were occasionally organic. These upper laminated clays were underlain in boreholes BH3, 4 and 6 by a peat deposit at depths of between 4.70 to 6.70mbgl extending to depths of between 11.70 to 12.30mbgl. The peat and organic clays were underlain by a gravelly sand deposit at 11.70 to 12.50mbgl and for a thickness of between 4.90 to 7.10m. Weathered Mercia Mudstone was encountered at 17.10 to 19.40mbgl generally as a red brown sandy gravelly clay. Mercia Mudstone bedrock was encountered at depths of between 20.10 to 22.60mbgl (IFA 2018, 7-8).

6.21 A recent programme of borehole and test pit monitoring (AOC 2021), in combination with previous work undertaken on the Humber Wetlands project, revealed basal deposits of fine sand of probable aeolian origin which was likely deposited during the late glacial period. The sands were encountered intermittently across the boreholes and could not always be distinguished from alluvial deposits. Overlying the sands and in some case cut into the sands are a series of organic deposits

which likely represent the presence of a number of Late Glacial to Early Holocene infilled channels or wetland areas. The channels/wetlands are infilled with between 0.5m to 7m of peat and intercalated organic silts and clays which are indicative of stable periods of vegetated wetland development along the floodplain of the late glacial/early Holocene River Trent. The organic deposits are overlain by up to 8m of silty sand to clay representing natural overbank deposition or human induced floodplain accretion (Warp).

6.22 Development impacts may affect buried Holocene horizons or deposits of archaeological or palaeoenvironmental significance. Although it is difficult to ascertain with certainty the potential of the deposits to contain archaeological remains, the nature of the deposits observed suggested any archaeological remains present within the alluvial floodplain areas may take the form of prehistoric localised dryland activity (i.e. short-lived flint and/or faunal 'camp site' assemblages) to floodplain exploitation (i.e., brushwood trackways and platforms, fish traps, etc.). Archaeological remains are more likely to be found in the sandier drier areas to the east of the floodplain.

7 ZONES OF ARCHAEOLOGICAL POTENTIAL

7.1 Zones of Archaeological Potential have been previously identified based on previous deposit models. The following is taken from the Written Scheme of Investigation (AOC, 2022).

7.2 Based on the known geological and archaeological setting of the site three linear north-south aligned zones were previously identified and are taken here from the DCO (pers. comm. ERM 04/08/21), these represent varying archaeological potential within which the main development impacts are proposed and are here combined with the findings of the geoarchaeological monitoring of GI works (AOC 2021):

Archaeological Zone 1

7.3 Trent Valley Alluvium. This comprises that portion of the Trent floodplain that lies immediately east of the current river channel and within which deep deposits (up to c.12-13m deep) of peat and/or peaty clay have been recorded in boreholes. Until the drainage and warping schemes of the seventeenth century onwards, this zone would have been too wet for cultivation and intermittently flooded for much of the year. It is unlikely that significant remains of settlement will be encountered in this area, with the possible exception of Flixborough Stathe itself (the site of the ERF plant) where medieval riverside activity is known to have occurred. There is potential for earlier prehistoric activity and material (e.g. flint scatters, wooden revetments, boats, votive deposits of metalwork) to occur, although this is potentially buried beneath deep alluvial and warp deposits.

7.4 The organic deposits found across the zone could indicate short-lived periods of stabilisation and wetland development within a more active fluvial environment, later fluvial erosion of well-formed peats, periods of soil development and waterlogging atop previously dry land surfaces. The latter being the least likely considering the generally low-lying floodplain nature of the landscape in question. Alternatively, they could be related to the warp also known in the area. Investigations to the north of the site (Lillie 2008, Lillie and Bunting 2016) recorded organic deposits on the eastern margins of the floodplain, similar to that recorded in A2 and A3, they were interpreted as either channel abandonment and infilling, or floodplain margin deposits (mire) but paleoenvironmental investigation (diatom and pollen) could not determine the precise nature of their formation.

7.5 Either way the peat represents a stabilisation or cessation of sediment accumulation and could record possible horizons of human activity; provide an environmental context for any human activity

or landscape development (i.e. through pollen and other botanical remains, diatoms, ostracods and insects); and through radiocarbon dating could provide a chronology for the sequence of alluvial or sand deposition; placing any nearby archaeological finds within a developing landscape context and contributing to the regional palaeoenvironmental record.

7.6 Areas A1, A2 and the northern part of A3 fall within this zone (see section 3 for more detail on the proposed developments in each area).

Archaeological Zone 1 - Development Area 1

7.7 The main ERF plant, including piling and the excavation of a shaft up to 10m bgl – falls within Archaeological Zone 1 as outlined above. The ERF facility is being developed on a site at Flixborough Stathe, formerly occupied by a series of large round storage tanks, which are likely to have contained fuels, other process chemicals, and where large quantities of coal and other solid fuels were also formerly stored. Flixborough Stathe was the historic river port linked to Flixborough on the high ground to the east by road. It seems likely that any remains of the medieval port will have been relatively shallow and therefore disturbed or destroyed by twentieth century activity at the wharf.

7.8 A ground investigation comprising 6 boreholes was carried out at the main ERF plant (A1), within this zone in 2018 (IFA 2018). This revealed the presence of varying depths of made ground (0.75-2.1m) containing brick, concrete, tarmac, slag, mudstone and sandstone. This lay above some 4-5m of alluvial silty clay with occasional organic content. From around 6m below ground level to c.12.5m all boreholes encountered a deep deposit of fibrous peat including large pieces of wood. This correlates with observations of peat deposits and potential palaeochannels of the Trent at the site of the proposed wind farm at Flixborough Grange to the north and in the area of the Lincolnshire Lakes to the south. Carbon dating of the peat deposits at Flixborough Grange indicate dates early in the fourth millennium BC (during the Neolithic period) for its early formation and the 8th-6th centuries BC (Early Iron Age) for its later phases. Given that the proposals include the excavation of a bunker hall to a depth of 10m below ground level, there will be significant disturbance caused to these deposits which have archaeological potential as well as palaeoenvironmental significance.

7.9 The thickest, deep peat deposits were located in BH6 (4.7-11.7m bgl) during investigations by IFA in 2018 and peat deposits in MW7 (AOC 2021) were not bottomed during the recent monitoring programme. Development proposals include the excavation of a bunker hall to a depth of 10m below ground level within A1, and thus there will be risk of disturbance of these deposits which have high palaeoenvironmental potential. The report on the GI monitoring (AOC 2021) recommended locating a further geoarchaeological borehole within this area between these two points in order to retrieve samples from the full Holocene sequence.

Archaeological Zone 1 - Development Area 2 and 3

7.10 The development area between the ERF plant and the B1216 (A2) falls within archaeological Zone 1 and includes piling associated with a concrete block manufacturing plant, ash treatment facility, a plastic recycling facility; and footprint excavation to unknown depths for a visitor centre, a railhead, a utilities corridor and several large ponds.

7.11 The report on the GI monitoring (AOC 2021) recommended, that in order to improve the distribution of data points across A1 and A2 it may be beneficial to undertake a number of purposive

geoarchaeological boreholes running west to east across these areas and drilling to the base of the Holocene sequence. This would have the added benefit of extending the Humber Wetlands transect (Lillie 1998), thus providing a more robust understanding of the paleoenvironmental context and archaeological potential of the site and any archaeological remains found by ongoing investigations. In A2 a west to east hand auger transect was also proposed, broadly following the route of Transect 5 (Figure 8) with interventions at 25 to 50m intervals over c. 1200m.

7.12 The report on GI monitoring (AOC 2021) also recommended Electrical Resistivity Tomography (ERT) transects in the location of previous or proposed borehole transects and another ERT transect between the two (Figure 6). An additional east west aligned ERT transect was subsequently added to WSI for the current work to the south of A2 and into the northern part of A3, following consultation with NLC (AOC 2022). ERT may be able to identify sub-surface structures and lithological changes, which in combination with any new or existing borehole data could then fill in the gaps between the borehole locations and provide a more robust and complete cross section of the deposits.

Archaeological Zone 2

7.13 The majority of A3 lies within this Archaeological Zone which lies on the edge of the Trent valley and extends from 'Archaeological Zone 1' in the west to the base of the west-facing slopes of 'Archaeological Zone 3' in the east.

7.14 Predominantly the impacts over much of the area will be from the southern DHPWN, which are so far undefined. In the very north of A3 some undefined impacts associated with a gas network connection, hydrogen production facility, hydrogen refuelling facility, battery storage, and EV vehicle charging are also expected.

7.15 Deposit records show thinner but relatively well-preserved organic alluvial deposits interleaved between the Upper and Lower alluvium/warp/sand (AOC 2021). Much of this zone was historically occupied by uncultivated and unenclosed common land, including areas of sandhills on Brumby Common, at the southern end of the Site. There is the potential for significant archaeological remains to occur in this zone, from settlement of the Neolithic or Bronze Age periods, to potentially seasonal occupation in the Iron Age, Roman and medieval periods. There are a number of cropmark sites in the area to the west of the Foxhills Industrial Estate which may be late prehistoric or Roman in date.

7.16 The report on the GI monitoring (AOC 2021) recommended a purposive geoarchaeological borehole survey retrieving continuous cored samples in a location between TP12 and TP14 in order to target the possible infilled channel/wetland sequence of high palaeoenvironmental potential and also possibly retrieve OSL dates from the underlying sands (at least 5m bgl). The aim being to help reconstruct the changing prehistoric to post-medieval landscape across the project area, enabling any nearby archaeological finds to be placed within a developing landscape context and contributing to the regional palaeoenvironmental record.

7.17 Recent work at Brumby Common (Trent and Peak Archaeology 2021) recorded varied thickness of peat in the vicinity, up to c.1.2m, but did not record peat below 2.53m OD. The peat samples from Brumby Common did not produce plant macros fossils for radiocarbon dating and at least one of the humic/humin radiocarbon dating couplets were erroneous. The GI monitoring (AOC 2021) of TP12 recorded peat below c. -1m OD. It was thus proposed to undertake a borehole as close to

TP12 in order to sample this deep peat and tie it into, and improve the chronology of, the other numerous records of peat deposits already existing for other parts of A3.

Archaeological Zone 3

7.18 Development areas A4, A5, and A6 lie within this zone. The main impacts are from A4 including an electrical substation with footprint excavation to unknown depths, and undefined impacts from a gas network connection and hydrogen production facility. A5 includes the northern DHPWN, consisting of linear impacts alongside existing roads (depth currently undefined) and impacts for A6 involve the construction of a flood bund over the whole footprint of the area.

Archaeological Zone 3 - Development Area 4

7.19 A4 recorded a single intervention, during the GI monitoring (MW08, AOC 2021), which indicated depths of windblown sand extending below 5m bgl. A4 is located within 'Archaeological Zone 3' on the sandy slopes to the east of the valley. These slopes are rich in archaeological remains, including significant multi-period remains of Neolithic, Bronze Age, Iron Age and Roman date from the sand and gravel quarry at Willow Halt and the mid-late Anglo-Saxon settlement at Flixborough. Purposive geoarchaeological boreholes retrieving continuous cored samples would allow for OSL dating of the sand sequence and also allow for palaeoenvironmental assessment of deep and potentially better-preserved deposits within A4.

Archaeological Zone 3 - Development Area 5

7.20 A5 lies within Archaeological Zone 3. No interventions were undertaken in this area during the monitored GI works, although previous BGS interventions to the south (SE81SE1, AOC 2021) recorded only windblown sand and Mudstone. It is likely that there is little geoarchaeological potential within deeply buried deposits in this area. The northern DHPWN runs through this area, consisting of linear impacts alongside existing roads (depth currently undefined). The near surface archaeological potential will be covered by a comprehensive watching brief covered under another WSI (ERM 2022).

Archaeological Zone 3 - Development Area 6

7.21 A6 pertains to the footprint of a flood bund to be constructed in front of a poultry farm less than 400m north of the Skippingdale Retail Park. The area lies within Archaeological Zone 3, and on the boundary with Zone 2. Previous BGS interventions to the northwest (SE81SE46, BGS 2022) does record c.1.5m of clayey peat, over suspected windblown sand. The results of the purposive geoarchaeological boreholes in A4 and the eastern part of Archaeological Zone 4, mentioned above, as well as a trial trench evaluation in A4 (ERM 2022), will inform the evaluation and mitigation plan. However, a single auger hole was proposed in this area as part of the current work in order to link up the sequences from previous known and proposed locations.

8 RESEARCH AIMS AND OBJECTIVES

8.1 Geoarchaeology is the application of earth science principles and techniques to the understanding of the archaeological record (HE 2015a). It involves the examination of sub-surface deposit sequences, through coring or exposed sections, in order to identify site formation processes or landscape features of archaeological interest. Deposit models are often employed in geoarchaeology, these are conjectural maps and cross-sections used to investigate the

archaeological significance, potential impact, or accessibility of buried deposits (HE 2020). Geoarchaeological approaches often form part of a wider programme of archaeological investigation.

8.2 The standards set out by the Chartered Institute for Archaeologists for archaeological field evaluation (CIfA 2020) apply to geoarchaeological evaluation, and the purpose of such is:

- To 'determine, as far as is reasonably possible, the nature of the (geo)archaeological resource within a specified area using appropriate methods and practices.'
- To be 'a limited programme of non-intrusive and/or intrusive fieldwork which determines the presence or absence of (geo)archaeological features, structures, deposits, artefacts or ecofacts within a specified area or site…. If such archaeological remains are present field evaluation defines their character, extent, quality and preservation, and enables an assessment of their worth in a local, regional, national or international context as appropriate.'
- But the (geo)archaeological resource should not be 'needlessly disturbed or damaged or inappropriate or excessive cost incurred' when evaluation is undertaken in support of a planning application.

8.3 Archaeological evaluation should enhance previous work and provide sufficient information upon which to base effective decisions concerning mitigation. Therefore, an evaluation can highlight the need for further WSIs and archaeological work to fulfil planning conditions.

8.4 The overall objective for the boreholes, deposit modelling and any subsequent on site works or off site palaeoenvironmental assessment is to evaluate the archaeological and palaeoenvironmental potential and likely significance of the deposits present, so that the impact of the development can be understood, and informed decisions made regarding appropriate mitigation. As part of this overarching objective and in order to fulfil the general aims, the specific objective of these works at the Site are defined as:

8.5 To monitor the geotechnical investigations and obtain geoarchaeological boreholes, in order to observe and record the deposit sequence and its distribution across the site and provide samples for palaeoenvironmental assessment.

8.6 The general aims of the investigation at the Site are defined as:

- To identify and characterise the Pleistocene and Holocene geoarchaeological and palaeoenvironmental potential of deposits within the Site.
- To use this information to provide a Site wide understanding of landscape evolution and human activity across the area through time.
- Produce a comprehensive site archive and report.
- To enable the archaeological advisor to North Lincolnshire Council to make an informed decision on the requirement for any further work.
- To make available to interested parties the results of the investigation.

8.7 The specific aims of the investigation at the Site are defined as:

- To update the deposit model for the Site mapping areas of and retaining samples from the alluvial deposits and potentially areas of peat or waterlogged material within the deeper areas of the Trent Valley.

- To update the deposit model for the Site mapping areas of and retaining samples from the windblown sand on the rising mudstone ridge and edge of the Trent Valley, and record potential old land surfaces that may highlight horizons of possible past human activity buried by, within, or atop those sequences.
- Inform the potential for, and likely location of, archaeological remains within the Site.
- To provide samples for and undertake range finder scientific dating in order to construct a chronostratigraphic framework for the site and in reference to previous investigations in the area.
- To set out recommendations for and undertake palaeoenvironmental assessment required in order to provide a chronologically robust understanding of the palaeoenvironmental sequence affected by the development.
- To provide a transect linking the low-lying and deep alluvial sequences, of high palaeoenvironmental potential, with the higher ground of greater potential for past settlement and occupation.

8.8 The specific research questions of the investigation at the Site are defined as:

- RQ1: What does the deposit sequence on the site reveal about the landscape evolution of the site and the River Trent, especially in relation to previous investigations?
- RQ2: How do the deposits recorded within the site relate to each other and how do they contribute to our understanding of the landscape evolution of the project area?
- RQ3: How does the character, extent, and scientific dating of organic horizons compare to those located in the vicinity of the site and do any samples retained have further potential for scientific dating (radiocarbon or OSL) and contributing to the project wide chronology?
- RQ4: Can greater differentiation in the warp/alluvial/windblown deposits be ascertained, by character, date or depositional context?
- RQ5: Can the palaeoenvironmental sequences sampled provided any further information about past channel routes or wetland onsite?
- RQ6: Can the ERT data provided any further information about past channel routes or wetland onsite?

8.9 The final aim is to make public the results of the investigation, subject to any confidentiality restrictions, through the ADS and OASIS website.

9 METHODOLOGY

Origin and Purpose of Deposit Modelling in Archaeology

9.1 AOC's geoarchaeological methodology followed the previously produced WSI covering this work and will conform to best professional practice as summarised in the appropriate Chartered Institute for Archaeologists Guidelines for Evaluation (CIfA 2020) and Historic England's guidelines for geoarchaeology (HE 2015a and HE 2020).

9.2 The purpose of a geoarchaeological deposit model as outlined by Historic England (HE 2020) is to:

- identify areas of low or high archaeological potential
- avoid blanket evaluation coverage and inform appropriate mitigation strategies
- aid communication with construction professionals
- facilitate palaeoenvironmental reconstruction

9.3 The character and distribution of past human activity can be better understood through the consideration of the past landscape or environmental context. Such an approach is often required by archaeological advisors and the local planning authority on floodplains where the deposit sequence can vary from thin alluvium or peat, with shallowly exposed ancient land surfaces, to complex and thick sequences of interchanging alluvium and peat, covering deeply buried ancient land surfaces.

9.4 The topography and nature of the ancient land surface during the early Holocene, the current geological epoch and equivalent to the early Mesolithic (*c.* 11,500 BP or 10,000 BC), is dictated by and inferred from the surface of the Pleistocene superficial deposits (the previous epoch) and older solid geology (e.g. mudstone, brickearth, gravel or chalk). Overlying the Pleistocene – or older – deposits, Holocene alluvium may preserve palaeoenvironmental evidence (e.g. pollen, diatoms, ostracods) of landscape development, from local channel migration and vegetation change to regional effects of climate and relative sea level (RSL) change. In combination, likely preservation of palaeoenvironmental remains and deposit data (e.g. depth and character) provides a comparative framework to assess archaeological potential. Peat represents vegetated and waterlogged landscapes (e.g. marshland) which developed, within local or regional fluctuations of hydrology. The anaerobic and acidic conditions of the deposit are particularly conducive to organic preservation. Palaeoenvironmental remains from floodplain deposits, especially peat, provide information on the nature and timing of environmental change and the interplay with past human activity (HE 2015a, 2015b).

9.5 Modelling software (Rockworks & ArcGIS) is often used to create two and three-dimensional deposit models of the buried topography and overlying strata on the site. The data used may be readily available British Geological Survey (BGS 2022) geological information, recent geotechnical data from the client, or data past archaeological investigations. The depth and distribution of the various deposits is mapped in schematic cross-sections (transects) or plan, showing the elevation (Digital Elevation Model, DEM) or thickness (Isopach), of deposits or stratigraphic units. The model often culminates in schematics maps showing areas of archaeological potential.

Onsite Borehole Evaluation

9.1 17 additional purposive geoarchaeological borehole locations approximately 100mm in diameter were drilled across the site (Figure 2, AOC53056_BH5-8, WS1-13). The core samples were retained. Boreholes were drilled by windowless sample (WS locations) and rotary (BH locations) rigs under the supervision of a geoarchaeologist/environmental archaeologist. Where appropriate, service pits (approximately 300mm x 300mm) were hand-dug to c 1.2m at each location, and the holes CAT-scanned for live services at regular intervals by the sub-contractor or by AOC during this process.

9.2 This work follows on from previous work undertaken as an earlier phase (AOC 2022b), which consisted of four purposive borehole locations drilled across the site (Figure 3-5, AOC53056_BH1-4) and the core samples were retained. As well as a further 13 hand auger holes (Figure 3-4, AOC53056_AH1, 5, 9, 12, 13,16, 20, 24, 26, 27, 30, 31) across the Site, and the obtained samples retained. Boreholes were drilled by a rotary rig under the supervision of a geoarchaeologist / environmental archaeologist.

9.3 Continuous samples were collected through the alluvial deposits down to *c.* 12m bgl or the surface of the underlying pre-Holocene drift/solid geology, whichever was encountered first. The cores

recovered were undisturbed 0.45m to 1.5m long plastic tubes, roughly 100mm diameter. The cores were retained. The borehole locations were surveyed in by the AOC contractor, with each position located to a six-figure national grid reference, and the elevation measured to metres above ordnance datum.

9.4 On site or back in the AOC laboratory, the geoarchaeologist photographed and logged the Holocene sediments revealed in the boreholes according to standard geological criteria (Jones et al 1999; Tucker 2003). Preliminary interpretation of the deposit sequence sampled in the cores was made in order to produce an overview of the lithology that characterises the stratigraphy and identifies formation processes.

9.5 The borehole cores were adequately sealed and labelled and stored in the AOC laboratories controlled storage for use during the subsequent stages of the project. As a general rule cores have a shelf life limited to 3-4 years.

Deposit Model

9.6 In order to create the deposit model, the geotechnical data was entered into a digital database (Rockworks 20). Any recent geotechnical logs supplied by the client or previous archaeological work onsite were given the prefix 'CP' for cable percussion, 'RT' for rotary, 'WS' for window samples, 'AH' for auger holes, 'TP' for test pits, or 'TR' for trenches. BGS logs (BGS 2022) added to the database were given a prefix relating to the two-letter grid square of its national grid reference e.g. TQ. A total of 177 sedimentary logs were included in the deposit model. The distribution of this data set is presented in Figure 2 and the data references for the sedimentary logs are presented in Appendix A. The numbers of each type are:

- BGS historic deposit data (BGS 2022): 44
- Client supplied GI/SI data: 79
- AOC deposit data: 64

9.7 Each lithology type (gravel, sand, silt, clay etc.) was given a unique colour (primary component) and pattern (secondary component) enabling visual correlation of the sediment components of deposits across the site. By examining the relationship of the lithology types (both horizontally and vertical) in preliminary and iterative transects, correlations can inform the site-wide deposit groups. The grouping of these deposits is based on the lithological descriptions, which represent distinct depositional environments, coupled with a wider understanding of the local floodplain sequences. Thus, a sequence of stratigraphic units ('facies'), representing certain depositional environments, and/or landforms can be reconstructed both laterally and through time.

9.8 Inverse distance weighted (IDW, weighting =2, number of points =12) digital elevation model (DEM) and thickness (Isopach) plots were produced for key deposits (i.e. units defining major changes in the environment and modes of deposition) and surface horizons. These highlight major features of the topography through time. In this respect, the most common surface plot depicts the surface of the Pleistocene (or older) deposits (Figure 14) gives an approximation of the topography of the site as it existed at the beginning of the early Mesolithic period c 10,000 years ago. The development of the Holocene floodplain is likely to have been influenced by the topography inherited from the Pleistocene/Late glacial period. This surface would have dictated the course of later channels, with gravel high points forming areas of dry land within the wetlands, and lower lying areas forming the main threads of later channels. Many of the additional surface or thickness plots are more

representative of deposit survival than time-specific landscapes (Yendell 2020).

9.9 The overlying deposit sequence across the site depicted by the stratigraphic units, as representative of specific depositional environments and/or landforms laterally and through time for the site and immediate vicinity, is illustrated in profile or transect form (Figures 6-10). Such transects present a straight-line correlation between the data points, extrapolating the stratigraphic units identified within each borehole.

9.10 By examining the surface and thickness plots in combination with the vertical deposition shown in the transects areas of archaeological potential can be mapped (Figure 2). These characterise the differing geoarchaeological and archaeological potential and significance of single stratigraphic units, deposit sequences containing multiple stratigraphic units, or specific landforms and depositional environments.

10 RESULTS

Borehole logs

10.1 The log tables for the geoarchaeological boreholes undertaken by AOC (Figures 3-5), AOC53056_BH5-8 and AOC53056_WS1-13) are presented below.

Table 2 Deposit log for AOC53056_BH5

Intervention		Easting	Northing	Elevation		
AOC53056_BH5		486299.92	413900.05	2.4271		
Top elevation (m OD)	**Base elevation (m OD)**	**Top depth (m bgl)**	**Base depth (m bgl)**	**Thickness (m)**	**Description**	**Interpretation**
2.43	1.63	0.00	0.80	0.80	Topsoil - mid greyish brown sandy SILT. Compact, homogenous. Large % rooting with rare subangular stones.	Topsoil
1.63	1.23	0.80	1.20	0.40	Subsoil - mid reddish greyish brown sandy silty CLAY. Occasional rooting and subangular stones. Compact, firm, homogenous. Dry. Gradual boundary.	
1.23	0.03	1.20	2.40	1.20	Mid brownish grey silty CLAY. Compact. Firm. Homogenous. Slightly moist. Very slight bluish tinge. No inclusions. Diffuse boundary.	Holocene - Upper Alluvium / Warp / Sutton Sand
0.03	-1.97	2.40	4.40	2.00	Mid bluish grey clayey SILT. Silk-like texture. Moderate vegetation present. Compact. Firm. Slightly moist and slightly mixed. Alluvium? Case empty from c. 3.4-4.4mbgl.	
-1.97	-4.77	4.40	7.20	2.80	Mid bluish grey clayey SILT. Silk-like texture. Sterile. Compact. Firm. Moist. Alluvium. Empty samples from c. 5.2-7.2m	
-4.77	-6.47	7.20	8.90	1.70	Mid bluish grey clayey SILT. Wet. Compact, especially towards 8m. Some orange patches. Vegetation beginning to show occasionally at 8m.	

-6.47	-7.37	8.90	9.80	0.90	PEAT. Dark brownish black silty PEAT. Organics present moderately - wood and fibrous. Compact. Firm. Moist. Sharp boundary.	Holocene - Organic Deposits
-7.37	-8.97	9.80	11.40	1.60	Mid grey SAND. Moist. Compact. Firm. Sterile. Empty from c. 10.2-11.4m.	Holocene - Lower Alluvium / Sutton Sand
-8.97	-9.47	11.40	11.90	0.50	Mid greyish brown silty SAND. Compact and moist. Sharp boundary. Rare vegetation.	
-9.47	-9.52	11.90	11.95	0.05	Mid grey blue SAND. Moist. Compact. Sterile. Sharp boundary.	Pleistocene - Sutton Sand
-9.52	-9.57	11.95	12.00	0.05	Mid brownish yellow SAND. Moist. Compact. Sterile.	

Table 3 Deposit log for AOC53056_BH6

Intervention		**Easting**	**Northing**	**Elevation**		
AOC53056_BH6		486653.53	413899.77	0.905602		
Top elevation (m OD)	**Base elevation (m OD)**	**Top depth (m bgl)**	**Base depth (m bgl)**	**Thickness (m)**	**Description**	**Interpretation**
0.91	0.41	0.00	0.50	0.50	Topsoil - mid brownish grey silty CLAY with high % rooting. Compact. Dry. Diffuse boundary.	Topsoil
0.41	-0.09	0.50	1.00	0.50	Subsoil? Mid greyish silty CLAY. Moderate rooting. Compact. Firm. Diffuse boundary.	Holocene - Upper Alluvium / Warp / Sutton Sand
-0.09	-3.09	1.00	4.00	3.00	PEAT. Highly organic. Dark brownish black silty clayey PEAT. Moist. Soft. Slight greenish hue c. 3.5mbgl. Less fibrous organics. Clayier than above. Moist. Soft. Empty case 3.7-4m	Holocene - Organic Deposits
-3.09	-5.09	4.00	6.00	2.00	Mid greyish black clayey SILT. Fine. Sticky texture. Moist. Compact. Occasional vegetation. Homogenous.	
-5.09	-6.49	6.00	7.40	1.40	PEAT - high % of woody, fibrous vegetation with silty clay. Moist. Soft but compact. Gradual boundary.	
-6.49	-8.09	7.40	9.00	1.60	SAND. Sterile SAND. Moist. Compact. Slightly coarse. Dark bluish grey.	Holocene - Lower Alluvium / Sutton Sand
-8.09	-8.99	9.00	9.90	0.90	SAND. Still sand but a mid grey slightly coarser sand. Moist. Compact. Sterile. Gradual boundary.	
-8.99	-9.99	9.90	10.90	1.00	Fine SAND - orange brown in colour. Sterile. Compact. Moist. Gradual boundary.	
-9.99	-10.09	10.90	11.00	0.10	Mid greyish black fine SAND. Only visible for 0.1 of tube. Appears compact and moist. Sterile.	

Table 4 Deposit log for AOC53056_BH7

Intervention	**Easting**	**Northing**	**Elevation**	

AOC53056_BH7		486299.93	413253.75	1.621606		
Top elevation (m OD)	**Base elevation (m OD)**	**Top depth (m bgl)**	**Base depth (m bgl)**	**Thickness (m)**	**Description**	**Interpretation**
1.62	1.12	0.00	0.50	0.50	Topsoil - mid greyish brown sandy CLAY. Compact. Dry. Crumbly. High % of rooting with occasional subangular stones of up to 30mm. Homogenous. Gradual boundary.	Topsoil
1.12	0.72	0.50	0.90	0.40	Subsoil - light greyish brown sandy CLAY. Dry, crumbly. Compact. Occasional rooting and subangular stones up to 20mm. Homogenous. Gradual boundary.	
0.72	0.22	0.90	1.40	0.50	Light brownish yellow clayey SAND. Rare rooting. Compact. Dry. Homogenous. Fairly fine. Gets clayier as it gets deeper so when at 1.5m it's a sandy clay. Homogenous. Sharp boundary.	Holocene - Upper Alluvium / Warp / Sutton Sand
0.22	-4.78	1.40	6.40	5.00	PEAT - dark brownish black clayey silty PEAT. Fibrous. Compact. Moist. Gets more fibrous with depth.	Holocene - Organic Deposits
-4.78	-6.38	6.40	8.00	1.60	Coarse grey SAND. Moist. Compact. Sterile. 6.5-8m taken for OSL.	Holocene - Lower Alluvium / Sutton Sand
-6.38	-7.08	8.00	8.70	0.70	Mid greyish brown CLAY. Sterile. Moist. Compact and firm. Sharpish boundary.	
-7.08	-7.58	8.70	9.20	0.50	Grey CLAY with tints of brown. Sterile. Compact and firm. Moist. Sharp boundary.	
-7.58	-9.38	9.20	11.00	1.80	Mid greyish brown SAND. Moist. Compact. Occasional black mineral flecks. Becomes wet with depth. Fairly fine at c. 10.5mbgl. Compact and firm. Voids in recovery 9.5-10.5m.	

Table 5 Deposit log for AOC53056_BH8

Intervention		**Easting**	**Northing**	**Elevation**		
AOC53056_BH8		486406.31	413253.99	1.533232		
Top elevation (m OD)	**Base elevation (m OD)**	**Top depth (m bgl)**	**Base depth (m bgl)**	**Thickness (m)**	**Description**	**Interpretation**
1.53	0.83	0.00	0.70	0.70	Topsoil - mid greyish brown sandy CLAY with high % roots, occasional subangular stones up to 30mm. Dry. Compact. Firm. Homogenous. Gradual boundary.	Topsoil
0.83	0.53	0.70	1.00	0.30	Subsoil? - mid yellow brown clayey silty SAND. Dry and compact but loose when disturbed. Occasional rooting and subangular stones up to 20mm. Gradual boundary.	Holocene - Upper Alluvium / Warp / Sutton Sand
0.53	-1.67	1.00	3.20	2.20	PEAT. Silty, clayey PEAT. Dark brownish black, moist. Compact but friable. Fibrous - becoming more so with depth. Gradual boundary.	Holocene - Organic Deposits

-1.67	-4.17	3.20	5.70	2.50	Mid grey SAND. Coarse. Moist. Compact and sterile. Sand running out leaving empty liners 3.5-5mbgl.	Holocene - Lower Alluvium / Sutton Sand
-4.17	-4.87	5.70	6.40	0.70	Coarse mid yellow brownish SAND. Moist. Compact. Sterile. Sharp boundary.	
-4.87	-5.07	6.40	6.60	0.20	Mid yellowish brown slightly sandy silty CLAY. Compact but friable. Moist. Sterile.	
-5.07	-6.27	6.60	7.80	1.20	Mid brownish grey silty CLAY. Compact but friable. Sterile. Moist. Gradual boundary.	
-6.27	-7.17	7.80	8.70	0.90	Fine greyish brown SAND. Sterile. Compact. Moist. Empty from 8.2-8.7.	
-7.17	-7.57	8.70	9.10	0.40	Fine mid brown SAND. Slightly coarse. Compact. Moist. Sterile. Sharp boundary.	
-7.57	-7.77	9.10	9.30	0.20	Compact grey CLAY. Sterile. Moist. Sharp boundary.	
-7.77	-8.87	9.30	10.40	1.10	Coarse mid greyish brown SAND. Sterile. Moist. Compact. Empty from 9.6m.	
-8.87	-9.47	10.40	11.00	0.60	Slightly fine mid brown SAND. Moist. Compact. Sterile.	

Table 6 Deposit log for AOC53056_WS1

Intervention		**Easting**	**Northing**	**Elevation**		
AOC53056_WS1		486499.96	413899.98	1.751561		
Top elevation (m OD)	**Base elevation (m OD)**	**Top depth (m bgl)**	**Base depth (m bgl)**	**Thickness (m)**	**Description**	**Interpretation**
1.75	1.20	0.00	0.55	0.55	Topsoil. Turfed. Very stiff. Friable ish. Mid grey brown. More compact than other locations, perhaps because on trackway. Rooting throughout. Clayey SILT. Gradual boundary.	Topsoil
1.20	0.25	0.55	1.50	0.95	Mid blue-grey wih mid orange mottling. Moderate rooting. Stiff. Silty CLAY. Becomes mid yellow brown at c. 1mbgl.	Holocene - Upper Alluvium / Warp / Sutton Sand
0.25	-0.56	1.50	2.31	0.81	Mid to dark blue-grey, firm, moist. Clayey SILT. Band of higher organic content (reedy pieces) c. 1.62-1.67m and 1.81-1.86m. Very reedy at c. 2.3m. Void from 2-2.26m.	
-0.56	-1.80	2.31	3.55	1.24	Very dark brown, reedy and woody, humified PEAT. Very potent. Soft to firm. Wet. Gradual lower boundary.	Holocene - Organic Deposits
-1.80	-2.30	3.55	4.05	0.50	Very soft. Wet. Slightly clayey SILT. Frequent wood and reed fragments. Mid to dark grey.	
-2.30	-4.26	4.05	6.01	1.96	Silty PEAT. Very dark grey-brown. Very soft. Wet. Moderate wood fragments. Humified in places. More humified 5.10-5.50m. Silty PEAT from 5.5m.	

-4.26	-5.25	6.01	7.00	0.99	Mid grey SAND (fine to coarse). Wet. Water c. 6.25m - becomes saturated. Sucked out lower sample. Water under high pressure. Barrel briefly jammed in casing.	Holocene - Lower Alluvium / Sutton Sand

Table 7 Deposit log for AOC53056_WS2

Intervention		Easting	Northing	Elevation		
AOC53056_WS2		486750.2	413899.95	0.963402		
Top elevation (m OD)	**Base elevation (m OD)**	**Top depth (m bgl)**	**Base depth (m bgl)**	**Thickness (m)**	**Description**	**Interpretation**
0.96	0.41	0.00	0.55	0.55	Topsoil. Crop cover. V stiff.	Topsoil
0.41	-0.09	0.55	1.05	0.50	Slightly clayey SILT interbedded with slightly sandy (fine) SILT. Light yellow brown and light to mid grey-brown. Occasional orange staining. Stiff but easily loosened.	Holocene - Upper Alluvium / Warp / Sutton Sand
-0.09	-0.19	1.05	1.15	0.10	Mid blue-grey mottled with dark grey and yellow brown. Firm. Moist. Very silty CLAY.	
-0.19	-0.24	1.15	1.20	0.05	Reedy, silty PEAT band. Compression of peat 1-2m.	Holocene - Organic Deposits
-0.24	-0.32	1.20	1.28	0.08	Mid blue-grey mottled with dark grey and a little yellow brown. Firm. Moist. Very silty CLAY. Sharp lower boundary.	
-0.32	-1.84	1.28	2.80	1.52	Very dark brown. Wet. Fibrous PEAT. Frequent wood and reed pieces.	
-1.84	-2.70	2.80	3.66	0.86	Wet/saturated dark grey brown fibrous silty PEAT. Similar to above. Humified in places.	
-2.70	-3.67	3.66	4.63	0.97	Very dark brownish grey slightly clayey SILT. Frequent wood fragment. Wet. Very soft.	
-3.67	-4.04	4.63	5.00	0.37	Wet. Soft. Woody, humified PEAT. Very dark brown.	
-4.04	-4.49	5.00	5.45	0.45	Very dark brownish grey slightly clayey SILT. Frequent wood fragment. Wet. Very soft. Frequent peaty pockets.	
-4.49	-5.28	5.45	6.24	0.79	Wet/saturated dark grey brown fibrous silty PEAT. Similar to above. Humified in places. Large wood fragments.	
-5.28	-5.44	6.24	6.40	0.16	Sandy saturated PEAT.	
-5.44	-5.77	6.40	6.73	0.33	Light grey SAND (fine to coarse).	Holocene - Lower Alluvium / Sutton Sand
-5.77	-6.04	6.73	7.00	0.27	Silty CLAY. Grey. Stiff.	

Table 8 Deposit log for AOC53056_WS3

Intervention		Easting	Northing	Elevation		
AOC53056_WS3		486855.26	413900.03	0.838918		
Top elevation (m OD)	**Base elevation (m OD)**	**Top depth (m bgl)**	**Base depth (m bgl)**	**Thickness (m)**	**Description**	**Interpretation**
0.84	0.29	0.00	0.55	0.55	Topsoil. Crop cover.	Topsoil

0.29	0.08	0.55	0.76	0.21	Light yellow brown soft fine sandy (fine) SILT. Friable. Firm. Bedded.	Holocene - Upper Alluvium / Warp / Sutton Sand
0.08	-0.12	0.76	0.96	0.20	Stiff grey silty CLAY. Occasional dark grey and bright orange patches.	
-0.12	-2.21	0.96	3.05	2.09	Firm / friable. Very dark brown to black. Humified PEAT. Clayey. Becomes moist c. 1.5m. Reed pieces. Woody pieces below 2m.	Holocene - Organic Deposits
-2.21	-3.30	3.05	4.14	1.09	Dark grey brown clayey PEAT with wood.	
-3.30	-4.08	4.14	4.92	0.78	Very woody humified PEAT. Very dark brown. Big wood. Wet.	
-4.08	-4.16	4.92	5.00	0.08	Light grey SAND (fine to coarse). Sand blow up casing 5-6m, no retrieval.	Holocene - Lower Alluvium / Sutton Sand

Table 9 Deposit log for AOC53056_WS4

Intervention		**Easting**	**Northing**	**Elevation**		
AOC53056_WS4		486965.11	413899.99	0.770907		
Top elevation (m OD)	**Base elevation (m OD)**	**Top depth (m bgl)**	**Base depth (m bgl)**	**Thickness (m)**	**Description**	**Interpretation**
0.77	0.17	0.00	0.60	0.60	Topsoil. Stiff. Friable. Dry.	Topsoil
0.17	-0.01	0.60	0.78	0.18	Light yellow brown. Dry. Laminated slightly sandy (fine) SILT. Blocky laminae. Sharp boundary.	Holocene - Upper Alluvium / Warp / Sutton Sand
-0.01	-0.15	0.78	0.92	0.14	Very stiff. Dry. Dark grey with orange mottling. Occasional rootlets. Very silty CLAY. Sharp boundary.	
-0.15	-0.83	0.92	1.60	0.68	Dry. Very dark brown. Humified PEAT. Firm / friable. Moist from 1.60m.	Holocene - Organic Deposits
-0.83	-3.22	1.60	3.99	2.39	Very dark brown to black. Humified PEAT. Moist. Friable. Woody. Reedy. Wet / saturated and very soft at top of sample. Very dark grey patch on one side at 3.94-4m. Touched sand at base - sharp boundary. Grey.	
-3.22	-3.23	3.99	4.00	0.01	Grey SAND.	Holocene - Lower Alluvium / Sutton Sand

Table 10 Deposit log for AOC53056_WS5

Intervention		**Easting**	**Northing**	**Elevation**		
AOC53056_WS5		487080.14	413899.97	1.395873		
Top elevation (m OD)	**Base elevation (m OD)**	**Top depth (m bgl)**	**Base depth (m bgl)**	**Thickness (m)**	**Description**	**Interpretation**
1.40	0.80	0.00	0.60	0.60	Topsoil.	Topsoil
0.80	0.70	0.60	0.70	0.10	Dark blue grey and orange mottled silty CLAY. Firm. Friable. Dry. Gradual boundary.	Holocene - Upper Alluvium / Warp / Sutton Sand

0.70	-0.60	0.70	2.00	1.30	Dry to moist. Firm to soft, friable. Humified PEAT. Reddish brown to very dark brown. 1-2m taken for OSL.	Holocene - Organic Deposits
-0.60	-0.89	2.00	2.29	0.29	Wet to saturated. Woody, humified PEAT.	
-0.89	-2.60	2.29	4.00	1.71	Mid grey turning light grey SAND (fine to coarse). Root 2.62-2.71m. Saturated. 3-4m taken for OSL.	Holocene - Lower Alluvium / Sutton Sand

Table 11 Deposit log for AOC53056_WS6

Intervention		**Easting**	**Northing**	**Elevation**		
AOC53056_WS6		487152.25	413899.98	1.714448		
Top elevation (m OD)	**Base elevation (m OD)**	**Top depth (m bgl)**	**Base depth (m bgl)**	**Thickness (m)**	**Description**	**Interpretation**
1.71	1.08	0.00	0.63	0.63	Topsoil. Gradual boundary.	Topsoil
1.08	0.71	0.63	1.00	0.37	Dry friable humified PEAT.	Holocene - Organic Deposits
0.71	-0.69	1.00	2.40	1.40	1-2m Taken for OSL. Saturated mid to light grey brown SAND (fine to coarse). Dark speckles at base.	Holocene - Lower Alluvium / Sutton Sand
-0.69	-1.29	2.40	3.00	0.60	Light grey wet to saturated SAND (fine to coarse). Very occasional wood fragments (c. 10mm).	
-1.29	-3.29	3.00	5.00	2.00	3-4m Taken for OSL. Light grey wet to saturated SAND (fine to coarse). Mid grey clay lens 4.01m. Dark grey lend 4.8m.	

Table 12 Deposit log for AOC53056_WS7

Intervention		**Easting**	**Northing**	**Elevation**		
AOC53056_WS7		486560.83	413269.78	0.819435		
Top elevation (m OD)	**Base elevation (m OD)**	**Top depth (m bgl)**	**Base depth (m bgl)**	**Thickness (m)**	**Description**	**Interpretation**
0.82	0.42	0.00	0.40	0.40	Topsoil / ploughsoil. MADE GROUND, topsoil. Dark Greyish Brown (2.5Y 4/2). firm, friable. homogenous. dry. gradual. Stone: none Rootlets: occasional Rooting: occasional	Topsoil
0.42	0.32	0.40	0.50	0.10	Weathered alluvium. SILT, clayey. Light Grey (10R 7/1). firm. blocky. dry. sharp. Stone: none Rootlets: occasional Rooting: none	Holocene - Upper Alluvium / Warp / Sutton Sand
0.32	-0.56	0.50	1.38	0.88	Peat. PEAT, humified. Very Dark Brown (10YR 2/2). firm, friable. bedded. dry. sharp. Woody, reedy Stone: none Rootlets: none Rooting: none	Holocene - Organic Deposits

-0.56	-1.63	1.38	2.45	1.07	SAND, silty. Dark Brown (7.5YR 3/2). soft. homogenous. saturated. diffuse. Reedy pieces c. 2.25mbgl Stone: none Rootlets: none Rooting: none	Holocene - Lower Alluvium / Sutton Sand
-1.63	-3.78	2.45	4.60	2.15	SAND. Light Grey (10R 7/1). firm. homogenous. wet. undefined. Stone: none Rootlets: none Rooting: none	
-3.78	-4.98	4.60	5.80	1.20	CLAY, silty. Light Brownish Grey (10YR 6/2). firm. undefined. moist. very sharp. Stone: none Rootlets: none Rooting: none	
-4.98	-5.18	5.80	6.00	0.20	SAND, silty. Reddish Brown (2.5YR 4/3). stiff. bedded. moist. undefined. Stone: none Rootlets: none Rooting: none	

Table 13 Deposit log for AOC53056_WS8

Intervention		**Easting**	**Northing**	**Elevation**		
AOC53056_WS8		486636.95	413287.48	1.06439		
Top elevation (m OD)	**Base elevation (m OD)**	**Top depth (m bgl)**	**Base depth (m bgl)**	**Thickness (m)**	**Description**	**Interpretation**
1.06	0.66	0.00	0.40	0.40	MADE GROUND, topsoil. Dark Greyish Brown (2.5Y 4/2). firm, friable. homogenous. dry. gradual. Stone: none Rootlets: occasional Rooting: occasional	Topsoil
0.66	0.36	0.40	0.70	0.30	CLAY, silty. Light Grey (10R 7/1). firm. blocky. dry. sharp. Stone: none Rootlets: occasional Rooting: none	Holocene - Upper Alluvium / Warp / Sutton Sand
0.36	-1.24	0.70	2.30	1.60	PEAT, humified. Very Dark Brown (10YR 2/2). firm. undefined. dry. sharp. Wood Stone: none Rootlets: none Rooting: none	Holocene - Organic Deposits
-1.24	-4.24	2.30	5.30	3.00	SAND. Light Grey (10R 7/1). firm. bedded. wet. sharp. Stone: none Rootlets: none Rooting: none	Holocene - Lower Alluvium / Sutton Sand
-4.24	-4.79	5.30	5.85	0.55	CLAY, silty. Brown (10YR 4/3). stiff. homogenous. moist. sharp. Stone: none Rootlets: none Rooting: none	
-4.79	-4.94	5.85	6.00	0.15	SAND, silty. Reddish Brown (2.5YR 5/3). stiff. bedded. wet. undefined. Stone: none Rootlets: none Rooting: none	

Table 14 Deposit log for AOC53056_WS9

Intervention		Easting	Northing	Elevation		
AOC53056_WS9		486716.87	413300.03	1.439985		
Top elevation (m OD)	**Base elevation (m OD)**	**Top depth (m bgl)**	**Base depth (m bgl)**	**Thickness (m)**	**Description**	**Interpretation**
1.44	1.04	0.00	0.40	0.40	MADE GROUND, topsoil. Greyish Brown (10YR 5/2). firm, friable. undefined. dry. gradual. Stone: none Rootlets: none Rooting: none	Topsoil
1.04	0.64	0.40	0.80	0.40	CLAY, sandy. Dark Brown (7.5YR 3/2). firm. undefined. dry. sharp. Stone: none Rootlets: occasional Rooting: none	Holocene - Upper Alluvium / Warp / Sutton Sand
0.64	0.24	0.80	1.20	0.40	PEAT, sandy. Dark Brown (10YR 3/3). soft. undefined. moist. undefined. Stone: none Rootlets: none Rooting: none	Holocene - Organic Deposits
0.24	0.04	1.20	1.40	0.20	SAND, clayey. Dark Brown (10YR 3/3). firm. undefined. moist. undefined. Stone: none Rootlets: none Rooting: none	Holocene - Lower Alluvium / Sutton Sand
0.04	-3.56	1.40	5.00	3.60	SAND. Light Brownish Grey (10YR 6/2). firm. undefined. saturated. undefined. Stone: none Rootlets: none Rooting: none	

Table 15 Deposit log for AOC53056_WS10

Intervention		Easting	Northing	Elevation		
AOC53056_WS10		486792.47	413299.67	1.077281		
Top elevation (m OD)	**Base elevation (m OD)**	**Top depth (m bgl)**	**Base depth (m bgl)**	**Thickness (m)**	**Description**	**Interpretation**
1.08	0.80	0.00	0.28	0.28	MADE GROUND, topsoil. Greyish Brown (10YR 5/2). firm, friable. undefined. dry. gradual. Stone: none Rootlets: none Rooting: none	Topsoil
0.80	0.20	0.28	0.88	0.60	SILT, clayey. Brown (10YR 4/3). stiff. undefined. dry. very sharp. Charcoal, ceramic Stone: none Rootlets: none Rooting: none	Holocene - Upper Alluvium / Warp / Sutton Sand
0.20	-1.38	0.88	2.46	1.58	PEAT, humified. Very Dark Brown (10YR 2/2). firm, friable. undefined. wet. gradual. Stone: none Rootlets: none Rooting: none	Holocene - Organic Deposits
-1.38	-3.85	2.46	4.93	2.47	SAND. Light Grey (10R 7/1). firm. homogenous. saturated. gradual. Stone: none Rootlets: none Rooting: none	Holocene - Lower Alluvium / Sutton Sand

-3.85	-4.58	4.93	5.66	0.73	CLAY, silty. Bluish Grey (10B 5/1). firm. undefined. moist. very sharp. Stone: none Rootlets: none Rooting: none	
-4.58	-4.92	5.66	6.00	0.34	SAND, silty. Reddish Brown (2.5YR 4/3). firm. bedded. saturated. undefined. Stone: none Rootlets: none Rooting: none	

Table 16 Deposit log for AOC53056_WS11

Intervention		Easting	Northing	Elevation		
AOC53056_WS11		486975.11	413335.23	0.303925		
Top elevation (m OD)	**Base elevation (m OD)**	**Top depth (m bgl)**	**Base depth (m bgl)**	**Thickness (m)**	**Description**	**Interpretation**
0.30	-0.28	0.00	0.58	0.58	Topsoil. Gradual boundary.	Topsoil
-0.28	-2.15	0.58	2.45	1.87	Dark brown humified PEAT. Bands of clayey peat. Woody. Large wood at 2-2.3m.	Holocene - Organic Deposits
-2.15	-2.23	2.45	2.53	0.08	Dark grey clay band. Peaty CLAY.	
-2.23	-3.04	2.53	3.34	0.81	Woody humified PEAT. Wet. Soft. Gradual boundary.	
-3.04	-4.70	3.34	5.00	1.66	Dark grey into like grey at 3.51. Upper part peaty SAND. Then SAND (fine to coarse) from 3.51m. Saturated. Hard/firm.	Holocene - Lower Alluvium / Sutton Sand

Table 17 Deposit log for AOC53056_WS12

Intervention		Easting	Northing	Elevation		
AOC53056_WS12		487059.72	413359.19	0.410388		
Top elevation (m OD)	**Base elevation (m OD)**	**Top depth (m bgl)**	**Base depth (m bgl)**	**Thickness (m)**	**Description**	**Interpretation**
0.41	-0.32	0.00	0.73	0.73	Topsoil. Sharp lower boundary.	Topsoil
-0.32	-1.09	0.73	1.50	0.77	Humified PEAT. Moderate rootlets. Friable. Very dark to dark brown. Areas of firmer peat with bedding. Dry. Void 1-1.5m.	Holocene - Organic Deposits
-1.09	-1.42	1.50	1.83	0.33	Very dark brown humified PEAT. Very sharp lower boundary. Compact and bedded from 1.77-1.83m.	
-1.42	-2.37	1.83	2.78	0.95	Mid blue-grey slightly silty SAND. Wet. Light grey lens near top (fine to medium) with some (coarse). Becomes yellow brown at c. 1.95m, and more equally fine to coarse (coarser). Sharp lower boundary. Wet. Saturated from 2.10m.	Holocene - Lower Alluvium / Sutton Sand
-2.37	-3.99	2.78	4.40	1.62	Firm. Wet. Light grey-brown, slightly silty SAND (fine to medium) with irregular black, organic-ish staining from the upper boundary. Black patches 3.6-3.7m. Drier 3.77-4m. Very gradual lower boundary.	

-3.99	-4.59	4.40	5.00	0.60	Stiff, wet. Blue-grey and red brown mottled silty CLAY. Small sandy patches and lenses.	

Table 18 Deposit log for AOC53056_WS13

Intervention		Easting	Northing	Elevation		
AOC53056_WS13		487176.15	413381.15	0.919248		
Top elevation (m OD)	**Base elevation (m OD)**	**Top depth (m bgl)**	**Base depth (m bgl)**	**Thickness (m)**	**Description**	**Interpretation**
0.92	-0.06	0.00	0.98	0.98	Topsoil (void to 0.5)	Topsoil
-0.06	-0.53	0.98	1.45	0.47	Very dark brown with moderate charcoal flecks and very occasional ceramic fragments. Occasional rootlets. Friable. Stiff. Dry. Mid to dark orange mottling. Humified PEAT. Moist patches at 1.35-1.43m	Holocene - Organic Deposits
-0.53	-0.66	1.45	1.58	0.13	Stiff mid brown and dark grey clayey SILT.	Holocene - Lower Alluvium / Sutton Sand
-0.66	-0.67	1.58	1.59	0.01	Organic SILT lens. Sandy (fine to coarse).	
-0.67	-3.08	1.59	4.00	2.41	Light grey with dark grey lenses becoming mid brown at 1.70m. Silty SAND (fine to coarse). Saturated from 1.70m. Becomes brownish grey gradually at c. 2.5m. Wet.	

11 DEPOSIT MODEL

11.1 10 stratigraphic units have been identified across the site. These units are summarised in Table 19 below and listed in stratigraphic order from the oldest to the most recent. The vertical deposit succession is illustrated on the transect(s) drawn across the site (Figures 6-10). The major stratigraphic units are also represented by surface and/or thickness plots (Figure 11-37).

Table 19 Summary of identified stratigraphic units (subdivision of the Holocene based Walker et al 2012)

Stratigraphic unit (facies)	Lithology/Description	Chronology	Environment of deposition
Mercia Mudstone Group	Mercia Mudstone is described by the BGS as predominantly red, less commonly green-grey, mudstones and subordinate siltstones, with presence of sandstones.	Triassic Period (approximately 201 to 252 million years ago)	Hot desert environments.
Pleistocene Glaciofluvial / Glaciolacustrine Deposits	Mostly sand and gravel with some finer-grained layers. Laminated clay, silt, and sand, with rare dropstones. Unfossiliferous. Resting directly on bedrock or underlain by basal glaciofluvial deposits.	Devensian (Late Pleistocene, *c.* 33,000 to 12,000 years ago)	Ice Age conditions. Meltwater stream deposits or Glacial lakes or ponds
Pleistocene Head	Clay, silt, sand, and gravel. Poorly sorted, poorly stratified.	Devensian (Late Pleistocene, *c.* 33,000 to 12,000 years ago)	Cold climatic stages. Subaerial slopes.

Sutton Sands	Predominantly sand. Medium to fine grained materials forming lenses, beds, and (locally) dunes.	Devensian (Late Pleistocene, *c.* 33,000 to 12,000 years ago)	Environment dominated by wind-blown (aeolian) deposits.
Lower alluvium	Clays, silts, sands, gravels, peats. Bedded.	Holocene (up to *c.*12,000 years ago)	Low lying fluvial and estuarine -temperate floodplain deposits.
Holocene organic deposits	Peat and organic clays, silts, and sands. Often interbedded with alluvium. Accumulated organic material forming beds and lenses.	Mid Holocene / Northgrippian (c 8,276 – 4,200 BP/ 6,326 – 2,250 BC) to Late Holocene / Meghalayan (c 4200 BP/2250 BC onwards)	Temperate wetland development within a floodplain environment.
Upper alluvium	Grey and yellow, sand/silt/clay, occasional gravel.	Late Holocene / Meghalayan (c 4,200 BP/ 2,250 BC onwards)	Representative of floodplain and intertidal mudflats, with additions from possible reworking of shingle or sand bank material.
Holocene Warp	Difficult to distinguish from alluvium – anthropogenic flood deposit.	Victorian to modern (up to *c.* 200 years ago)	Temperate floodplain deposits – anthropogenic – reclamation.
Made Ground	Mixed material, often containing modern construction materials and anthropogenic waste. Concrete often included. Sometimes includes redeposited material.	Victorian to modern (up to *c.* 200 years ago)	Anthropogenic - reclamation / agriculture.
Topsoil	Modern topsoil horizon, sealing the beneath stratigraphy.	Victorian to modern (up to *c.* 200 years ago)	Temperate terrestrial environment.

Mercia Mudstone Formation

11.2 Mercia Mudstone is the underlying bedrock within the investigation area. It was not encountered within the interventions from this phase of borehole evaluation. The unit is described as very stiff, dominantly red, less commonly green-grey mudstones and siltstones. It was not encountered in all parts of the study area due to the thickness of superficial deposits, thus the majority of the data is from 50 historic borehole logs and GI data.

11.3 Bedrock surface (Figure 11) was recorded between approximately -16 and -2m OD, with these upper values generally located toward the east and southeast of the study area (Zones 2 and 3). Within the north west of the site, and within A1, mudstone is record at c. -16.5m OD (e.g. SOLAR21_IFABH5 and DS20-1405.01_CP102, Figure 7). There is an anomalous area of high mudstone recorded at BGS record SE81SE70 towards the centre of the study area but outside the western site boundary (Zone 2), which places the bedrock surface at approximately -4m OD, compared with -14.5m OD at SE81SE80 and c. -13.5m OD at SE81SE26 in the same vicinity. Bedrock was not encountered within the two nearest interventions to the east (SE81SE79 and SE81SE34) in order to compare, though these records extend to a greater depth without record of mudstone. This may indicate that either the data is erroneous, or that there is an isolated area of raised bedrock within the floodplain zone potentially indicating an area of high ground between eroded river channel paths.

11.4 There is no data representing the mudstone in the majority of the site (A2-4, and 6). There is a c. 1m thick band of stiff silty clay to clay recorded within the superficial lower alluvium/ Sutton Sand unit. The preliminary ERT data (Wessex Archaeology pers. comm. June 2022) appears to mark this as mudstone. On Transect D, crossing A2 and 3, the surface of this unit is encountered at c. -6.5m OD in the west (AOC53056_BH7, Figure 9) and c. -4m OD in the east (AOC53056_WS12, Figure 9). This may represent the mudstone, but the clay is sandwich between thick sands of very similar lithology so confident identification is difficult especially considering the variation in elevation of the unit in the historic records to the west of the site and more recent records in A1. During the first phase of boreholes (AOC 2022b) BH3 identified a similar unit from -5.79m OD as mudstone. OSL dating of the unit IN BH7 and WS10 has produced a XXXX

Pleistocene Glaciofluvial / Glaciolacustrine Deposits

11.5 Identified among 8 records within the investigation (Zones 1, 2, and 3), the Pleistocene glaciofluvial / glaciolacustrine deposits comprise bedded sand, silt, and clay of varying coarseness. These were confined to northeastern part of the site (A4, with thickness (Figure 12) of up to approximately 3.5m at AOC_24864_MW8 (Zone 3).

11.6 The glaciofluvial / glaciolacustrine deposits represent periglacial meltwater streams, lakes, and ponds which were active as glaciers melted toward the end of the Pleistocene epoch, thus this may suggest one of these streams to have run downhill from the higher elevations of the northeast of the site pooling here or running toward the main river channel. The presence of these deposits on the northeastern hill and its slopes is illustrated in Transects A and B (Figure 6, Figure 7). Transect A shows how the deposits have accumulated on the slope toward the southwest, with a surface elevation between approximately 4-4.3m OD. Elevation is similar in Transect B, in the direction of the modern river channel, with glaciofluvial deposits recorded at just over 4m OD on the slope.

Pleistocene Head

11.7 Pleistocene head was identified across 8 locations within the northeastern part of the study area (Zones 1, 2, and 3), and overlay the glaciofluvial / glaciolacustrine deposits, with a thickness (Figure 13) of up to approximately 4.5m (SE81SE40). It is recorded as comprising poorly sorted gravel, sand, silt, clay, primarily orange-brown and reddish-brown in colour. Head results from the downslope movement of waterlogged sediment initiated by meltwater (BGS, 2022), thus likely represents the reduction and eventual cessation of water transport within the meltwater streams with instead saturated ground losing stability.

11.8 The surface of the head and older deposits is represented in Figure 14, illustrating the possible land surface at c. 12,000 BP, XXthough this will not be representative for the full area as the presence or extent of Sutton Sand / Mudstone has not been determined prior to the return of OSL dates. At present, the surface is identified between -17 to 12m OD, the highest of these values represented in the northeast where glaciofluvial and head deposits have been recorded. Much of the study area is represented by the lower values, particularly at the base of the northeastern slope, and to the east of the modern channel in the centre of the site. These lower areas likely represent regions of past active channel incision, and possibly a relict route further east in the central area.

11.9 Higher areas such as that in the southeast where the surface is recorded between approximately -9 and -3.5m OD may indicate areas of dry land during the early Holocene, which would have provided access to riparian and wetland resources. The highest area in the northeast (c.10-12m OD) likely represents a stable dry land environment adjacent to the river, which may have been

suited for more consistent human activity and settlement into the late prehistoric and onward. The extent of the slope is illustrated in Transects A and B (Figure 6, Figure 7), showing a steep decline from the northeast toward the floodplain and channel.

Sutton Sand / Lower Alluvium

11.10 XXPending return of OSL sates to support interpretation, the deposits of sand, silt, and clay underlying Holocene organic deposits are presently represented as the single stratigraphic unit, 'Lower Alluvium / Sutton Sand'. The unit is described as generally grey to brownish grey and homogenous sand, silt, and clay, with some gradual colour variation with depth.

11.11 The deposits were identified across 135 of the locations, though the full depth was not reached across all of these. The recorded thickness of this deposit across the site is represented in Figure 15, and illustrates that it is generally thickest across the central area, and in the southeast, although this may be skewed by the depth reached among the interventions.

11.12 Figure 16 shows a higher resolution thickness plot focused on the northern part of the site, in the area of Transects A and B. The thickness is greatest closer to the current channel, reaching up to approximately 12m (Zone 1). This may suggest the deposit to be more likely alluvial (or involved alluvial reworking), although aeolian sediments may also have been dropped in the sheltered area at the base of the slope.

11.13 Toward the centre, within the broader floodplain, there is greater thickness illustrated (Figure 17) toward the southeast and south. The majority of these interventions did not reach through the deposits, however, which is likely reflected in the model.

11.14 A band of stiff, silty clay was present within this unit, represented in Transect D (Figure 9) from roughly -6.5 and -4m OD. The elevation of this band generally increased from west to east. This corresponds with the modelled mudstone bedrock elevation from the ERT survey carried out within this part of the site (Wessex Archaeology pers. comm. June 2022: Figure 3a, 3b), suggesting this may be the deposit which resulted in this signal. Underlying this clay band, however, were deposits of grey sand akin to those overlying it, thus it has not been recorded as mudstone within the borehole investigation.

11.15 XXResults of OSL dating will aid in distinguishing these lower deposits in respective of the presence of Holocene alluvium, pre-Holocene Sutton Sand, and mudstone bedrock. OSL dates have been sought from the stiff clay in AOC53056_BH8 at c. -5m OD and/or AOC53056_WS10 at c. -4m OD, and the surface of the silty sand in AOC53056_BH7 at c. -5m or OD AOC53056_BH3 at c. -0.8m OD, and AOC53056_WS5 at c. -1.6m OD. These provided dates of XX

11.16 A topographic plot has been generated for this unit (Figure 18). It illustrates a surface elevation of between approximately -12 and 20m OD and may represent the landscape at the end of the Pleistocene (pending OSL dates). Depending on the outcome of the OSL dating Figure 14 or Figure 18 may represent the most accurate representation of the early Holocene topography. A roughly north-south aligned low region to the east of the modern channel might represent a relict channel of the river, with areas of higher surface to the east and an isolated area in the central west (SE81SW91) where elevation reaches up to c. 4m OD compared with between approximately -6 and -4m OD within the adjacent low area. The lower area, which may represent a relict channel, is located within Zone 1 and is outside the site boundary and any Development Area.

11.17 Figure 19 illustrates the surface in the northern part of the site(A1 and 4), in the area of Transects A and B. It illustrates at a higher resolution the steep slope between the northeast and the land adjacent to the modern river channel, as well as the shallower slope from the hill to the wider floodplain area to the southeast. In the far southwest (SE81SE21) the surface falls as low as c. -13.5m OD, though to the north adjacent to the channel this value is between approximately -7.5 and -6.5m OD. The broader floodplain is represented at a smaller scale in Figure 20 (A2 and northern part of A3), showing generally lower variation over this area. The highest elevations in this area are between approximately 1-1.5m OD, with much of the area recorded between c. -0.5 and -1.5m OD. Closer to the modern channel this value falls as low as c. -8m OD, following the trend of the below stratigraphy.

11.18 In Transects C and D (Figure 8 and Figure 9), the surface appears to undulate across the area, particularly in Transect D. This may suggest the deposit to more likely represent Sutton Sand surface, which can present as dunes (BGS, 2022), though the pending OSL dates will confirm whether or not this is the case. Transect E (Figure 10) also illustrates some undulation in the southern part of the site, with the surface ranging between approximately -1 and 1.5m OD.

Holocene Organic Deposits

11.19 Holocene organic deposits were identified at 126 locations across the study area. These deposits consisted primarily of humified, reedy, or woody peat, with some units of organic clay, sand, or silt. Minerogenic lenses were identified within some of the peat deposits, indicating periods of water influx.

11.20 A thickness plot for these deposits has been generated to show variation across the site (Figure 21). It illustrates that organic deposits are generally thicker in a north-south alignment, generally to the east of the modern channel route outside of the eastern part of the south of A3. This may reflect the distribution of the interventions, with fewer located to the west of the river, though directly east of the channel in the central area interventions recorded only up to approximately 0.5m of organics (SE81SW72, SE81SW26, SE81SW31). The thickest deposits are adjacent to the channel in the south (SE81SW34), where they reach up to approximately 11m in thickness.

11.21 The northern part of the site (A1 and 4) is illustrated in Figure 22, showing that here the thickest deposits are up to approximately 6.5m and also adjacent to the river channel. There is an abrupt reduction in thickness on the steep slope of the valley side, showing the extent of the historic wetland. This is further illustrated in Transect B (Figure 7).

11.22 Figure 23 shows the thickness of Holocene organics across the floodplain in the central area of the site (A2 and north of A3) and shows there is a significant difference between the north and south in this area. This is further evident in Transects C and D (Figure 8 and Figure 9), which illustrate that these deposits are present throughout the area, but thicker on Transect C, with generally between c. 2-5m and reaching up to c. 6.5m in the centre (AOC53056_BH6). Across Transect D, the values are lower, more frequently recorded between 1-2.5m in thickness.

11.23 The southern part of A3 presents Holocene organic deposits of lesser thickness, generally only reaching up to approximately 1m (Figure 24). Transect E (Figure 10) also shows the thinner organic unit across the area.

11.24 A topographic plot of the organic deposits across the site has been generated (Figure 25). It shows

that the surface was encountered between approximately -7.5 and 20m OD, the lowest elevations generally situated within close proximity of the river channel. Figure 26 shows this plot in the north (A1 and 4), illustrating a general levelling of the lower area with surface elevation generally between c. -1.5 and -0.5m OD, with the exception of the southwestern most point (SE81SE21) where the surface falls to c. -7m OD.

11.25 In the wider floodplain (Figure 27, A2 and north of A3) around Transects C and D, the surface of the organic deposits is generally recorded between approximately 0-2m OD, with the exception of the northwest where the surface falls as low as c. -6m OD (AOC53056_BH5). This is likely caused by proximity to the river channel, and the topography of the underlying geology. This, as well as the general levelling of the land surface, is illustrated in Transects C and D (Figure 8, Figure 9). Figure 28 illustrates the surface of this unit in the south of A3, which in conjunction with Transect E (Figure 10) shows it to range between approximately -1 and 2.5m OD.

11.26 Two C14 dates were obtained during previous works (WYAS, 2021) from this unit at intervention WYAS21_Tr12, suggesting a long period of peat formation in the south of A3. The earliest date, taken from humic material at 0.27m OD returned a late Mesolithic date range of 5670-5605 Cal BC (BETA592207). At 0.97m OD, a sample of *Maloideae* roundwood yielded a Neolithic date range of 2632-2469 Cal BC (BETA592205). These dates may translate to other nearby peat deposits and suggest the wetland to have been forming between the Late Mesolithic to Early Bronze Age periods. Plant and insect remains from the peat were found to be poorly preserved, though evidenced sedges and willow, indicative of waterside vegetation, and areas of heathland. Heathland was likely present upon the higher ground. The pollen assemblage indicated an environment dominated by trees and shrubs, primarily birch and pine. These features signify a marginal wetland setting, with seasonally fluctuating water levels.

11.27 Radiocarbon dates obtained from the peat deposits in A1, 2 and north of 3 – in AOC53056_BH1 at c. -5 and -8m OD, AOC53056_BH6 at c. 0 and -6.5m OD, and AOC53056_BH3 at c. -0.2m OD respectively – have provided dates of XX.

11.28 A continuing rise in relative sea level (RSL) then resulted in inundation, signified by the minerogenic deposits sealing the peats.

Upper Alluvium / Warp

11.29 Overlying the Holocene organic unit are deposits of clay, silt, and sand. As it is difficult to distinguish between naturally accumulating alluvium and anthropogenically instigated flood deposits of warp, the unit is modelled as one under 'Upper Alluvium / Warp'.

11.30 The thickness of these deposits across the study area is illustrated in Figure 29. The deposits are shown to be thickest in the north, west, and east, with lesser deposits generally where the surface of the organics beneath are higher. The thickest deposits recorded are of approximately 10.5m in A2 (SE81SE21), and 9.5m beyond the western site boundary (SE81SW26). Both are adjacent to the modern channel.

11.31 Figure 30 shows the thickness of these deposits in A1 and 4. It illustrates the accumulation of alluvium or warp adjacent to the river channel, and the reduction in thickness toward the valley slope at the northeast. It is also evident that there is an area of thicker alluvium or warp to the southeast of the slope. This area is highlighted in Transect A (Figure 6) and may represent a low-

lying area which was more consistently waterlogged than the adjacent areas within which peat formed, most likely a pool forming part of the wetland mosaic landscape. Two of the locations (SE81SE43, SE81SE45) record pockets of peat within the clayey sand units, which is likely accumulation from the adjacent peat deposits where it has fallen into these wetter areas. The site boundary encompasses SE81SE44 and SE81SE45.

11.32 Upper alluvium or warp thickness for the wider floodplain (A2 and north of 3) in Transects C and D is shown in Figure 31. Across the majority of the area thickness is of up to 1m, with the exception of the west, closer to the channel, where it reaches 8m (AOC53056_BH5, A2) and an area in the east where thickness is approximately 4.5m. Transects C and D (Figure 8, Figure 9) show that although the unit is generally quite thin in this area, there is an overall decrease from west to east following change in the underlying surface. Interventions furthest east in transects C and D didn't record any of these deposits overlying the organics, beyond A2 and the north of A3 and in the vicinity of A6.

11.33 Toward the south of A3, thickness ranges from approximately 0-4m (Figure 32), thicker where it overlies lower organic surfaces as illustrated by Transect E (Figure 10). Generally, the thickness of the deposits within the site is approximately 1-2m.

11.34 A topographic plot for this unit is represented in Figure 33. The surface elevation is shown to range between approximately -2 to 20m OD, the highest of these values being in the northeast (A4), as with the below units. Across much of the study area recorded surface elevations are between c. 0-3m OD.

11.35 In the northern area (Figure 34, A4) the surface was encountered generally between approximately 2.5 and 4m OD, though in the southeastern area this fell to c. 1-2m OD on average. A small area of reduced elevation was recorded close to the river channel (AOC_25864_TP26, TLP_25864_BH5, A1) to the west, where this unit was encountered at c. 1.5-2m OD. This is likely representative of modern truncation, due to the difference from the adjacent records.

11.36 In A2 and the north of 3, little variation is seen in the topographic plot (Figure 35). The surface is mapped mostly between c. 0-2m OD, with isolated areas in which it was encountered higher at up to approximately 3m OD.

11.37 In the south of A3 (Figure 36) elevation of this unit was recorded between c. 1-2.5m OD, with lower values generally to the southwest.

Topsoil and Made Ground

11.38 Topsoil and made ground sealed the alluvial, organic, and Pleistocene deposits across the Site. Made ground was primary identified adjacent to the river outside of the site to the west, south, and within the Flixborough Estate (A1) in the north. Thickness of these deposits reached up to 3.5m (Figure 37), though was recorded generally below 1.5m within the site boundary.

11.39 Topsoil was often described as ploughsoil from ongoing agricultural practices. Among many of the interventions the ploughsoil was underlain with a thin subsoil, suggesting ploughing to not have disturbed the underlying sequence to a significant degree. This was the case particularly in the are of Transects C and D.

11.40 The greater thickness of the made ground deposits in the north (A1) suggest it is likely there has

been significant post-medieval make up and modern truncation in this area.

Deposit Model Reliability and Limitations

11.41 182 borehole records were included to generate the deposit models, covering the majority of the area. They are sufficiently spaced and detailed enough to produce high resolution transects across different parts of the site, and to contribute to reliable topographic and thickness plots for each unit. Some areas, particularly adjacent to the A1077 road through the centre of the site boundary, were not as well covered. These areas however showed little variation in the models produced, so are likely to be accurate regardless.

11.42 The lower stratigraphy, such as the mudstone bedrock, may not have been reached in all interventions. However, for the purposes of the investigation depth was sufficient for producing models of stratigraphic units with archaeological and palaeoenvironmental potential.

11.43 Overall, the models can be regarded with a high degree of confidence for interpretation of potential across the site.

12 ARCHAEOLOGICAL AND PALAEOENVIRONMENTAL POTENTIAL

Wider context

12.1 TBC after radiocarbon dating

Realisation of the Research Aims

12.2 Drawing on the results presented in section 10, the following is concluded in relation to the evaluation aims, objectives and research questions detailed in section 8:

- RQ1: What does the deposit sequence on the site reveal about the landscape evolution of the site and the River Trent, especially in relation to previous investigations?
  - The sequence confirms that a remains relating to a possible periglacial lake feature survive in A4, overlain by the downslope transport of waterlogged material under gravity and causing an accumulation of head.
  - Models of the lower stratigraphy also suggest a N-S channel to have been located beyond the south east of the site (Zone 3) during the Pleistocene to Holocene transition, due to the distribution of lower alluvium / Sutton Sand deposits. This could also explain the areas of lower Holocene organic and alluvium surfaces beyond the east of the site, specifically the south of A3.
  - There is evidence of significant wetland across the lower-lying land adjacent to the river, in the form of thick peat and other organic deposits, particularly to the east of the modern channel. Dates from previous work (WYAS, 2021) suggest those in the south of A3 (Transect E) to be Late Mesolithic to Early Bronze Age in date. These peat deposits were slightly further from the modern river, thinner than those identified further north, and encountered between roughly 0.27-1.5m OD. In the north of the site (A2 and northern part of 3) where core samples have been obtained, peat was identified between c. -7.5 and 1.2m OD. Assessment of these samples has potential to expand the understanding of these organic accumulations, and as such enhance the interpretation of local and broader environment and climate reconstructions.

- OSL dates are yet to be returned for the lower alluvium / Sutton sand deposits to determine their age and origin.

- RQ2: How do the deposits recorded within the site relate to each other and how do they contribute to our understanding of the landscape evolution of the project area?

  - Tertiary bedrock of Mercia mudstone underlies the site, with a surface between approximately -16 and -2m OD.

  - This unit is overlain by Pleistocene glaciofluvial deposits in the northeast, and Sutton Sand or lower alluvium across the rest of the lower study area. The glaciofluvial / glaciolacustrine deposits are overlain with Pleistocene head on the hillslopes of the northeast. They suggest the higher elevations to have been impacted most by higher energy periglacial action. If OSL results prove the silty sands to be the pre-Holocene Sutton Sand, this would suggest the floodplain area to have been exposed and dry for a long period. As a lower alluvial deposit, it would suggest a floodplain of a wide, shallow, and potentially braided river channel with relatively high velocity existed prior to the development of wetland.

  - The lower alluvium / Sutton Sand deposits are overlain with Holocene organics, primarily peat. The peat infills much of the lower surface of the underlying sands. The organics vary in thickness but are shown to have a relatively level surface. They suggest a long, stable period throughout which the landscape was dominated by wetland environments.

  - In the east, the organics are a times directly overlain with topsoil, however alluvium or warp seals much of the organic unit elsewhere and is generally thickest toward the river. The alluvium or warp is generally of finer fabric than the lower alluvium / Sutton Sand, reflecting a lower energy depositional environment.

  - Topsoil seals the site. Made ground is identified to the north in the Flixborough Industrial Estate and adjacent to the roads throughout, as well as across the southernmost area. It truncates earlier deposits.

- RQ3: How does the character, extent, and scientific dating of organic horizons compare to those located in the vicinity of the site and do any samples retained have further potential for scientific dating (radiocarbon or OSL) and contributing to the project wide chronology?

  - XXOrganic horizons sampled present opportunity for radiocarbon dating, with significant depth and thickness in some potentially suggesting good levels of preservation.

  - XXOSL dating could be carried out on coarser grained sediments underlying the organic unit to determine their age. This would also be applicable to the sands above and below the stiff clay band represented in Transect D.

- RQ4: Can greater differentiation in the warp/alluvial/windblown deposits be ascertained, by character, date or depositional context?

- XXDifferentiation between lower Holocene alluvial and Pleistocene aeolian (Sutton Sand) deposits is to be achieved through OSL dating, the results of which are pending.

- In terms of lithology, warp is indistinguishable from any other deposits laid down by fluvial or estuarine processes. BGS records suggest warp to have been deposited to the west of the channel, and within the floodplain between the river and Scunthorpe, the northern areas toward Flixborough are mapped as alluvium. There is no clear lithological differentiation between the upper alluvium / warp deposits recorded between these two areas, thus it has not been possible to further distinguish these deposits.

- RQ5: Can the palaeoenvironmental sequences sampled provided any further information about past channel routes or wetland onsite?

  - Specialist palaeoenvironmental assessment of the Holocene organic deposits sampled during the investigation would contribute to understanding of the vegetation types which were present in the wetland, as well as potential changes to the environment over time. Their thickness and depth present opportunity for comprehensive palaeoenvironmental assessment to potentially provide significant improvement to the understanding of the local, and broader, landscapes.

  - Assessment of proxies such as diatoms and ostracods could reveal detail on the salinity, flow, and depth of any water in this environment, which would reveal short-lived wetland pools, creeks, and the extent of estuarine influx on the wetland. This would likely be applicable only to standing water within the wetland, as no long-lived Holocene palaeochannels have been identified within the site.

- RQ6: Can the ERT data provided any further information about past channel routes or wetland onsite?

  - The June 2022 ERT (pers. comm. Wessex Archaeology) data does not show further evidence of channel routes. Most variation shown in the transects is within the upper 1-2m, and likely represents the fluctuating interface between the Holocene organic deposits and lower alluvium / Sutton Sand, and the upper interface between the upper alluvium / warp and the Holocene organic deposits.

  - ERT transect 3b (Wessex, 2022) shows a deep anomaly at 192m, which roughly aligns with an area of deep peat recorded in the borehole transect. This is unlikely to represent a significant channel, but more likely a wetland pool or short-lived creek forming part of the wetland landscape.

Archaeological Potential and Significance

12.3 Based on distribution and character of the deposit sequence, as identified in the deposit model, and illustrated in the figures, areas of archaeological and palaeoenvironmental potential have been mapped for the site. These are shown on Figure 2 and the differing character and potential of each area is outlined in Table 20. The table also details which Development Areas fall within those zones where new works have been undertaken, specifically A1, A2, A3, A4 and A6. The understanding of the deposit distribution and XXchronostratigraphy has been refined but broadly the information

has not changed significantly since the previous deposit model (AOC, 2021) or the interim report (AOC, 2022b).

Table 20 Archaeological and palaeoenvironmental potential of zones within the site (modified from AOC, 2022b)

Zone	Character of area	Archaeological / palaeoenvironmental potential
1	Applies to the site and to the west (A1, A2, parts of A3) Immediately east of the modern channel of the river Trent. Deep Holocene sequences of peat and alluvium. A broad section of the floodplain. A1 lies entirely within Zone 1. A2 is almost entirely within Zone 1. The northwestern-most part of A3 is within Zone 1.	Applies to the site and to the west (A1, A2, parts of A3) Lower bedrock and Pleistocene deposit surfaces in this zone have resulted in accumulation of thick Holocene alluvial and organic deposits. Lower alluvium / Sutton Sand reaches c. 15m here. Organic deposits, generally peat, reach up to c. 11m in thickness in this Zone. Upper alluvium / warp is also thickest in this zone, reaching up to c. 10.5m. Organic deposits may indicate short-term stabilisation and wetland developments and may provide context for human activity and landscape evolution. Palaeoenvironmental assessment of proxies including pollen, diatoms, ostracods, from these deposits could reveal the typology of vegetation locally and in the broader region, as well as details on water quality. This information can contribute to an understanding of human activity and occupation locally, identifying signs of agriculture and deforestation. There is potential for earlier prehistoric activity and remains (e.g. flint scatters, wooden boats, fire), though this would likely be buried beneath the thick Holocene sequences and heavily reworked by fluvial processes. Prior to warping and drainage schemes from the 17th Century onwards, this Zone would have been waterlogged and intermittently flooded throughout the year, rendering it unusable for agricultural practices. It is unlikely that there will be significant occupation remains in this Zone, although

Zone	Character of area	Archaeological / palaeoenvironmental potential
		medieval and post-medieval riverside activity at Flixborough Stathe (at the site of the ERF plant) is known to have occurred.
2	Applies to the site and outside to the west and east (A3, A4, part of A5) Extends from Zone 1 in the west to the west-facing slopes of Zone 3 in the east. Within the floodplain but presenting thinner Holocene sequences than in Zone 1. Organic deposits have been recorded. Parts of A4 are within Zone 2 in the north. A3 is almost exclusively within Zone 2, throughout the length of the site. The westernmost extent of A5 is within Zone 2.	Applies to the site and outside to the west and east (A3, A4, part of A5) Significant archaeological remains may be found within this zone. This zone covers the edge of the floodplain to the base of the valley slopes, which would likely have been suited to occupation in the Neolithic and Bronze Age periods, and perhaps seasonal occupation during later periods. Cropmark sites have been identified to the west of the Foxhills Industrial Estate, which may be late prehistoric or Roman in date. Historically much of this land was uncultivated and unenclosed common land, including Brumby Common at the southern end of the site. Palaeoenvironmental potential is high, with evidence of wetland extension into this zone including peat deposits and infilled wetland ponds.
3	Applies to the site and outside to the east (A4, A5, A6) Zone 3 encompasses the west-facing slopes to the east of the river Trent floodplain. Most of A4 is located within Zone 3. A6 is in Zone 3. Much of A5 is within Zone 3, or extending further east away from the floodplain.	Applies to the site and outside to the east (A4, A5, A6) Significant multi-period remains have been identified on the slopes, including remains of Neolithic, Bronze Age, Iron Age, and Roman date at the sand and gravel quarry at Willow Halt, and the mid-late Anglo-Saxon settlement at Flixborough. Deeper Holocene sequences within this zone, particularly around A4 and A6, may be well preserved and suitable for palaeoenvironmental assessment.

13 CONCLUSIONS AND RECOMMENDATIONS

13.1 The following section reviews the significance of the results of the geoarchaeological borehole

evaluation in relation to the development and makes recommendations for an appropriate mitigation strategy.

13.2 Development impacts from the currently proposed North Lincolnshire Green Energy Park (NLGEP) and Energy Recovery Facility (ERF) are to be associated with excavations required for construction of the facility itself as well as the associated District Heat and Private Wire Networks (DHPWN).

13.3 Although it is difficult to ascertain with certainty the potential of the deposits to contain archaeological remains, the nature of the deposits observed suggests any archaeological remains will most likely be identified within Zones 2 and 3 and reflect multi-period occupation in the local area. For Zone 1 the main potential is for XXearlier prehistoric activity and remains (e.g. flint scatters, wooden boats, fire), deeply buried and heavily reworked by fluvial processes. Similar remains in Zone 2 are likely to be of XXlate prehistoric date and underlie the thinner upper alluvium / warp (from c. 1-2m bgl and 0-2m OD), whereas those in Zone 3 may extend from the same period through to the medieval based on other findings locally and survive at a shallower depth (from 1-2m bgl and 1m OD).

13.4 The impact on these remains could be adequately mitigated by a programme of archaeological evaluation trenching, already planned, and outlined in a separate document (ERM 2022). Standard 1.2m evaluation trenches will likely reach these deposits within most of Zones 2 and 3, although stepping may be required in some areas. The nature of the deposits observed suggests preservation of paleoenvironmental remains will be best across zones 1, potentially reducing slightly in 2, and reducing more in parts of Zone 3. The latter being comparable in landscape position to the work in the south of A3, at Brumby Common (WYAS, 2021). The wetland peat formations most likely relate to the mosaic environment of vegetated wetland, and short-lived creeks and pools, as evidenced to the north of Flixborough at Flixborough Grange (Smith and Lillie, 2008).

13.5 The appropriate mitigation strategy for the site will be decided by and agreed with the Local Authority and their archaeological advisors.

14 UPDATED PROJECT DESIGN

14.1 To be completed

Task	Description	Resource	Days
General			
Assessment			
Report			

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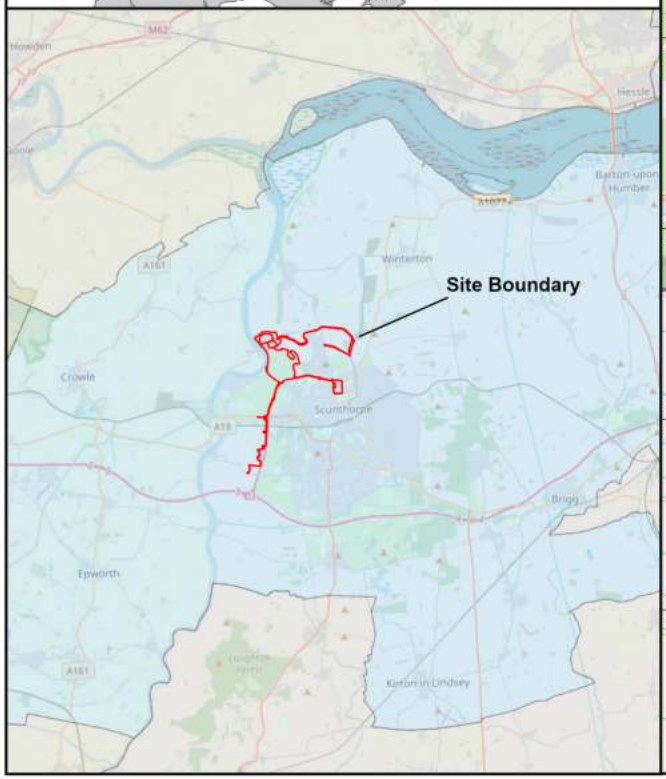
APPENDICES

16 APPENDIX A – DEPOSIT MODEL DATA REFERENCES

Deposit log	Easting	Northing	Elevation	Source

17 APPENDIX B – OASIS FORM



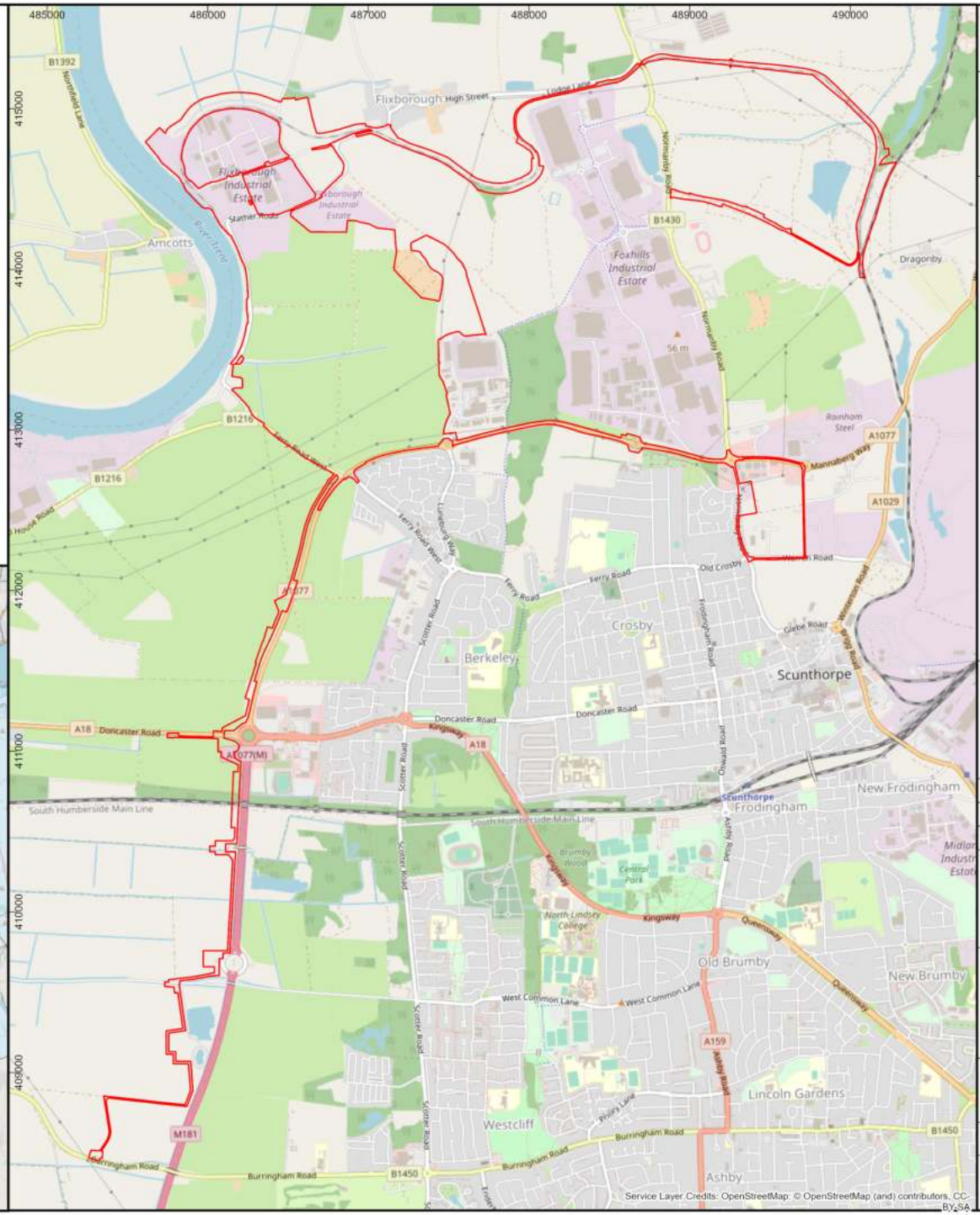


Figure 1

Site Location Map

Legend

Site Boundary

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33 St Mary Axe,
London
EC3A 8AA

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DWG no:	n/a
AOC Project No.:	53056

AOC Archaeology Group

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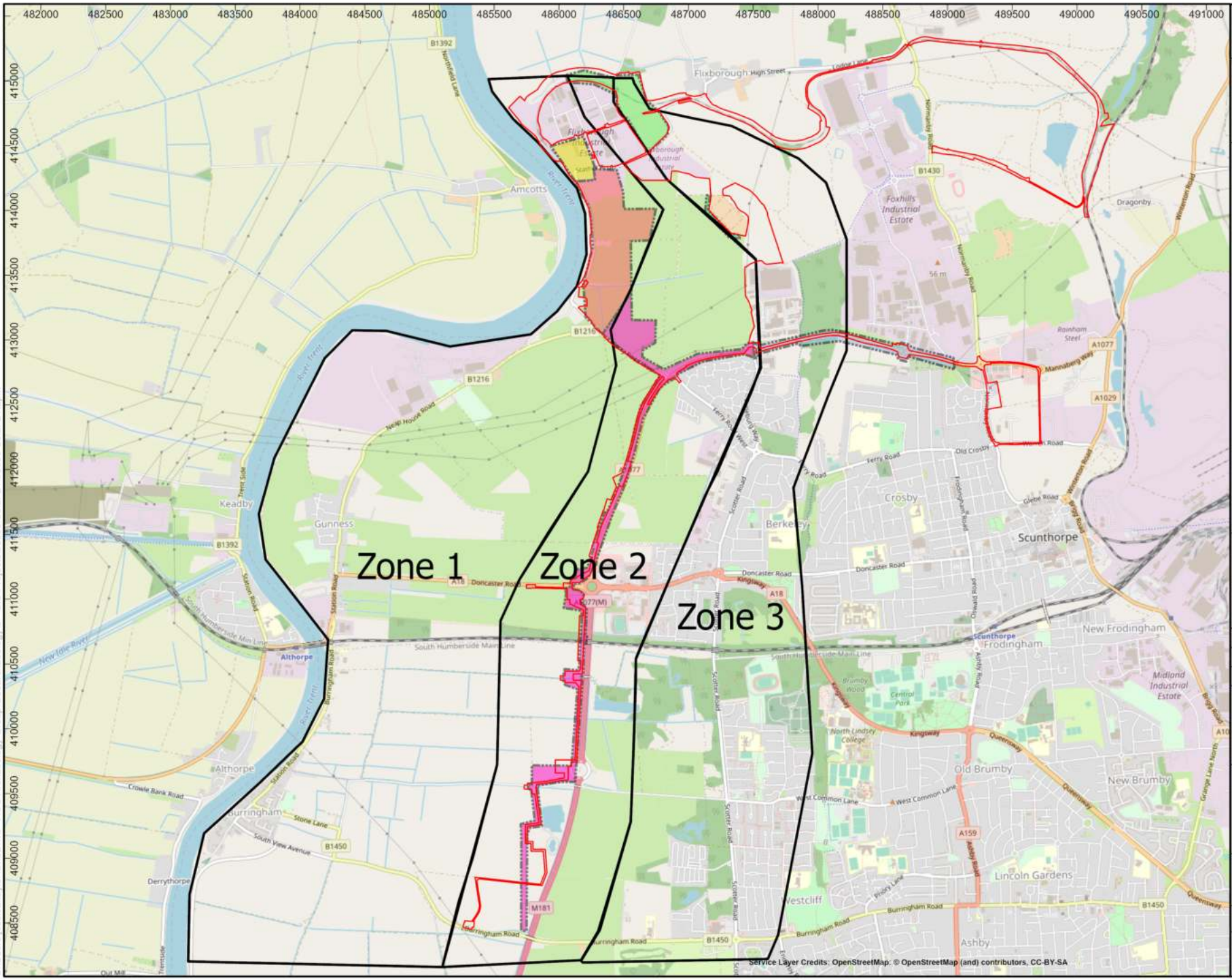

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Figure	2

Archaeological Zones and Development Areas

Legend

Layer

Development Areas

- Area 1
- Area 2
- Area 3
- Area 4
- Area 5
- Area 6
- Site Boundary
- Zone 1
- Zone 2
- Zone 3

FIRM

ERM
2nd Floor Exchequer Court,
33 St Mary Axe,
London
EC3A 8AA

Drawn/checked:	JT
DWG no:	N/A
AOC Project No.:	53056

AOC Archaeology Group

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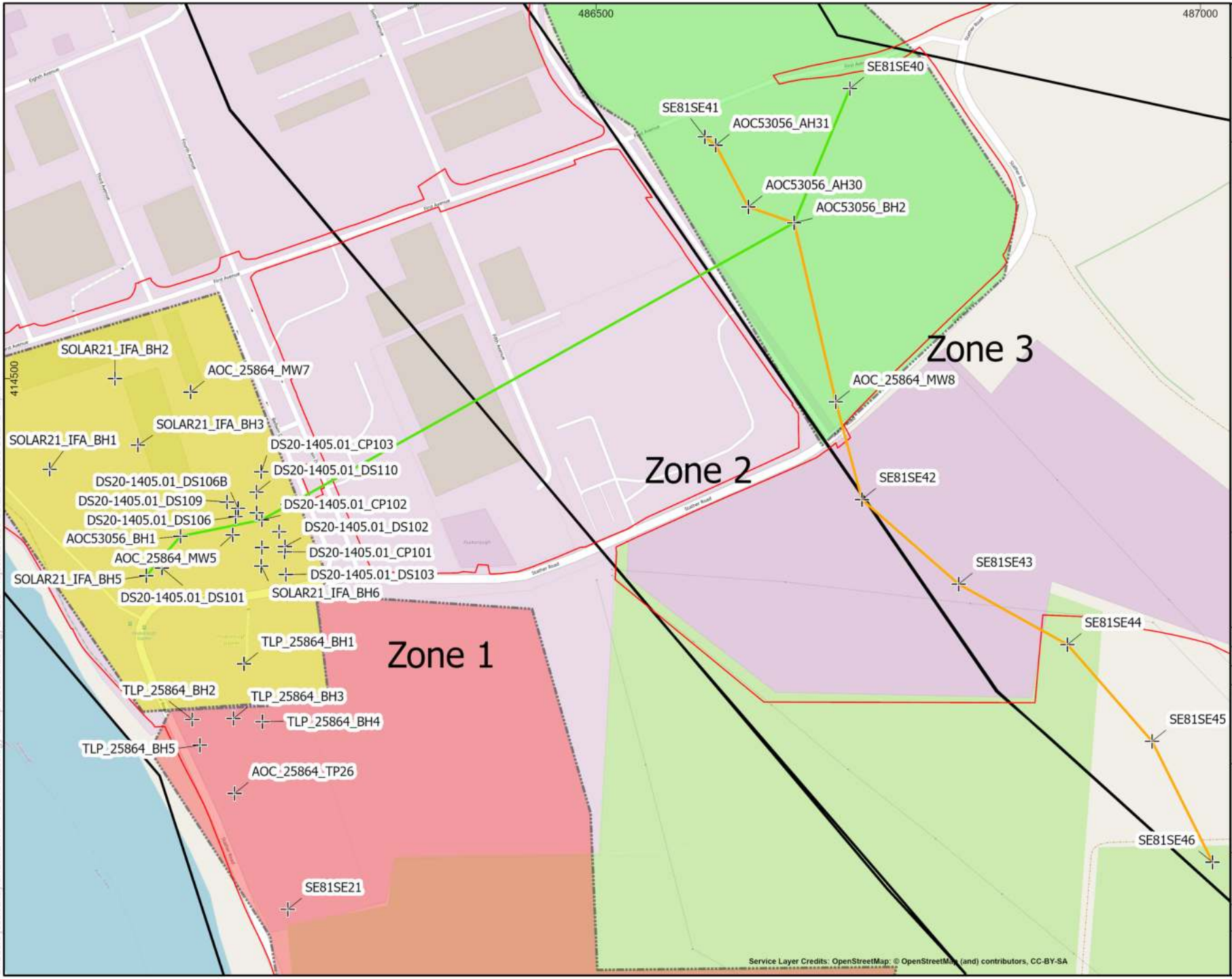

Figure	3

Data points and locations of transects A and B against development areas and archaeological zones

Legend

- Data Points
- Site Boundary
- Zone 2
- Zone 3
- Data Points
- Transect A
- Transect B

Development Areas

Development Areas

- Area 1
- Area 2
- Area 3
- Area 4
- Area 5
- Area 6
- Zone 1
- Zone 2
- Zone 3

FIRM

ERM
2nd Floor Exchequer Court,
33 St Mary Axe,
London
EC3A 8AA

Drawn/checked:	JT
DWG no:	N/A
AOC Project No.:	53056

AOC Archaeology Group

SYSTEM

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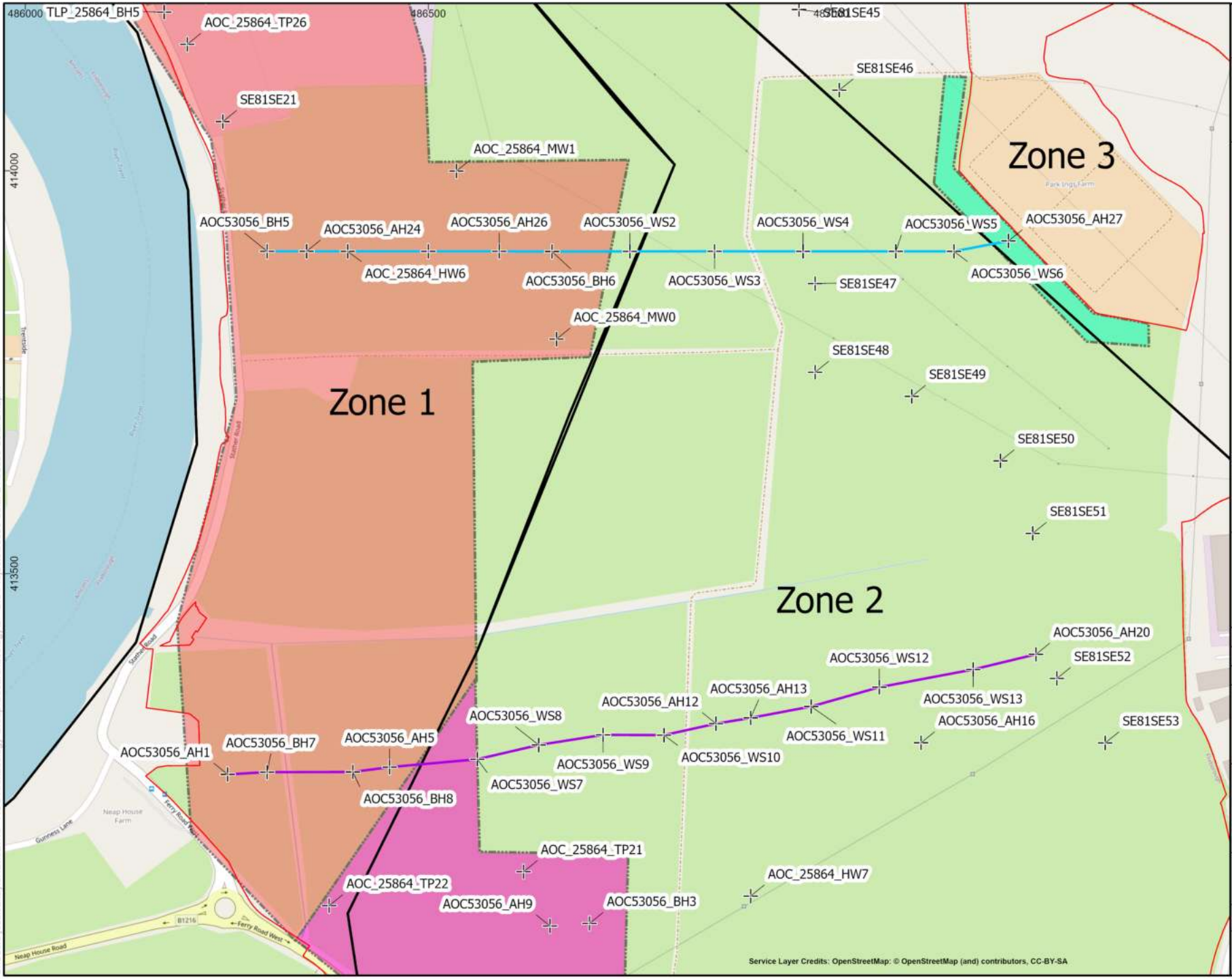

Figure 4

Data points and locations of transects C and D against development areas and archaeological zones

Legend

- Data Points
- Transect C
- Transect D
- Site Boundary
- Zone 1
- Zone 2
- Zone 3

Development Areas

Development Areas

- Area 1
- Area 2
- Area 3
- Area 4
- Area 5
- Area 6

ERM
2nd Floor Exchequer Court,
33 St Mary Axe,
London
EC3A 8AA

Drawn/checked:	JT
DWG no:	N/A
AOC Project No.:	53056

AOC Archaeology Group

Coordinate System: British National Grid
Projection: Transverse Mercator
Datum: OSGB 1936

1:4,500 @ A3

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Figure 5

Data points and locations of transect E against development areas and archaeological zones

Legend

- Data Points
- Transect E
- Site Boundary
- Zone 1
- Zone 2
- Zone 3

Development Areas

Development Areas

- Area 1
- Area 2
- Area 3
- Area 4
- Area 5
- Area 6

FIRM

ERM
2nd Floor Exchequer Court,
33 St Mary Axe,
London
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AOC Archaeology Group

N

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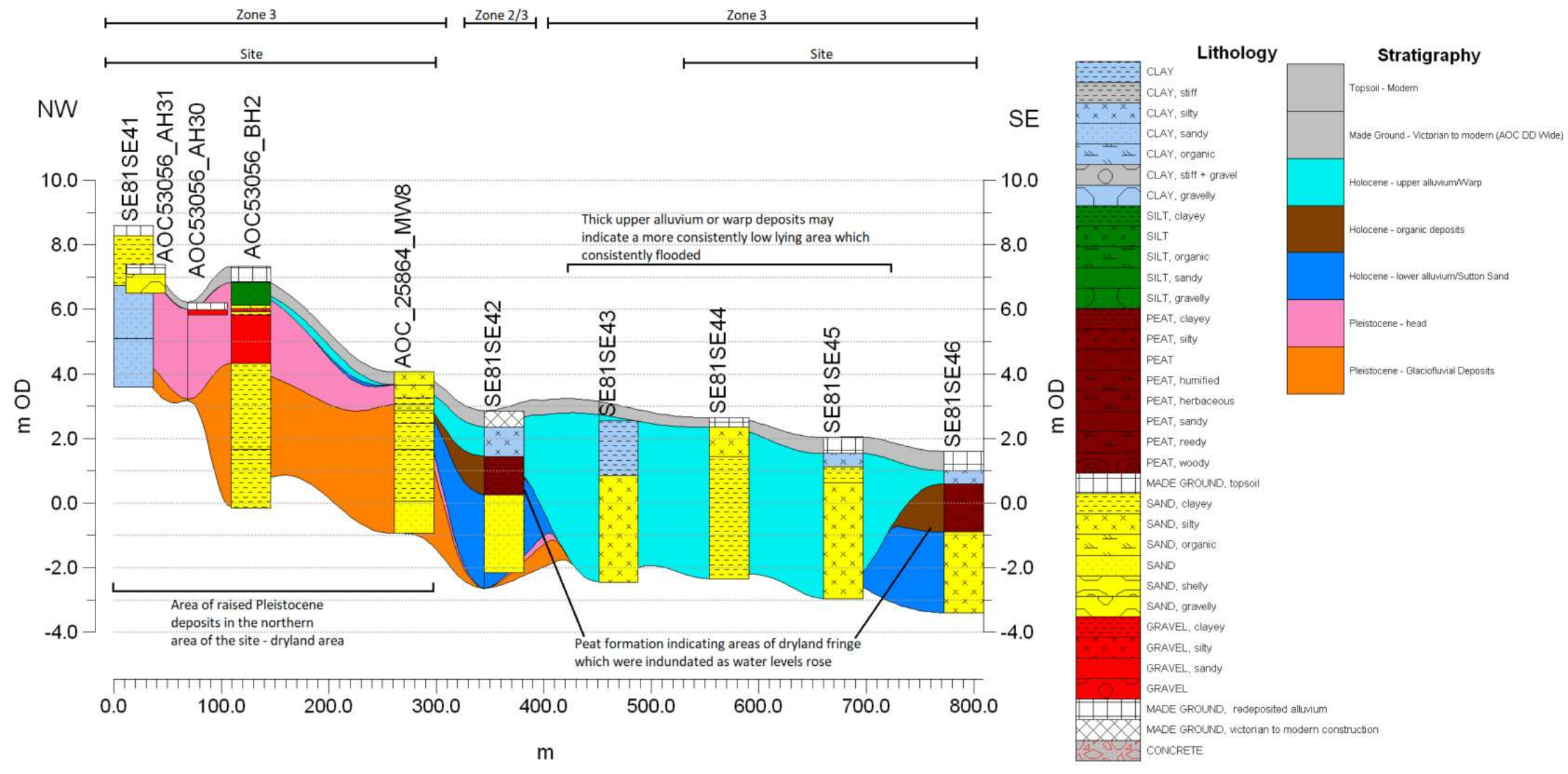
Zone 3
Zone 2/3
Zone 3
Site
Site
NW
SE
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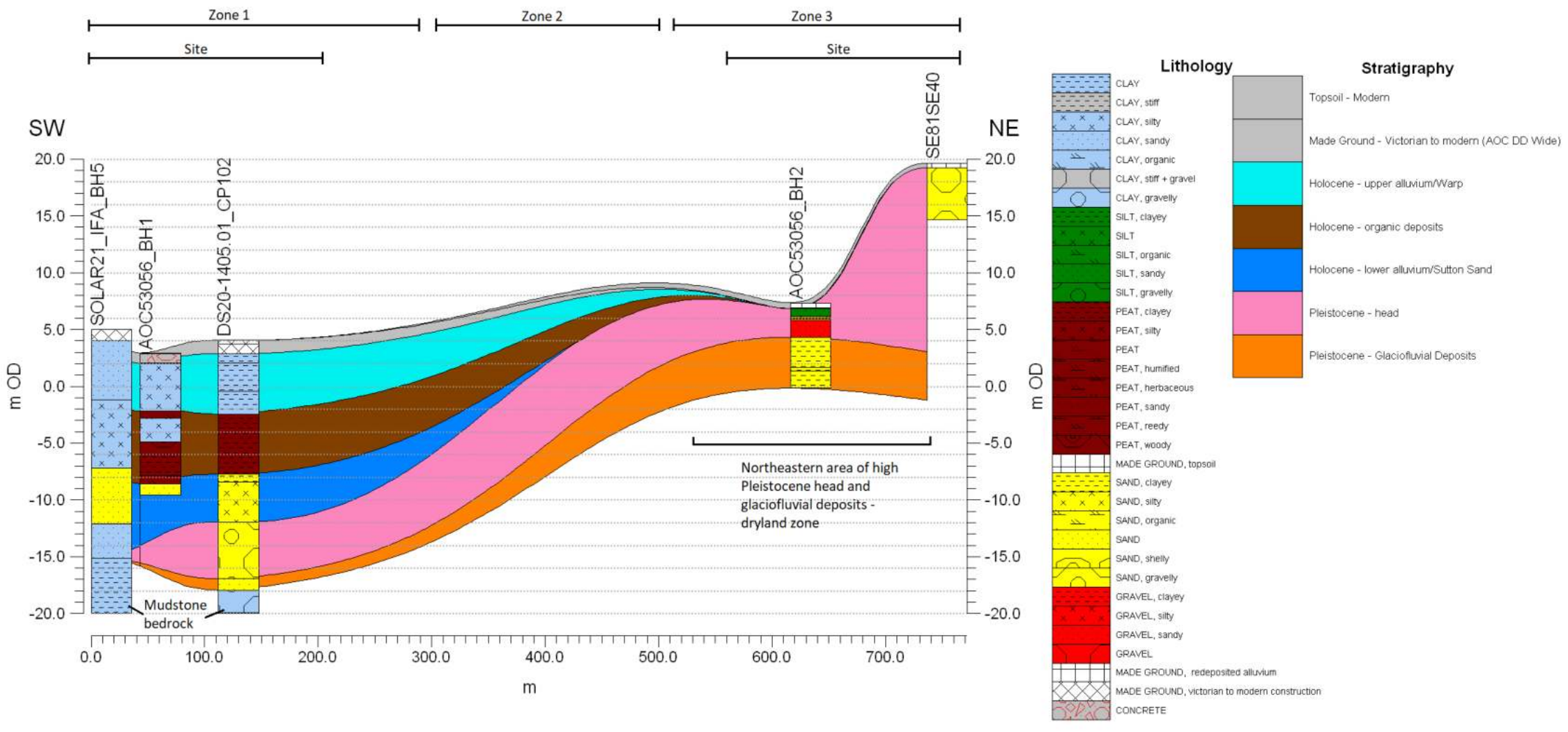
AOC53056_AH30
AOC53056_BH2
AOC_25864_MW8
SE81SE42
SE81SE43
SE81SE44
SE81SE45
SE81SE46
Thick upper alluvium or warp deposits may indicate a more consistently low lying area which consistently flooded
Area of raised Pleistocene deposits in the northern area of the site - dryland area
Peat formation indicating areas of dryland fringe which were indundated as water levels rose
m OD
m
10.0
8.0
6.0
4.0
2.0
0.0
-2.0
-4.0
0.0
100.0
200.0
300.0
400.0
500.0
600.0
700.0
800.0
Lithology
CLAY
CLAY, stiff
CLAY, silty
CLAY, sandy
CLAY, organic
CLAY, stiff + gravel
CLAY, gravelly
SILT, clayey
SILT
SILT, organic
SILT, sandy
SILT, gravelly
PEAT, clayey
PEAT, silty
PEAT
PEAT, humified
PEAT, herbaceous
PEAT, sandy
PEAT, reedy
PEAT, woody
MADE GROUND, topsoil
SAND, clayey
SAND, silty
SAND, organic
SAND
SAND, shelly
SAND, gravelly
GRAVEL, clayey
GRAVEL, silty
GRAVEL, sandy
GRAVEL
MADE GROUND, redeposited alluvium
MADE GROUND, victorian to modern construction
CONCRETE
Stratigraphy
Topsoil - Modern
Made Ground - Victorian to modern (AOC DD Wide)
Holocene - upper alluvium/Warp
Holocene - organic deposits
Holocene - lower alluvium/Sutton Sand
Pleistocene - head
Pleistocene - Glaciofluvial Deposits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Zone 2
Zone 3
Site
Site
SW
NE
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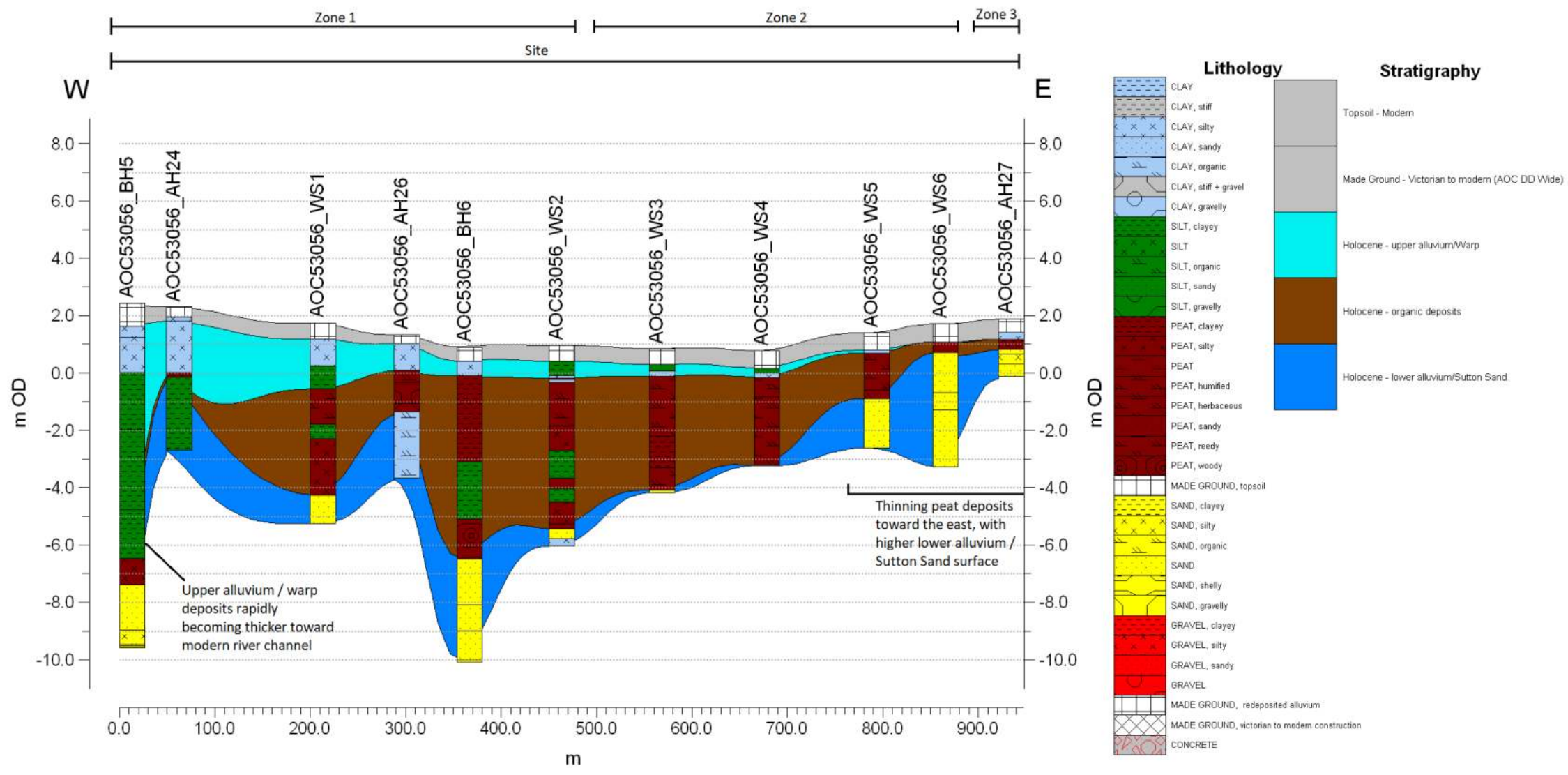
DS20-1405.01_CP102
AOC53056_BH2
SE81SE40
m OD
m
Mudstone bedrock
Northeastern area of high Pleistocene head and glaciofluvial deposits - dryland zone
Lithology
CLAY
CLAY, stiff
CLAY, silty
CLAY, sandy
CLAY, organic
CLAY, stiff + gravel
CLAY, gravelly
SILT, clayey
SILT
SILT, organic
SILT, sandy
SILT, gravelly
PEAT, clayey
PEAT, silty
PEAT
PEAT, humified
PEAT, herbaceous
PEAT, sandy
PEAT, reedy
PEAT, woody
MADE GROUND, topsoil
SAND, clayey
SAND, silty
SAND, organic
SAND
SAND, shelly
SAND, gravelly
GRAVEL, clayey
GRAVEL, silty
GRAVEL, sandy
GRAVEL
MADE GROUND, redeposited alluvium
MADE GROUND, victorian to modern construction
CONCRETE
Stratigraphy
Topsoil - Modern
Made Ground - Victorian to modern (AOC DD Wide)
Holocene - upper alluvium/Warp
Holocene - organic deposits
Holocene - lower alluvium/Sutton Sand
Pleistocene - head
Pleistocene - Glaciofluvial Deposits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Zone 2
Zone 3
Site
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E
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AOC53056_AH26
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AOC53056_WS2
AOC53056_WS3
AOC53056_WS4
AOC53056_WS5
AOC53056_WS6
AOC53056_AH27
m OD
8.0
6.0
4.0
2.0
0.0
-2.0
-4.0
-6.0
-8.0
-10.0
0.0
100.0
200.0
300.0
400.0
500.0
600.0
700.0
800.0
900.0
m
Upper alluvium / warp deposits rapidly becoming thicker toward modern river channel
Thinning peat deposits toward the east, with higher lower alluvium / Sutton Sand surface
Lithology
CLAY
CLAY, stiff
CLAY, silty
CLAY, sandy
CLAY, organic
CLAY, stiff + gravel
CLAY, gravelly
SILT, clayey
SILT
SILT, organic
SILT, sandy
SILT, gravelly
PEAT, clayey
PEAT, silty
PEAT
PEAT, humified
PEAT, herbaceous
PEAT, sandy
PEAT, reedy
PEAT, woody
MADE GROUND, topsoil
SAND, clayey
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SAND, shelly
SAND, gravelly
GRAVEL, clayey
GRAVEL, silty
GRAVEL, sandy
GRAVEL
MADE GROUND, redeposited alluvium
MADE GROUND, victorian to modern construction
CONCRETE
Stratigraphy
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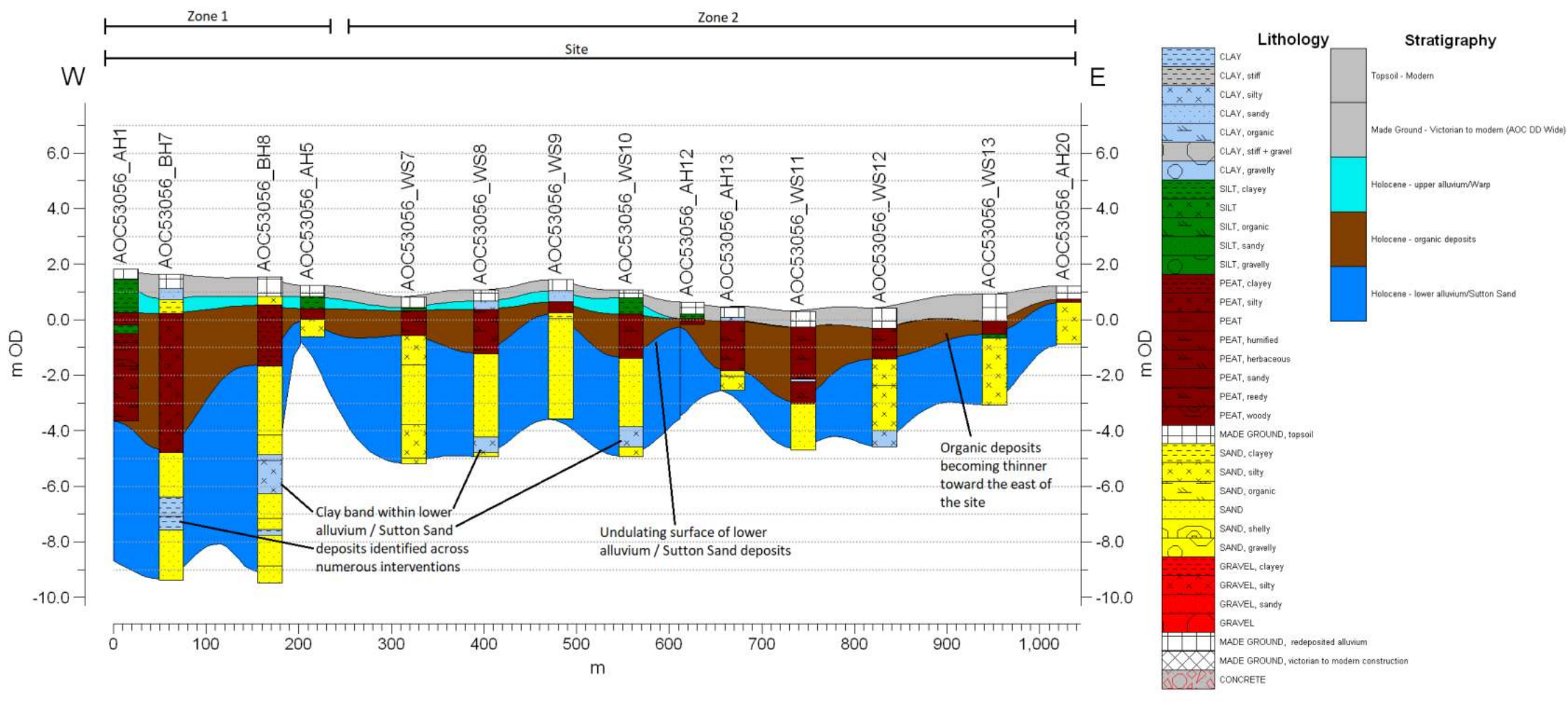
Made Ground - Victorian to modern (AOC DD Wide)
Holocene - upper alluvium/Warp
Holocene - organic deposits
Holocene - lower alluvium/Sutton Sand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AOC53056_AH20
6.0
4.0
2.0
0.0
-2.0
-4.0
-6.0
-8.0
-10.0
m OD
0
100
200
300
400
500
600
700
800
900
1,000
m
Clay band within lower alluvium / Sutton Sand deposits identified across numerous interventions
Undulating surface of lower alluvium / Sutton Sand deposits
Organic deposits becoming thinner toward the east of the site
Lithology
CLAY
CLAY, stiff
CLAY, silty
CLAY, sandy
CLAY, organic
CLAY, stiff + gravel
CLAY, gravelly
SILT, clayey
SILT
SILT, organic
SILT, sandy
SILT, gravelly
PEAT, clayey
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PEAT
PEAT, humified
PEAT, herbaceous
PEAT, sandy
PEAT, reedy
PEAT, woody
MADE GROUND, topsoil
SAND, clayey
SAND, silty
SAND, organic
SAND
SAND, shelly
SAND, gravelly
GRAVEL, clayey
GRAVEL, silty
GRAVEL, sandy
GRAVEL
MADE GROUND, redeposited alluvium
MADE GROUND, victorian to modern construction
CONCRETE
Stratigraphy
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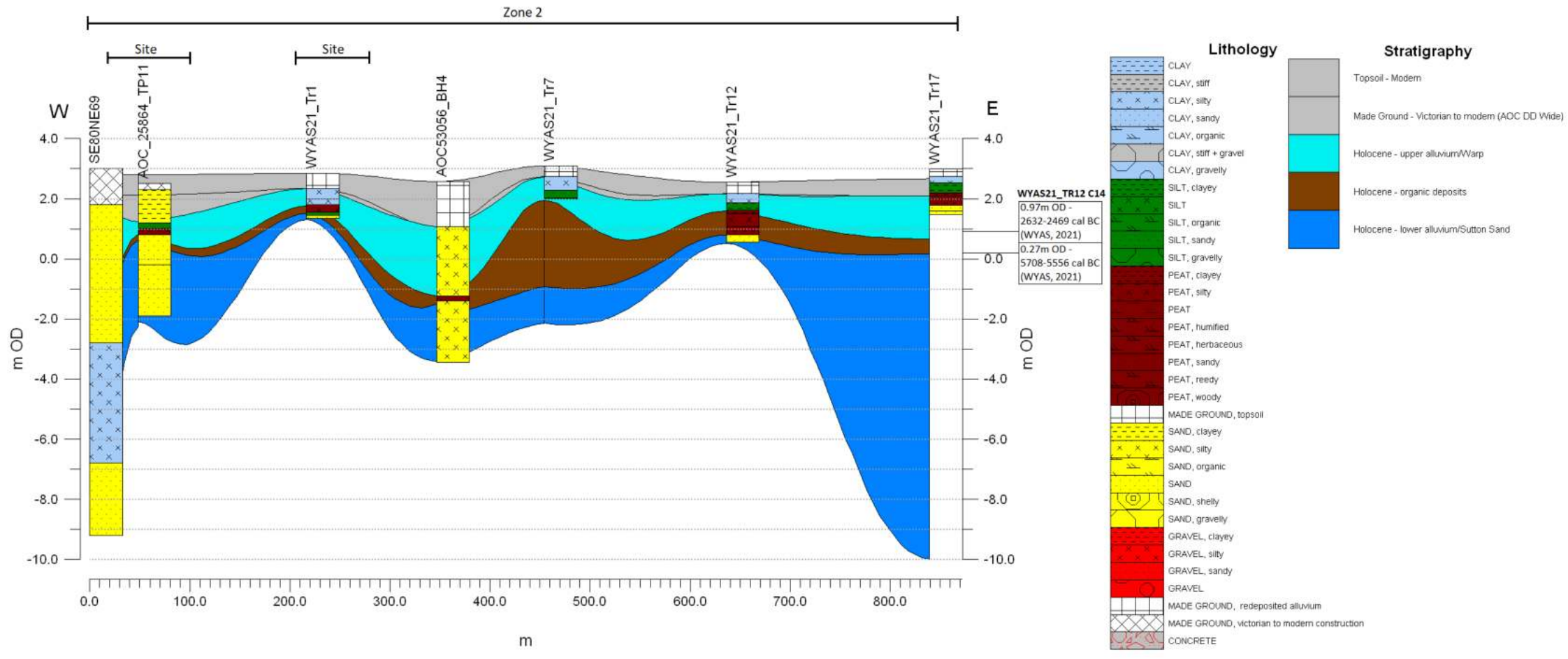
Made Ground - Victorian to modern (AOC DD Wide)
Holocene - upper alluvium/Warp
Holocene - organic deposits
Holocene - lower alluvium/Sutton Sand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0.0
-2.0
-4.0
-6.0
-8.0
-10.0
m OD
0.0
100.0
200.0
300.0
400.0
500.0
600.0
700.0
800.0
m
WYAS21_TR12 C14
0.97m OD - 2632-2469 cal BC (WYAS, 2021)
0.27m OD - 5708-5556 cal BC (WYAS, 2021)
Lithology
CLAY
CLAY, stiff
CLAY, silty
CLAY, sandy
CLAY, organic
CLAY, stiff + gravel
CLAY, gravelly
SILT, clayey
SILT
SILT, organic
SILT, sandy
SILT, gravelly
PEAT, clayey
PEAT, silty
PEAT
PEAT, humified
PEAT, herbaceous
PEAT, sandy
PEAT, reedy
PEAT, woody
MADE GROUND, topsoil
SAND, clayey
SAND, silty
SAND, organic
SAND
SAND, shelly
SAND, gravelly
GRAVEL, clayey
GRAVEL, silty
GRAVEL, sandy
GRAVEL
MADE GROUND, redeposited alluvium
MADE GROUND, victorian to modern construction
CONCRETE
Stratigraphy
Topsoil - Modern
Made Ground - Victorian to modern (AOC DD Wide)
Holocene - upper alluvium/Warp
Holocene - organic deposits
Holocene - lower alluvium/Sutton Sand

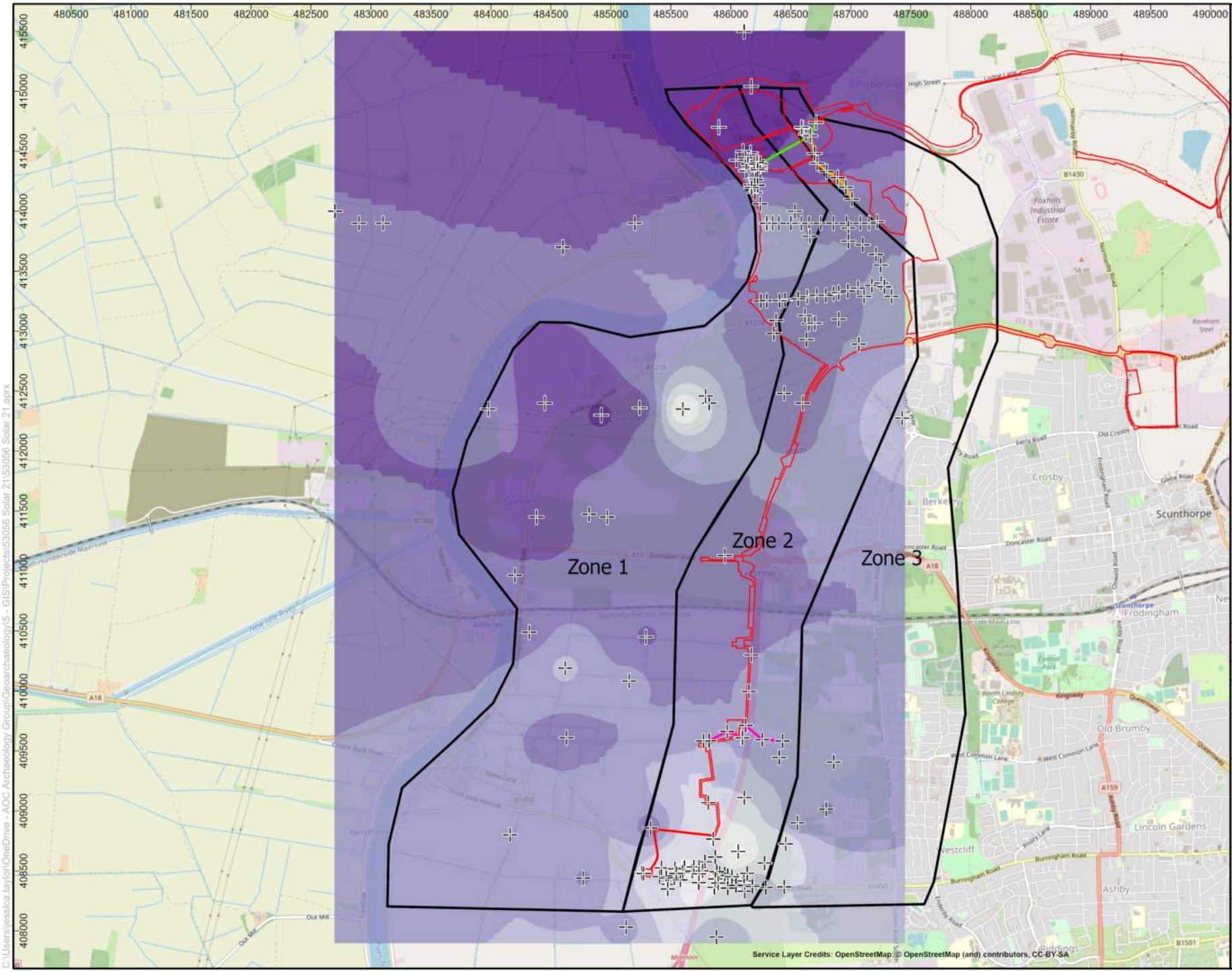

Figure 11

Topographic plot of the surface of the below ground tertiary bedrock (extrapolated from deposit records)

Legend

- Data Points
- Transect A
- Transect B
- Transect C
- Transect D
- Transect E

Bedrock Surface
m OD

- -3.999999 - -2.000000
- -5.999999 - -4.000000
- -7.999999 - -6.000000
- -9.999999 - -8.000000
- -11.999999 - -10.000000
- -13.999999 - -12.000000
- -15.999999 - -14.000000
- -17.000000 - -16.000000
- Site Boundary
- Zone 1
- Zone 2
- Zone 3

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SYSTEM
Coordinate System: British National Grid
Projection: Transverse Mercator
Datum: OSGB 1936

SCALE
1:30,000 @ A3

0 1,000m

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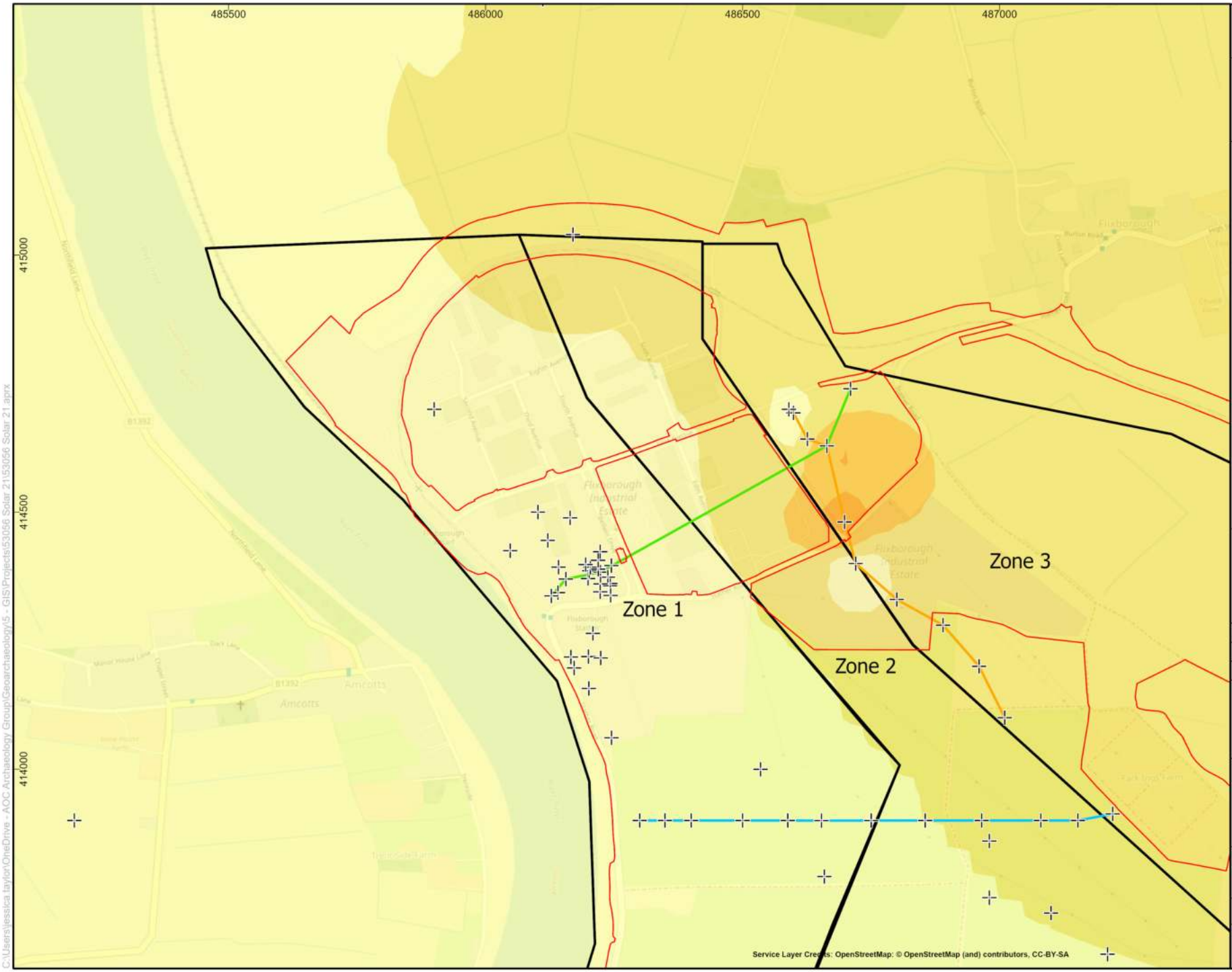

Figure	12

Thickness plot of the below ground Pleistocene glaciofluvial deposits (extrapolated from deposit records), representing deposit survival

Legend

- Data Points
- Site Boundary
- Transect A
- Transect B
- Transect C
- Transect D
- Transect E
- Zone 1
- Zone 2
- Zone 3

Glaciofluvial Deposits Thickness m

- 0.000000 - 1.000000
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 4.000000
- 4.000001 - 5.000000
- 5.000001 - 6.000000
- 6.000001 - 7.000000
- 7.000001 - 8.000000
- 8.000001 - 9.000000
- 9.000001 - 10.000000
- 10.000001 - 11.000000
- 11.000001 - 12.000000
- 12.000001 - 13.000000
- 13.000001 - 14.000000
- 14.000001 - 15.000000

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Datum: OSGB 1936

SCALE

1:7,000 @ A3

0 200m

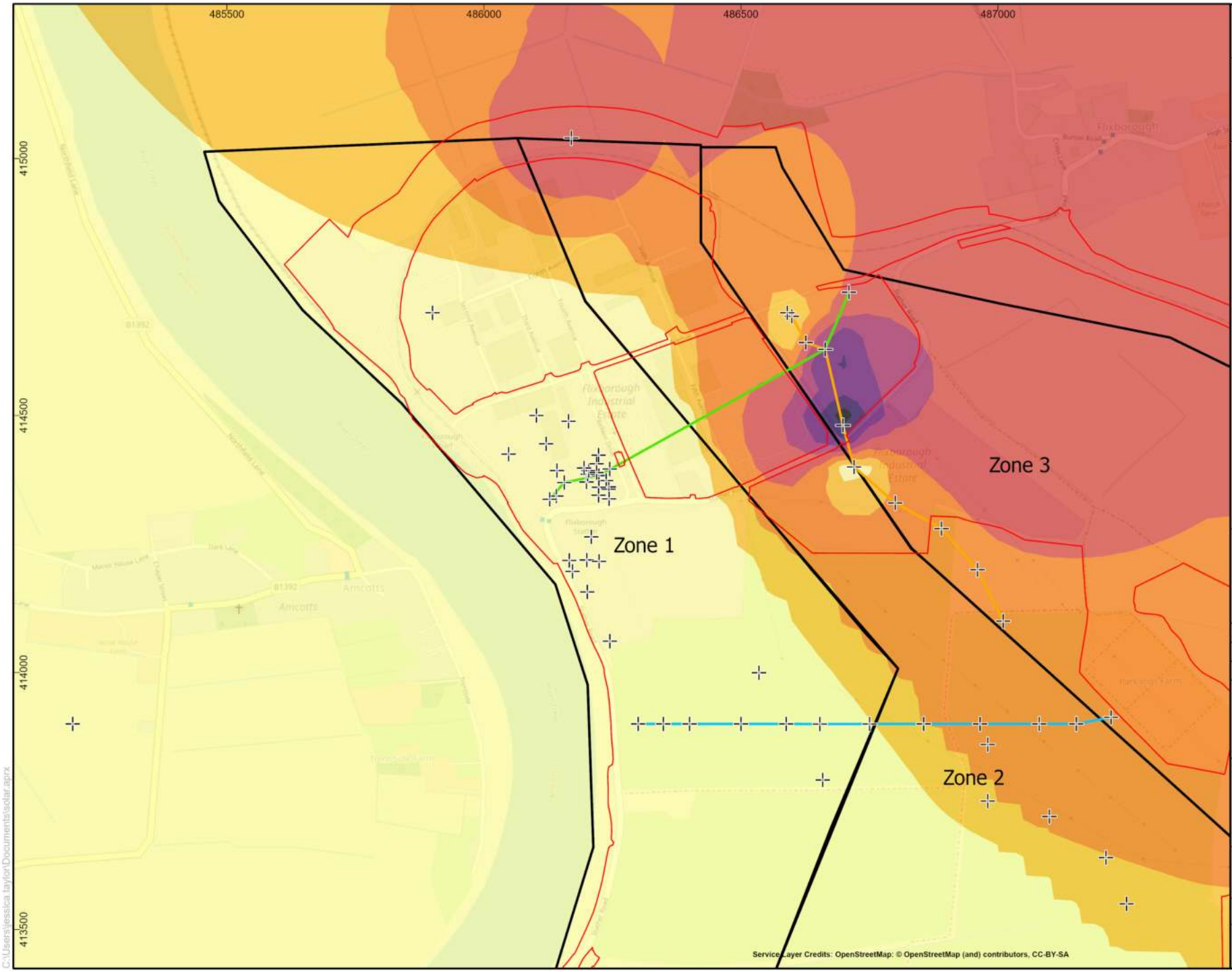

Figure	12

Thickness plot of the below ground Pleistocene glaciofluvial deposits (extrapolated from deposit records), representing deposit survival

Legend

- Data Points
- Site Boundary
- Transect A
- Transect B
- Transect C
- Zone 1
- Zone 2
- Zone 3

Glaciofluvial Deposits Thickness
m

- 0.500000
- 0.500001 - 1.000000
- 1.000001 - 1.500000
- 1.500001 - 2.000000
- 2.000001 - 2.500000
- 2.500001 - 3.000000
- 3.000001 - 3.500000
- 3.500001 - 4.000000

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Datum: OSGB 1936

SCALE

1:7,000 @ A3

0 200m

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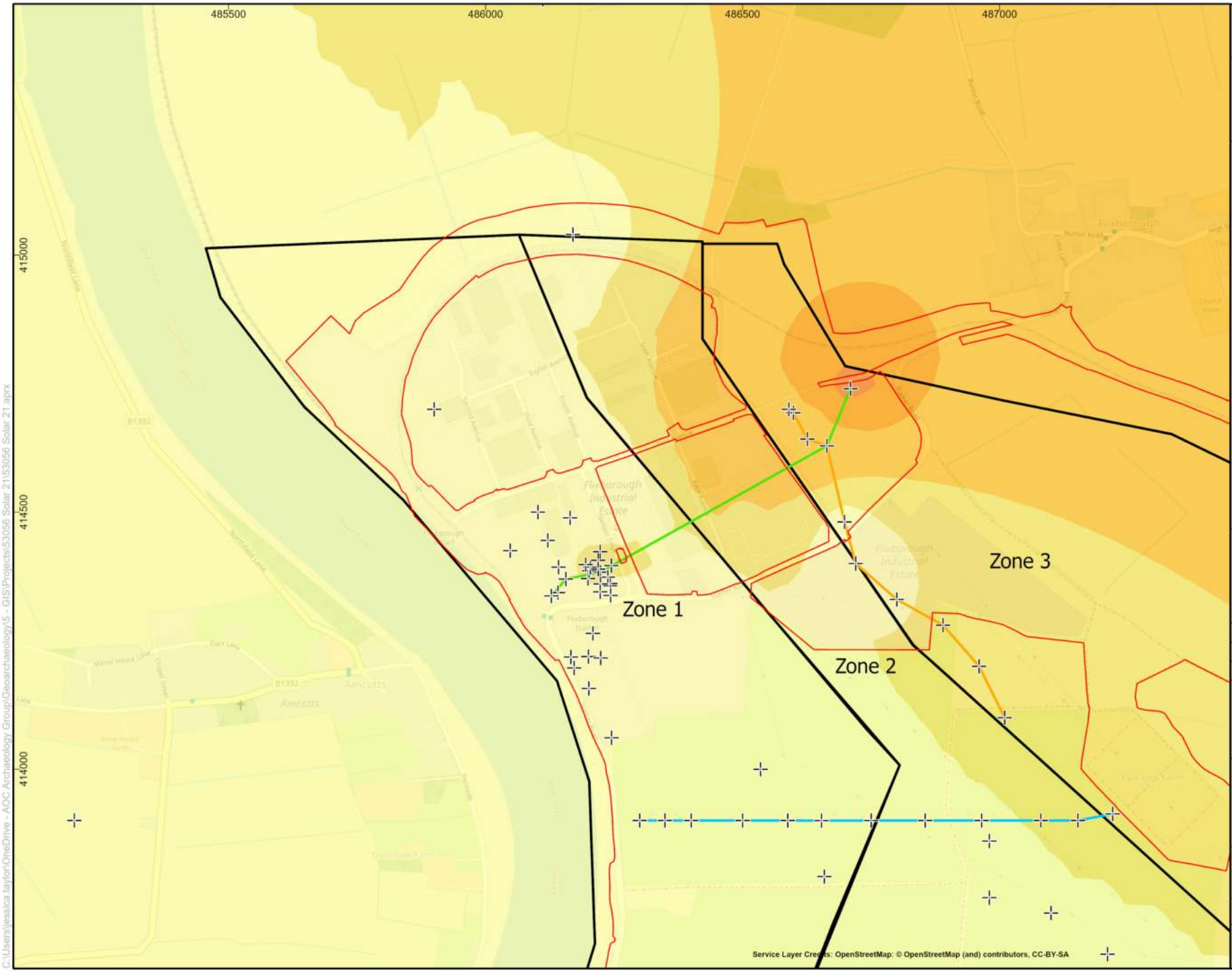

Figure	13

Thickness plot of the below ground Pleistocene head deposits (extrapolated from deposit records), representing deposit survival

Legend

- Data Points
- Site Boundary
- Transect A
- Transect B
- Transect C
- Transect D
- Transect E
- Zone 1
- Zone 2
- Zone 3

Pleistocene Head Thickness m

- 0.000000 - 1.000000
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 4.000000
- 4.000001 - 5.000000
- 5.000001 - 6.000000
- 6.000001 - 7.000000
- 7.000001 - 8.000000
- 8.000001 - 9.000000
- 9.000001 - 10.000000
- 10.000001 - 11.000000
- 11.000001 - 12.000000
- 12.000001 - 13.000000
- 13.000001 - 14.000000
- 14.000001 - 15.000000

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Datum: OSGB 1936

SCALE

1:7,000 @ A3

0 200m

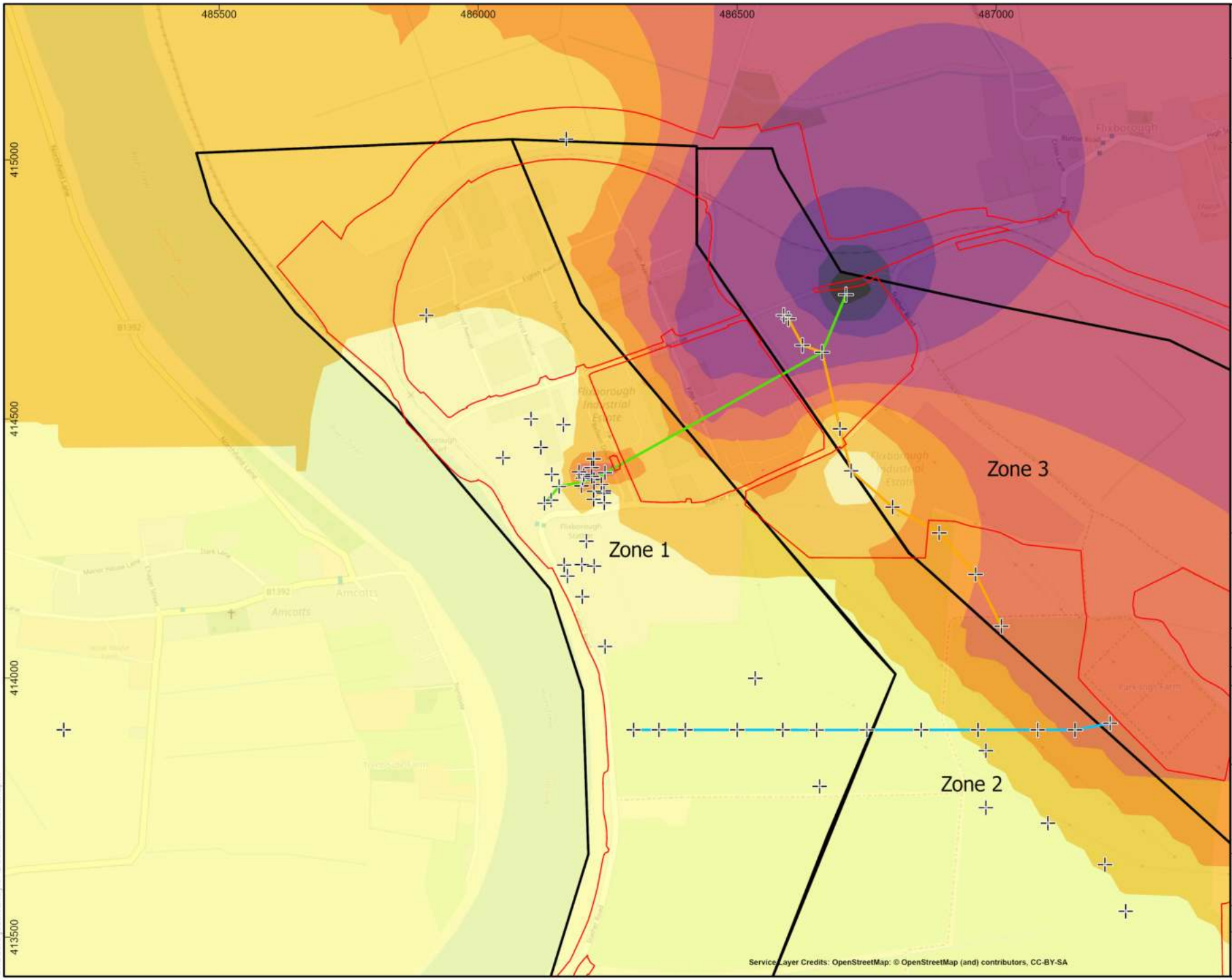

Figure	13

Thickness plot of the below ground Pleistocene head deposits (extrapolated from deposit records), representing deposit survival

Legend

- Data Points
- Site Boundary
- Transect A
- Transect B
- Transect C
- Zone 1
- Zone 2
- Zone 3

Pleistocene Head Thickness
m

- 0.500000
- 0.500001 - 1.000000
- 1.000001 - 1.500000
- 1.500001 - 2.000000
- 2.000001 - 2.500000
- 2.500001 - 3.000000
- 3.000001 - 3.500000
- 3.500001 - 4.000000
- 4.000001 - 4.500000

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SCALE

1:7,000 @ A3

0 200m

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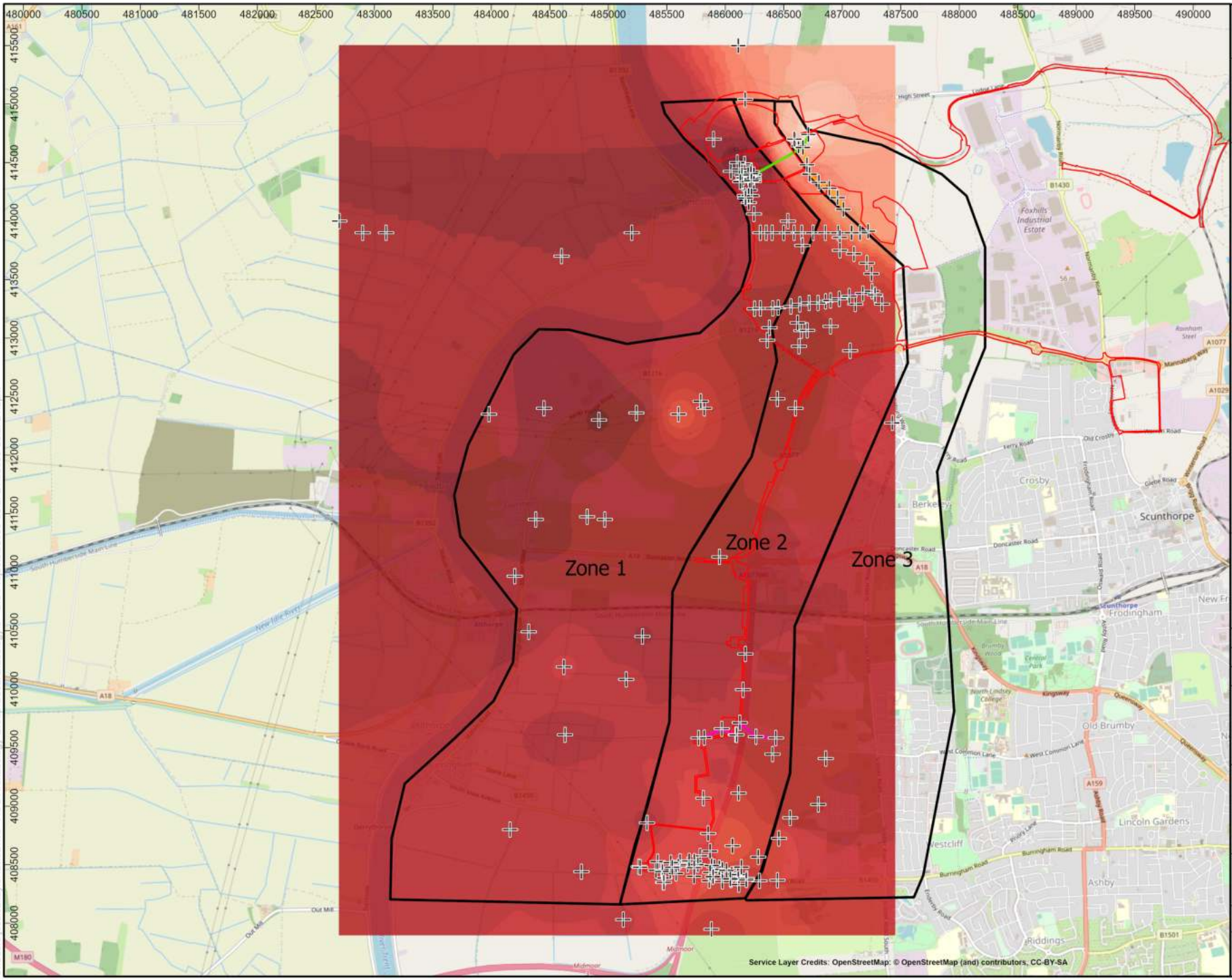

Figure	14

Topographic plot of the surface of the below ground Pleistocene (head and glaciofluvial) and earlier deposits (extrapolated from deposit records), suggesting the form of the ancient land surface at c. 10,000 BC

Legend

- Data Points
- Site Boundary
- Transect A
- Transect B
- Transect C
- Transect D
- Transect E
- Zone 1
- Zone 2
- Zone 3

Pleistocene Surface m OD

- 18.000001 - 20.000000
- 16.000001 - 18.000000
- 14.000001 - 16.000000
- 12.000001 - 14.000000
- 10.000001 - 12.000000
- 8.000001 - 10.000000
- 6.000001 - 8.000000
- 4.000001 - 6.000000
- 2.000001 - 4.000000
- 0.000001 - 2.000000
- -1.999999 - 0.000000
- -3.999999 - -2.000000
- -5.999999 - -4.000000
- -7.999999 - -6.000000
- -9.999999 - -8.000000
- -11.999999 - -10.000000
- -13.999999 - -12.000000
- -15.999999 - -14.000000
- -17.000000 - -16.000000

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SYSTEM

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Projection: Transverse Mercator
Datum: OSGB 1936

SCALE

1:31,000 @ A3

0 1,000m

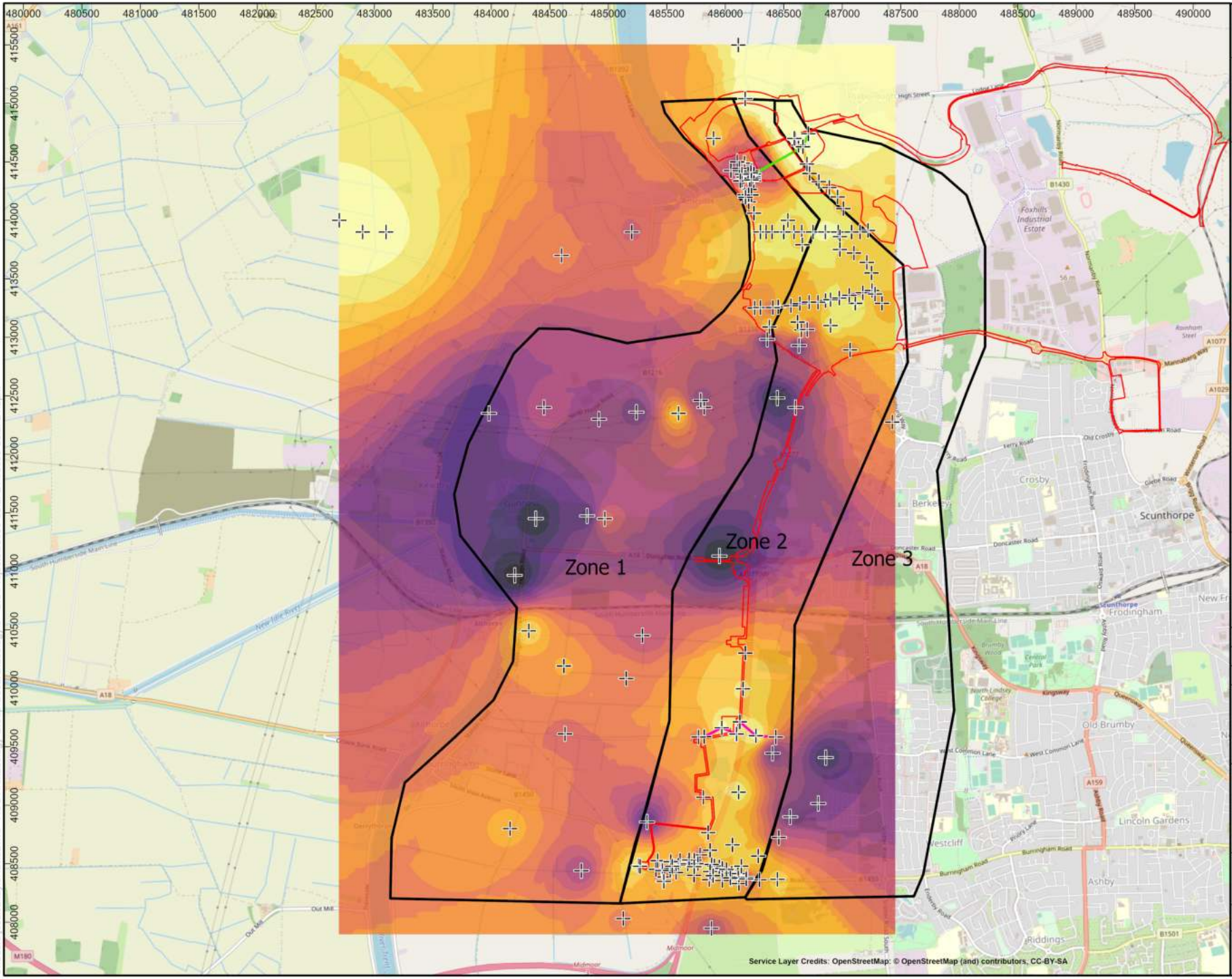

Figure	15

Thickness plot of the below ground lower alluvium or Sutton Sand (extrapolated from deposit records), representing deposit survival

Legend

- Data Points
- Site Boundary
- Transect A
- Transect B
- Transect C
- Transect D
- Transect E
- Zone 1
- Zone 2
- Zone 3

Lower Alluvium / Sutton Sand Thickness
m

- 0.000000 - 1.000000
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 4.000000
- 4.000001 - 5.000000
- 5.000001 - 6.000000
- 6.000001 - 7.000000
- 7.000001 - 8.000000
- 8.000001 - 9.000000
- 9.000001 - 10.000000
- 10.000001 - 11.000000
- 11.000001 - 12.000000
- 12.000001 - 13.000000
- 13.000001 - 14.000000
- 14.000001 - 15.000000

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SYSTEM

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Projection: Transverse Mercator
Datum: OSGB 1936

SCALE

1:31,000 @ A3

0 1,000m

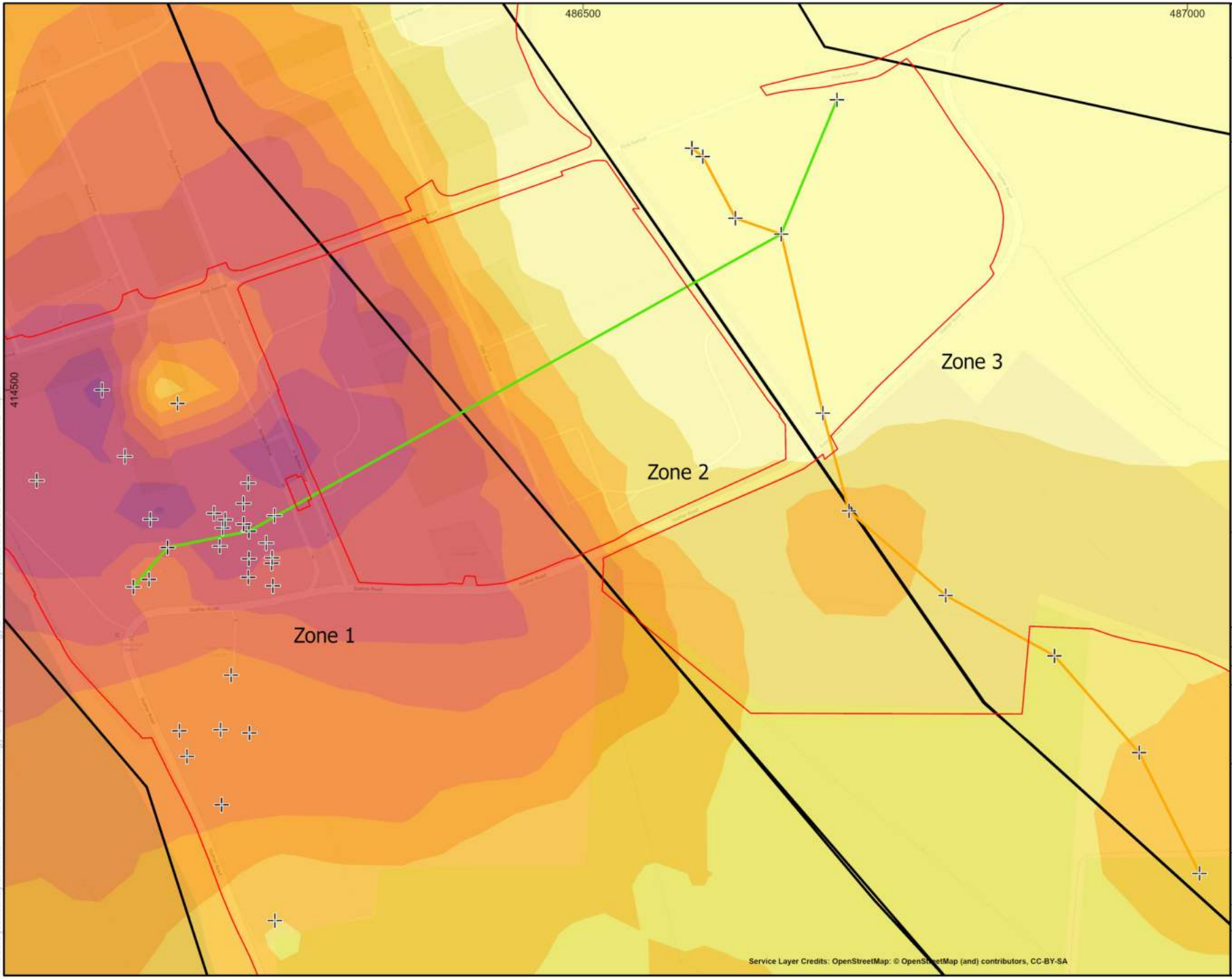

Figure	16

Thickness plot of the below ground lower alluvium or Sutton Sand (extrapolated from deposit records), representing deposit survival. Transects A and B

Legend

- Data Points
- Site Boundary
- Transect A
- Transect B
- Zone 1
- Zone 2
- Zone 3

Lower Alluvium / Sutton Sand Thickness
m

- 0.000000 - 1.000000
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 4.000000
- 4.000001 - 5.000000
- 5.000001 - 6.000000
- 6.000001 - 7.000000
- 7.000001 - 8.000000
- 8.000001 - 9.000000
- 9.000001 - 10.000000
- 10.000001 - 11.000000
- 11.000001 - 12.000000
- 12.000001 - 13.000000
- 13.000001 - 14.000000
- 14.000001 - 15.000000

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SYSTEM
Coordinate System: British National Grid
Projection: Transverse Mercator
Datum: OSGB 1936

SCALE
1:3,000 @ A3

0 100m

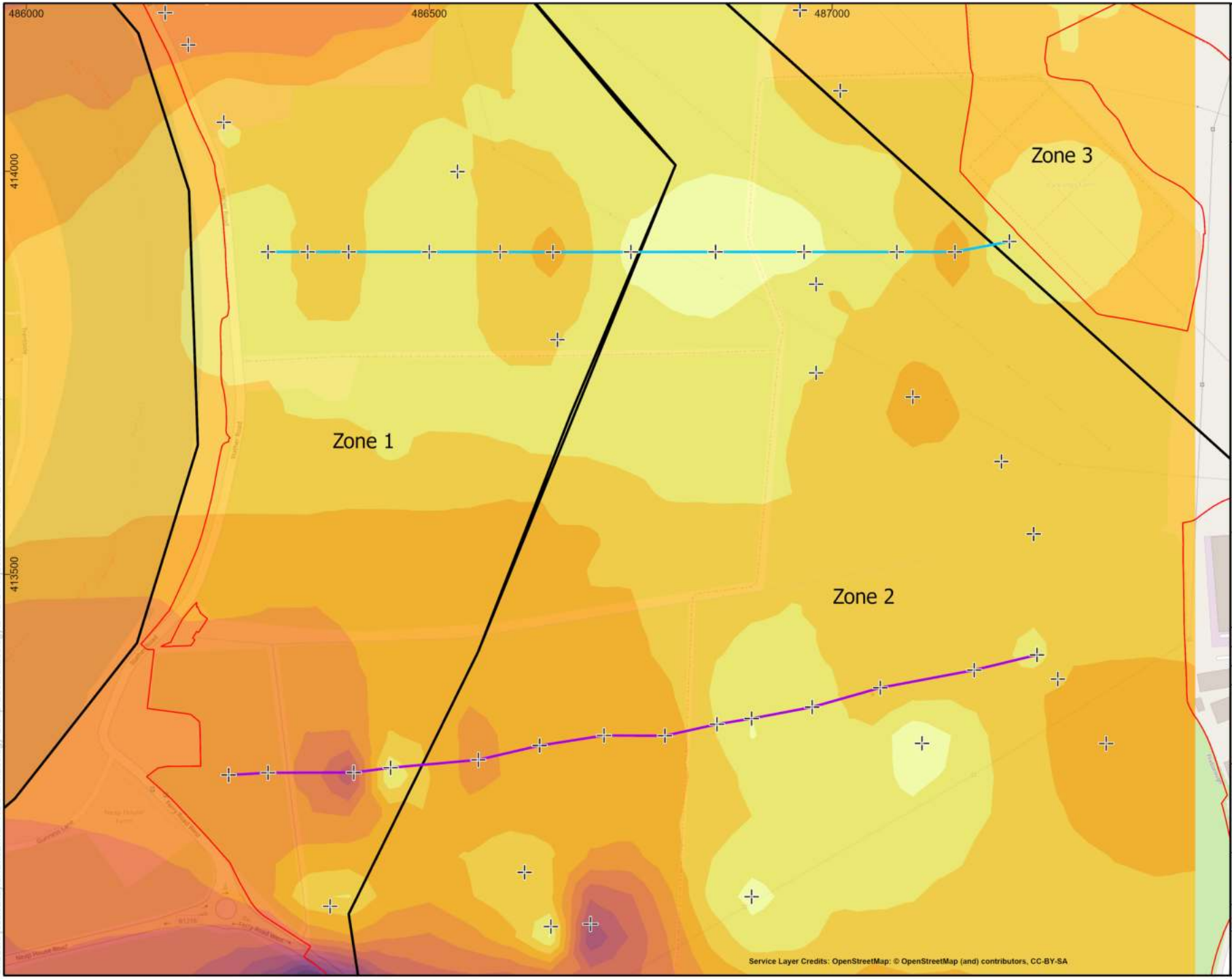

Figure	17

Thickness plot of the below ground lower alluvium or Sutton Sand (extrapolated from deposit records), representing deposit survival. Transects B and C

Legend

- Data Points
- Site Boundary
- Transect C
- Transect D
- Zone 1
- Zone 2
- Zone 3

Lower Alluvium / Sutton Sand Thickness
m

- 0.000000 - 1.000000
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 4.000000
- 4.000001 - 5.000000
- 5.000001 - 6.000000
- 6.000001 - 7.000000
- 7.000001 - 8.000000
- 8.000001 - 9.000000
- 9.000001 - 10.000000
- 10.000001 - 11.000000
- 11.000001 - 12.000000
- 12.000001 - 13.000000
- 13.000001 - 14.000000
- 14.000001 - 15.000000

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SYSTEM
Coordinate System: British National Grid
Projection: Transverse Mercator
Datum: OSGB 1936

SCALE
1:4,500 @ A3

0 100m

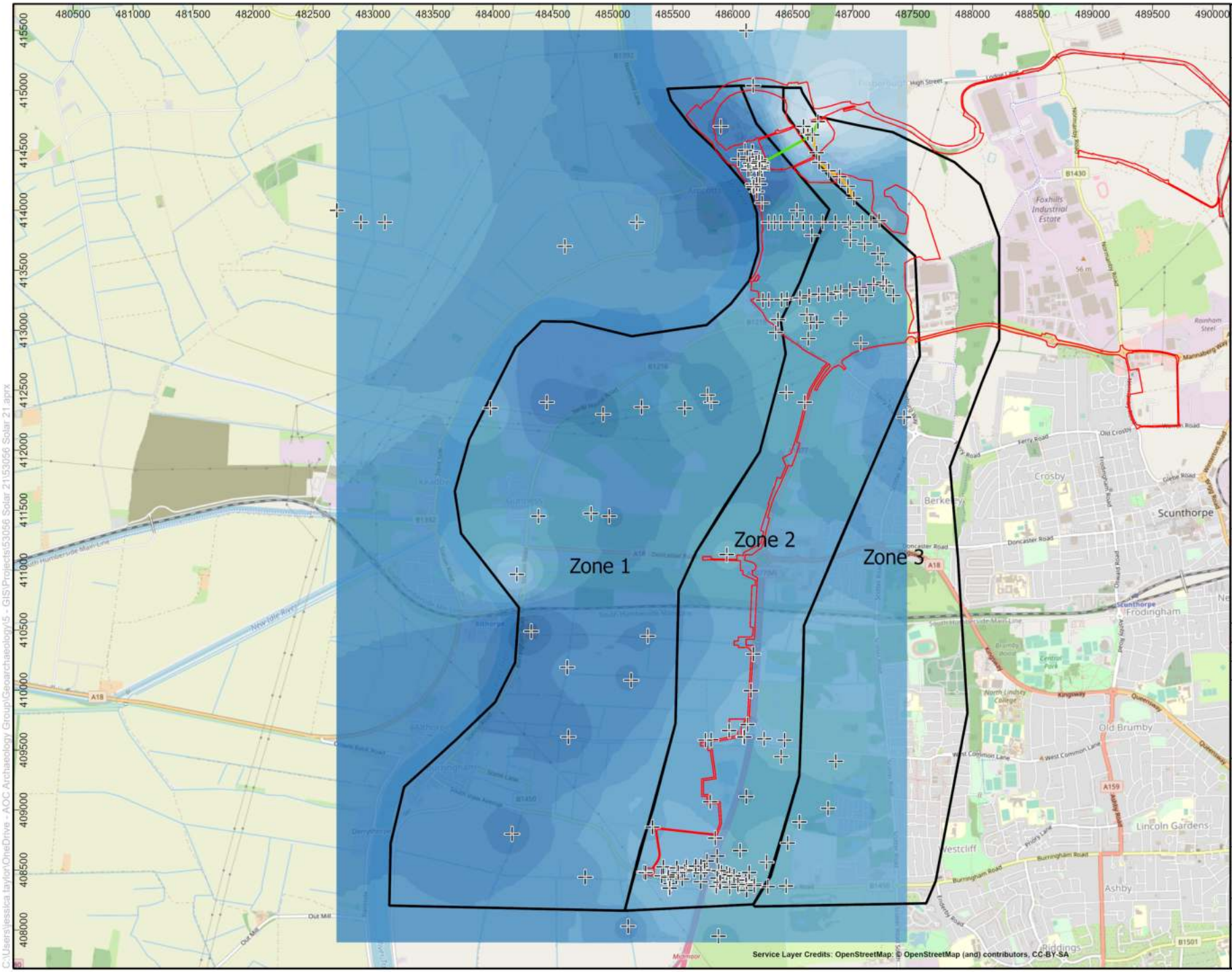

Figure	18

Topographic plot of the surface of the below ground lower alluvium / Sutton Sand (extrapolated from deposit records)

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SCALE

1:30,000 @ A3

0 1,000m

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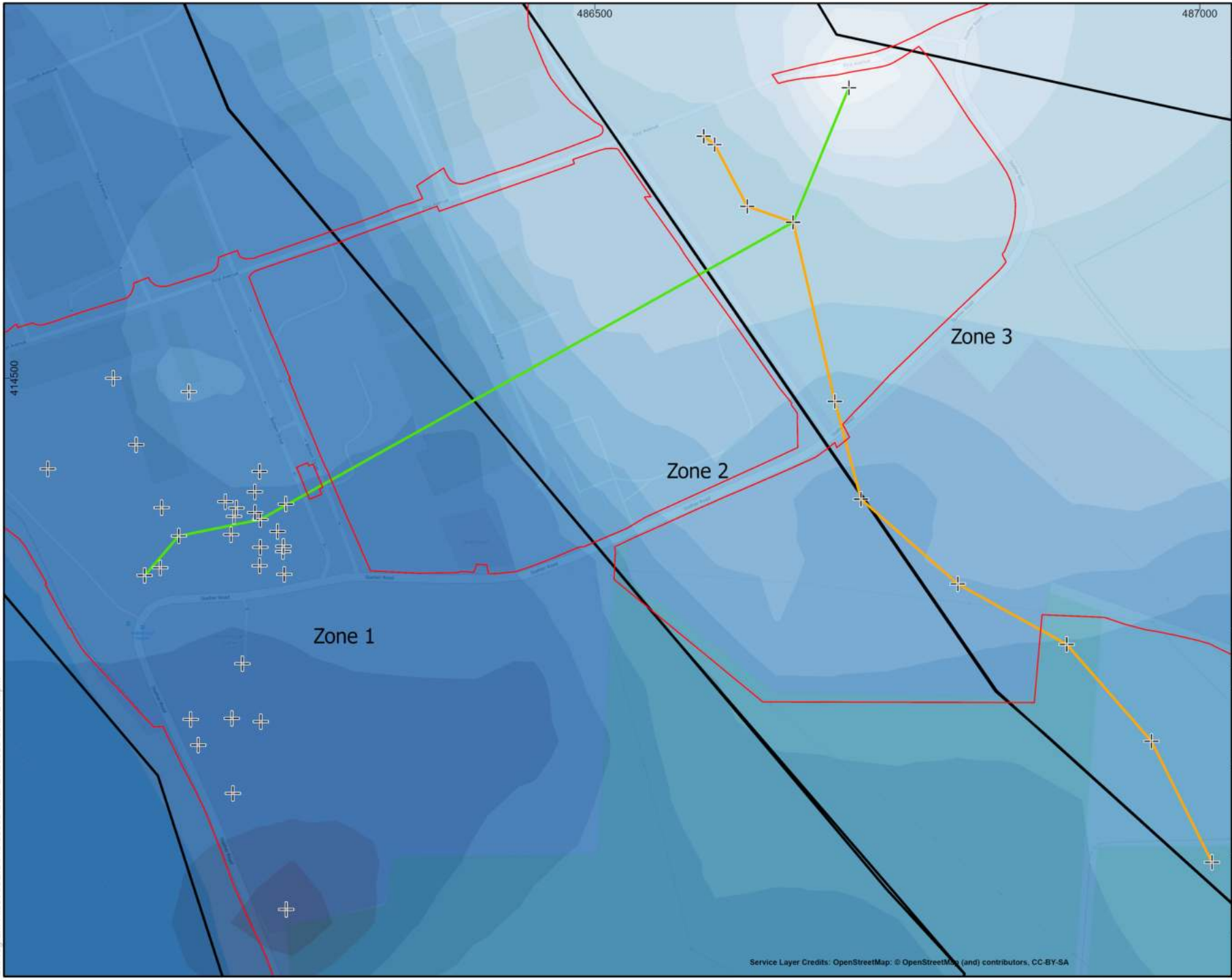

Figure	19

Topographic plot of the surface of the below ground lower alluvium / Sutton Sand (extrapolated from deposit records) Transects A and B

Legend

- Data Points
- Site Boundary
- Transect A
- Transect B
- Zone 1
- Zone 2
- Zone 3

Lower Alluvium / Sutton Sand Surface m OD

- 18.000001 - 20.000000
- 16.000001 - 18.000000
- 14.000001 - 16.000000
- 12.000001 - 14.000000
- 10.000001 - 12.000000
- 8.000001 - 10.000000
- 6.000001 - 8.000000
- 4.000001 - 6.000000
- 2.000001 - 4.000000
- 0.000001 - 2.000000
- -1.999999 - 0.000000
- -3.999999 - -2.000000
- -5.999999 - -4.000000
- -7.999999 - -6.000000
- -9.999999 - -8.000000
- -11.999999 - -10.000000
- -13.500000 - -12.000000

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SYSTEM

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Projection: Transverse Mercator
Datum: OSGB 1936

SCALE

1:3,000 @ A3

0 100m

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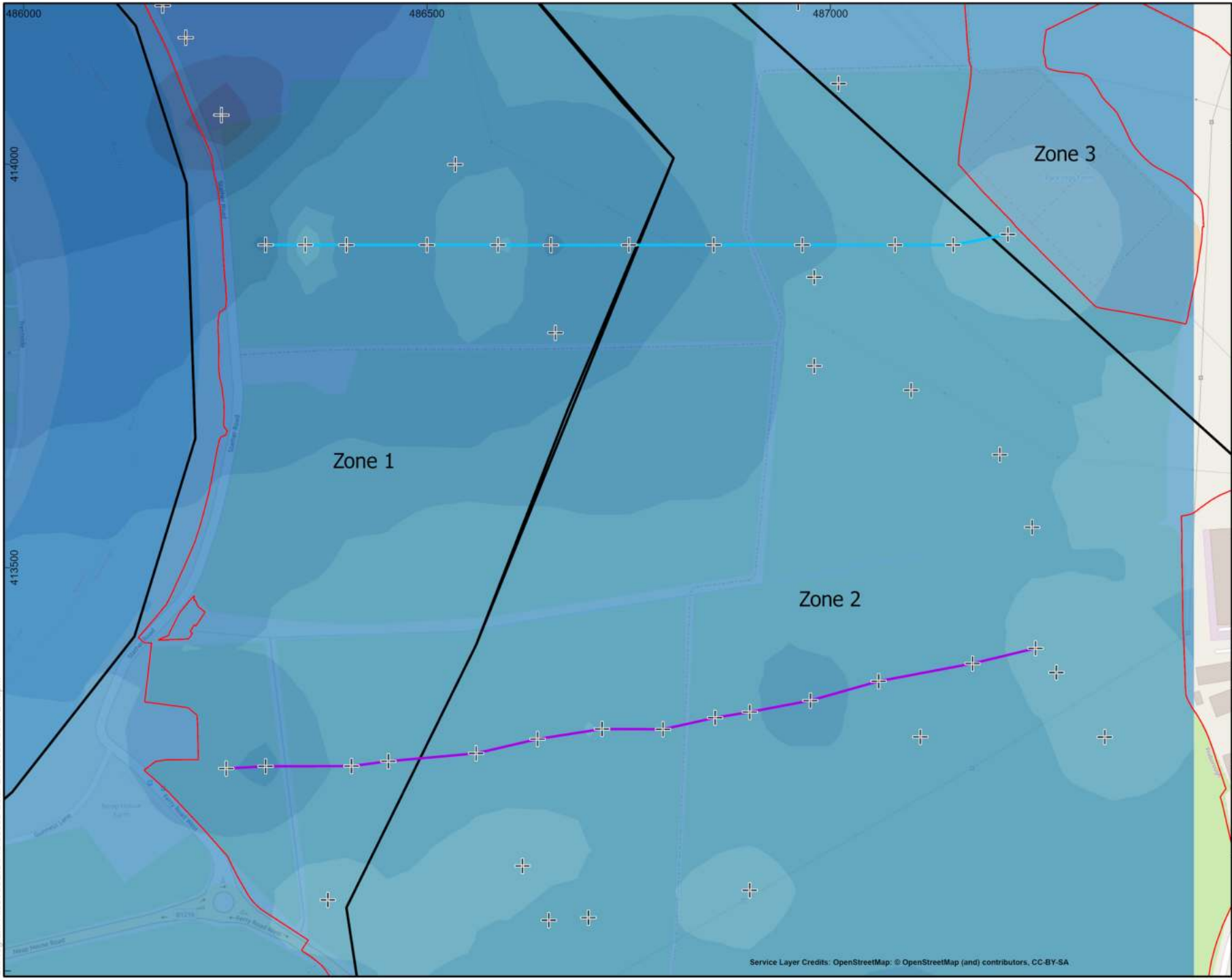

Figure	20

Topographic plot of the surface of the below ground lower alluvium / Sutton Sand (extrapolated from deposit records) Transects B and C

Legend

- Data Points
- Site Boundary
- Transect C
- Transect D
- Zone 1
- Zone 2
- Zone 3

Lower Alluvium / Sutton Sand Surface m OD

- 18.000001 - 20.000000
- 16.000001 - 18.000000
- 14.000001 - 16.000000
- 12.000001 - 14.000000
- 10.000001 - 12.000000
- 8.000001 - 10.000000
- 6.000001 - 8.000000
- 4.000001 - 6.000000
- 2.000001 - 4.000000
- 0.000001 - 2.000000
- -1.999999 - 0.000000
- -3.999999 - -2.000000
- -5.999999 - -4.000000
- -7.999999 - -6.000000
- -9.999999 - -8.000000
- -11.999999 - -10.000000
- -13.500000 - -12.000000

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SYSTEM
Coordinate System: British National Grid
Projection: Transverse Mercator
Datum: OSGB 1936

SCALE
1:4,500 @ A3

0 200m

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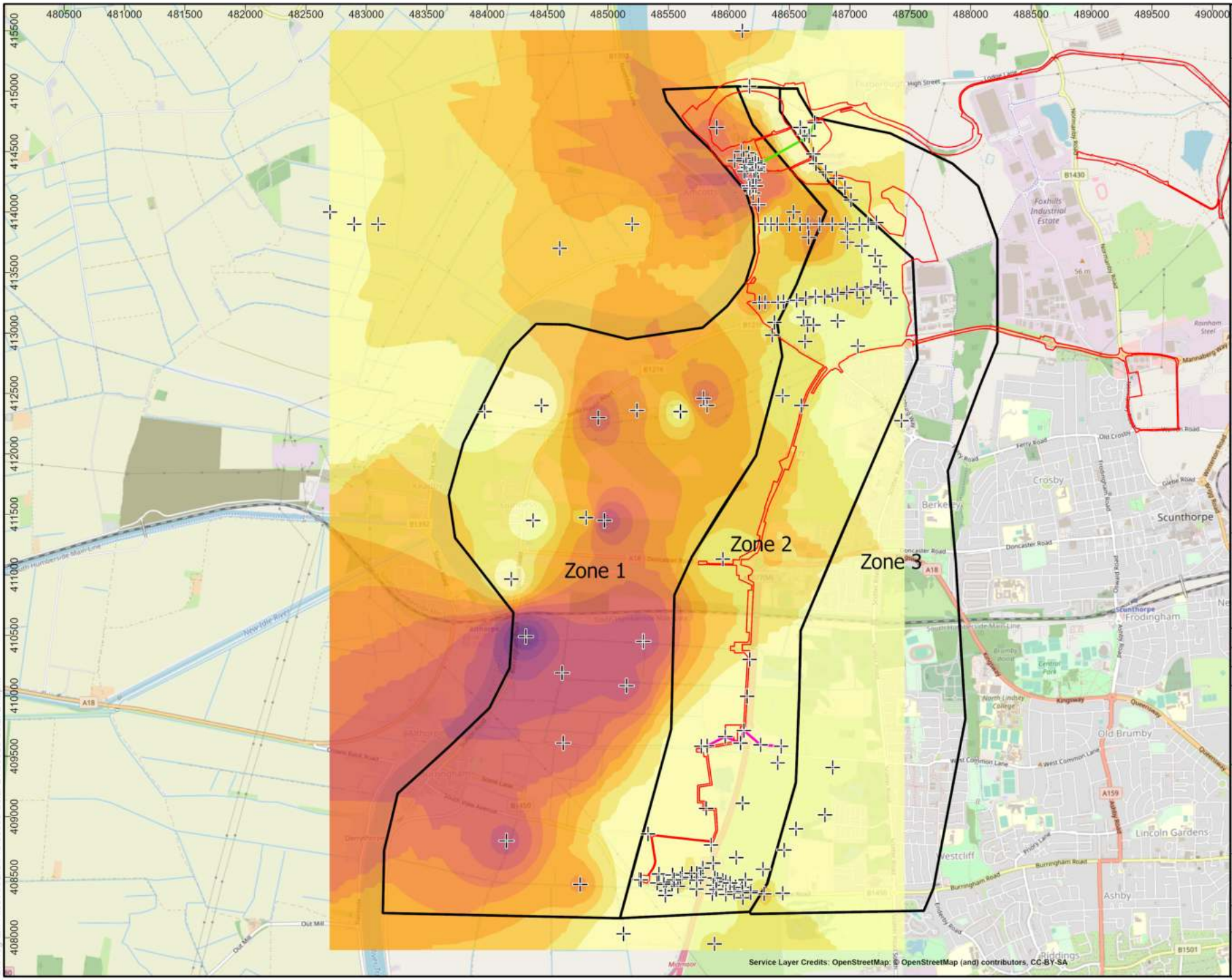

Figure	21

Thickness plot of the below ground Holocene organic deposits (extrapolated from deposit records), representing deposit survival.

Legend

- Data Points
- Site Boundary
- Transect A
- Transect B
- Transect C
- Transect D
- Transect E
- Zone 1
- Zone 2
- Zone 3

Holocene Organic Deposits Thickness
m

- 0.000000 - 1.000000
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 4.000000
- 4.000001 - 5.000000
- 5.000001 - 6.000000
- 6.000001 - 7.000000
- 7.000001 - 8.000000
- 8.000001 - 9.000000
- 9.000001 - 10.000000
- 10.000001 - 11.000000
- 11.000001 - 12.000000
- 12.000001 - 13.000000
- 13.000001 - 14.000000
- 14.000001 - 15.000000

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SYSTEM

Coordinate System: British National Grid
Projection: Transverse Mercator
Datum: OSGB 1936

SCALE

1:30,000 @ A3

0 1,000m

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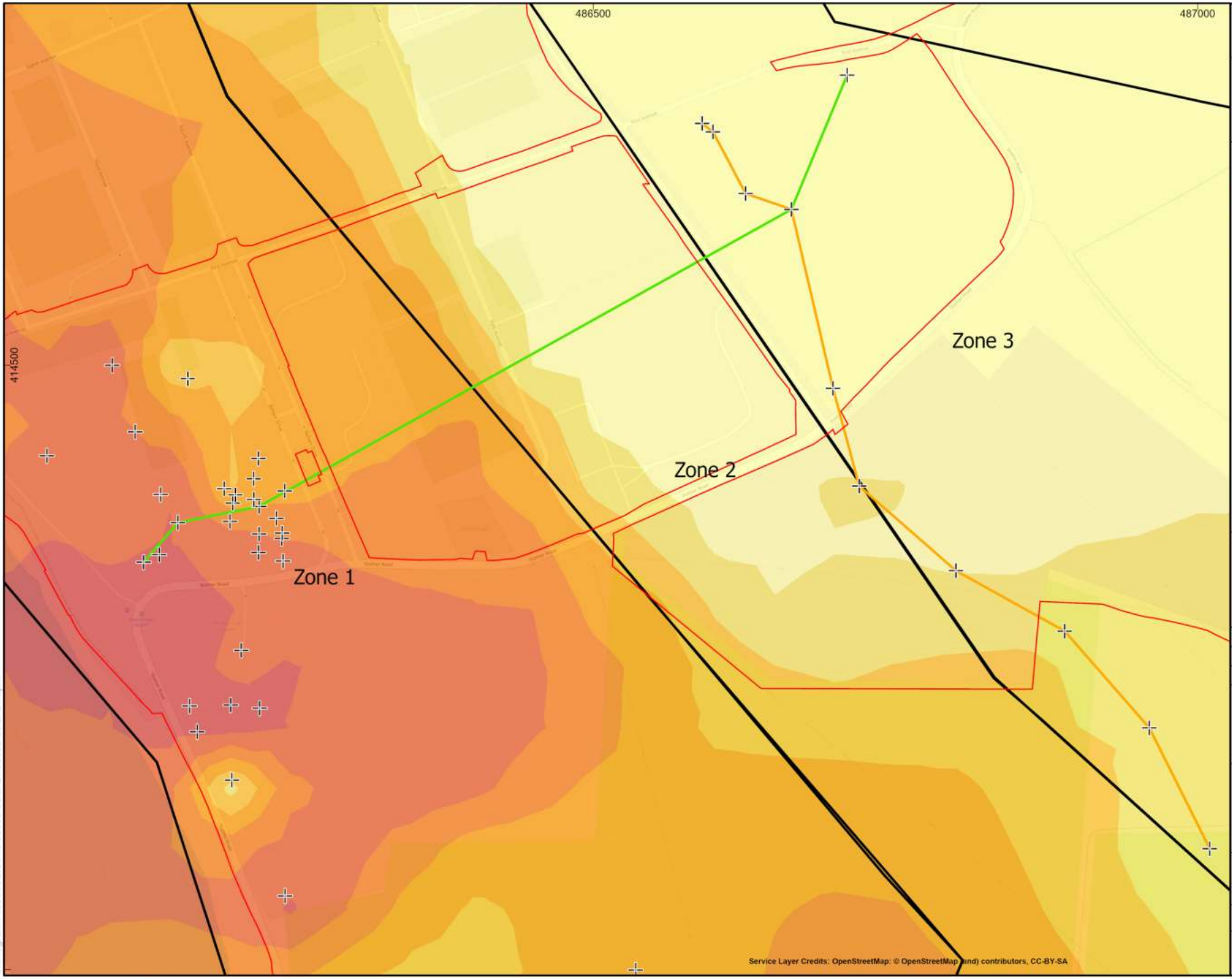

Figure	22

Thickness plot of the below ground Holocene organic deposits (extrapolated from deposit records), representing deposit survival. Transects A and B

Legend

- Data Points
- Site Boundary
- Transect A
- Transect B
- Zone 1
- Zone 2
- Zone 3

Holocene Organic Deposits Thickness
m

- 0.000000 - 1.000000
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 4.000000
- 4.000001 - 5.000000
- 5.000001 - 6.000000
- 6.000001 - 7.000000
- 7.000001 - 8.000000
- 8.000001 - 9.000000
- 9.000001 - 10.000000
- 10.000001 - 11.000000
- 11.000001 - 12.000000
- 12.000001 - 13.000000
- 13.000001 - 14.000000
- 14.000001 - 15.000000

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AOC Project No.:	53056

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SYSTEM
Coordinate System: British National Grid
Projection: Transverse Mercator
Datum: OSGB 1936

SCALE
1:3,000 @ A3

0 100m

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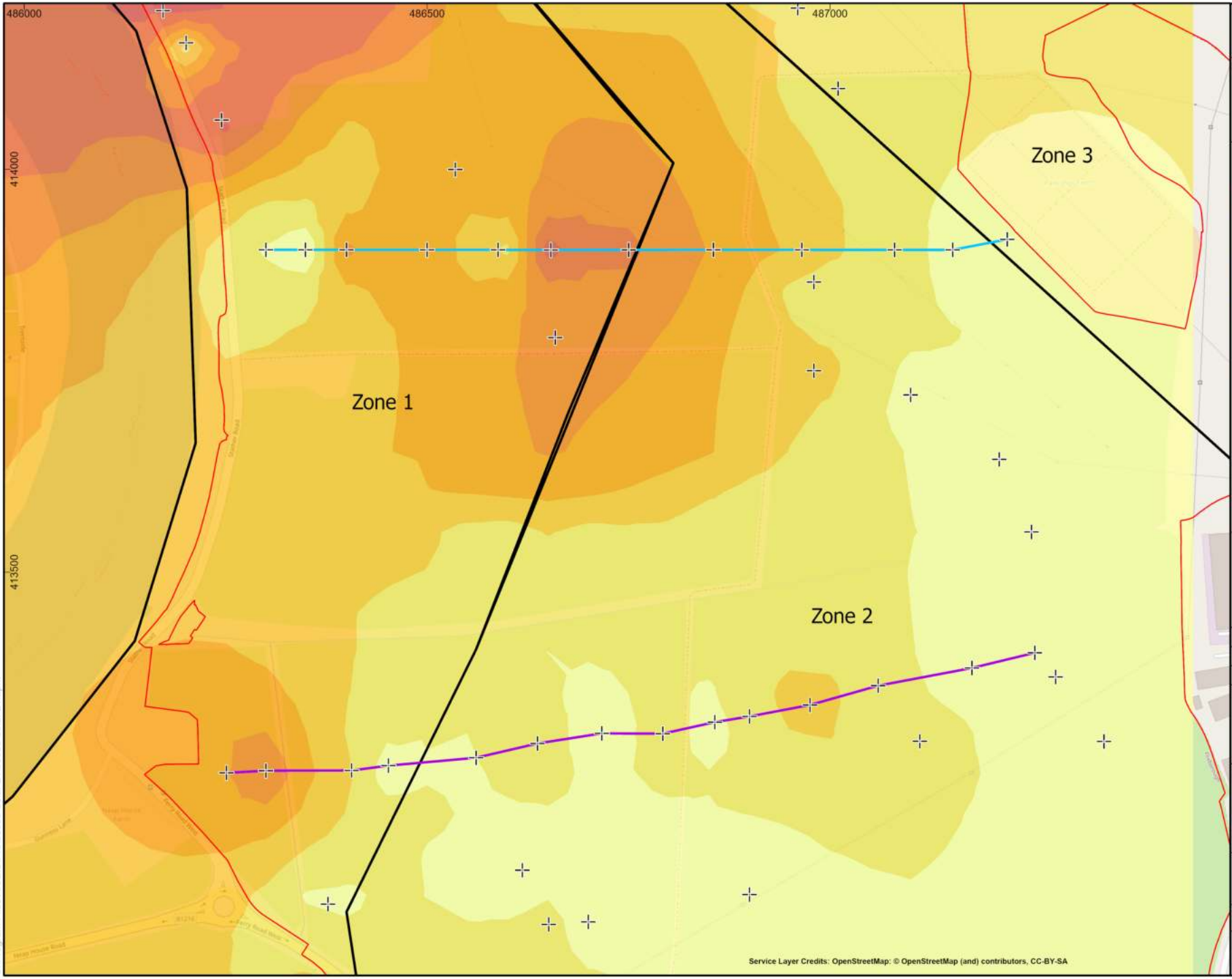

Figure	23

Thickness plot of the below ground Holocene organic deposits (extrapolated from deposit records), representing deposit survival. Transects C and D

Legend

- Data Points
- Site Boundary
- Transect C
- Transect D
- Zone 1
- Zone 2
- Zone 3

Holocene Organic Deposits Thickness
m

- 0.000000 - 1.000000
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 4.000000
- 4.000001 - 5.000000
- 5.000001 - 6.000000
- 6.000001 - 7.000000
- 7.000001 - 8.000000
- 8.000001 - 9.000000
- 9.000001 - 10.000000
- 10.000001 - 11.000000
- 11.000001 - 12.000000
- 12.000001 - 13.000000
- 13.000001 - 14.000000
- 14.000001 - 15.000000

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Datum: OSGB 1936

SCALE

1:4,500 @ A3

0 200m

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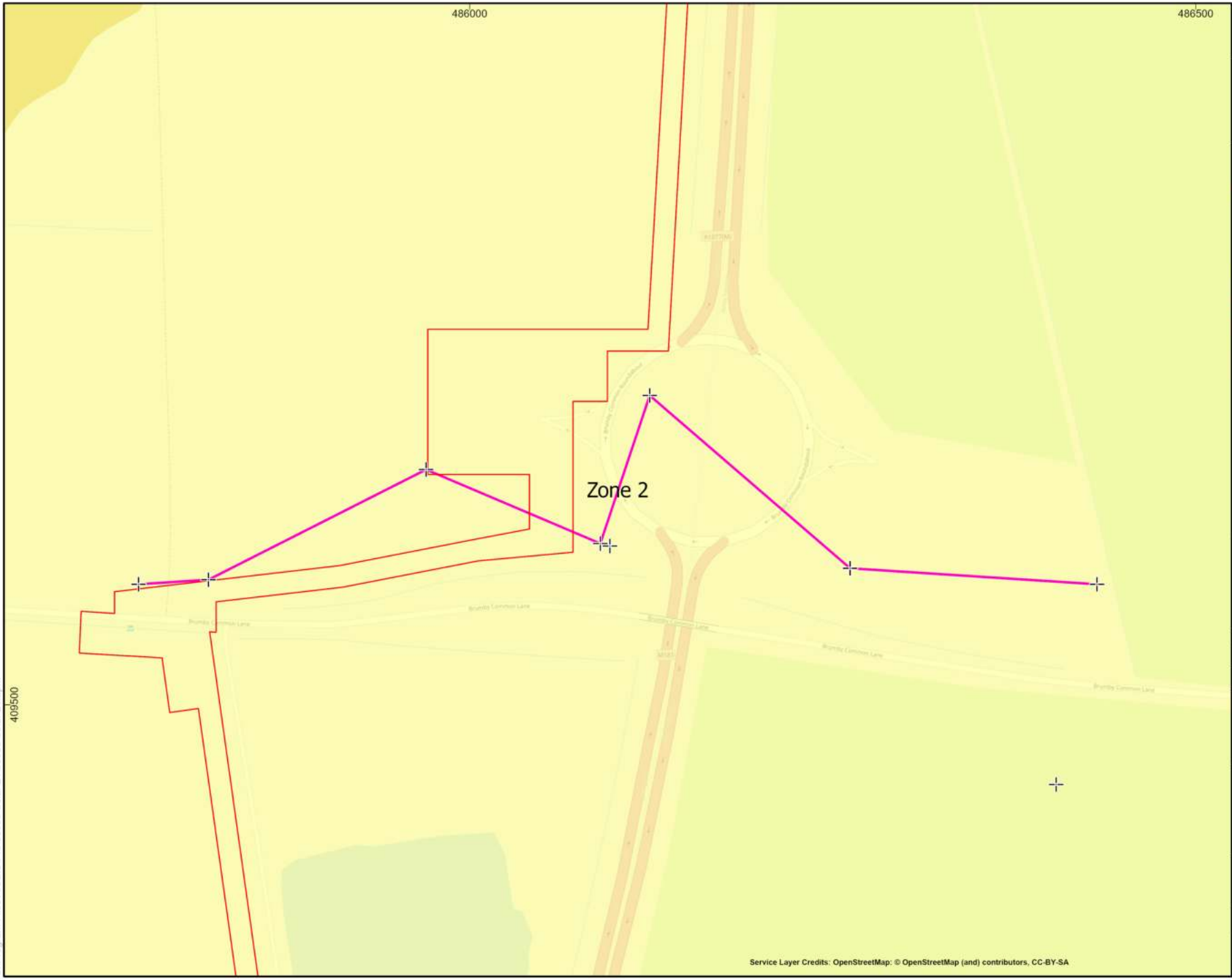

Figure	24

Thickness plot of the below ground Holocene organic deposits (extrapolated from deposit records), representing deposit survival. Transect E

Legend

- Data Points
- Site Boundary
- Transect E
- Zone 1
- Zone 2
- Zone 3

Holocene Organic Deposits Thickness m

- 0.000000 - 1.000000
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 4.000000
- 4.000001 - 5.000000
- 5.000001 - 6.000000
- 6.000001 - 7.000000
- 7.000001 - 8.000000
- 8.000001 - 9.000000
- 9.000001 - 10.000000
- 10.000001 - 11.000000
- 11.000001 - 12.000000
- 12.000001 - 13.000000
- 13.000001 - 14.000000
- 14.000001 - 15.000000

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Projection: Transverse Mercator
Datum: OSGB 1936

SCALE
1:2,500 @ A3

0 100m

C:\Program Files\ArcGIS\Pro\53056 Solar 21\53056 Solar 21.aprx

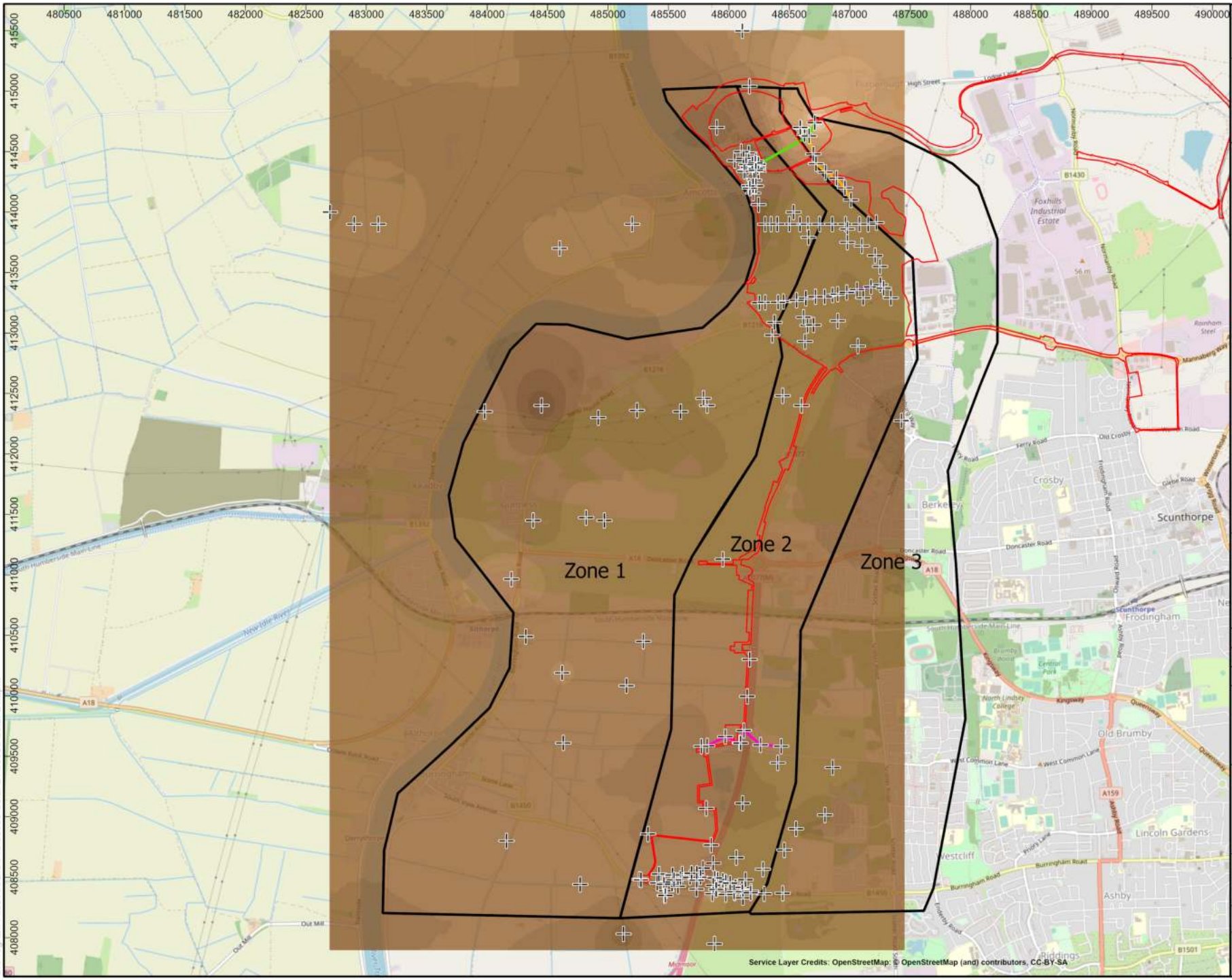

Figure	25

Topographic plot of the surface of the below ground Holocene organic deposits (extrapolated from deposit records)

Legend

- Data Points
- Site Boundary
- Transect A
- Transect B
- Transect C
- Transect D
- Transect E
- Zone 1
- Zone 2
- Zone 3

Holocene Organics Surface m OD

- 18.000001 - 20.000000
- 16.000001 - 18.000000
- 14.000001 - 16.000000
- 12.000001 - 14.000000
- 10.000001 - 12.000000
- 8.000001 - 10.000000
- 6.000001 - 8.000000
- 4.000001 - 6.000000
- 2.000001 - 4.000000
- 0.000001 - 2.000000
- -1.999999 - 0.000000
- -3.999999 - -2.000000
- -5.999999 - -4.000000
- -7.500000 - -6.000000

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SCALE
1:30,000 @ A3

0 1,000m

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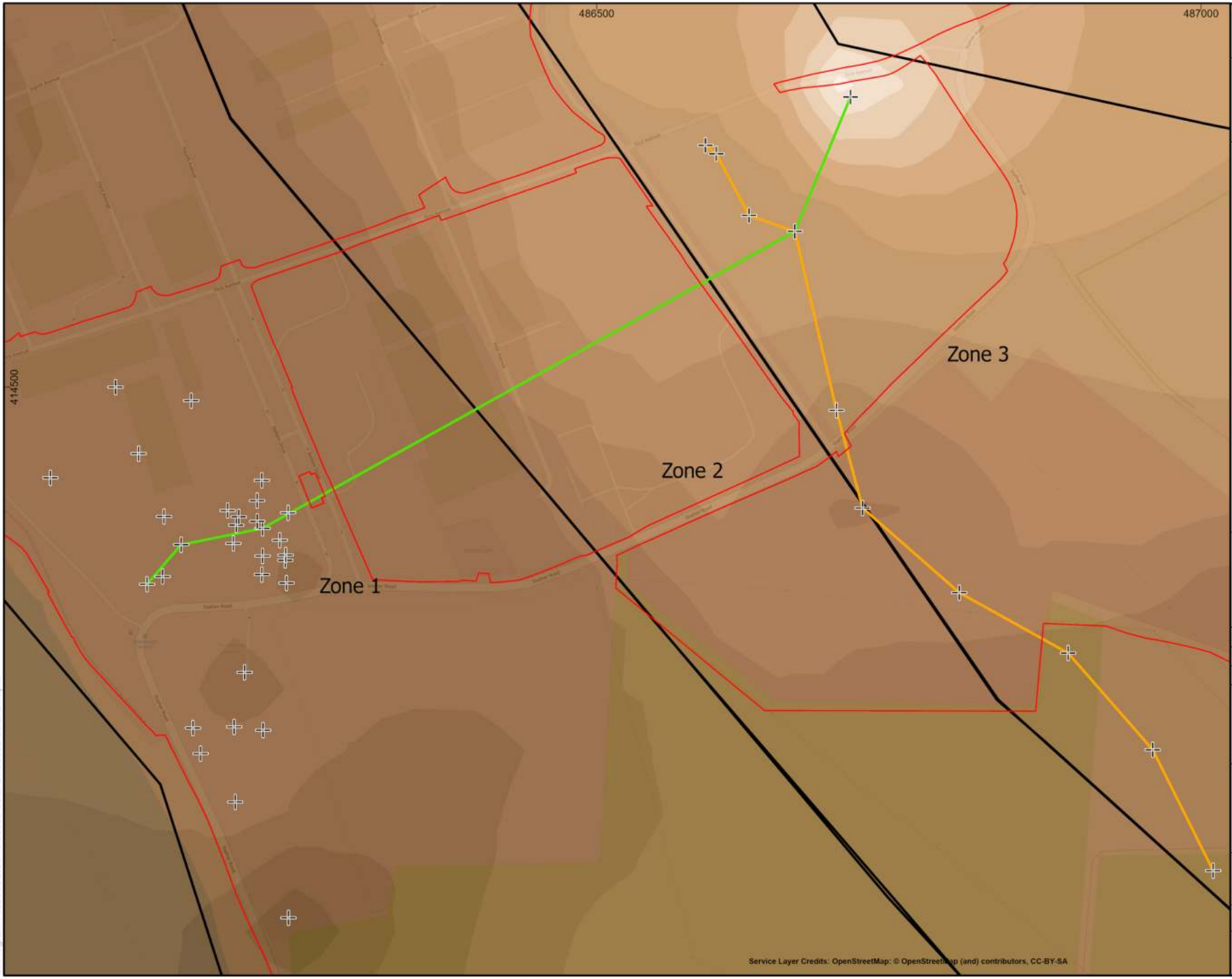

Figure	26

Topographic plot of the surface of the below ground Holocene organic deposits (extrapolated from deposit records)
Transects A and B

Legend

- Data Points
- Site Boundary
- Transect A
- Transect B
- Zone 1
- Zone 2
- Zone 3

Holocene Organics Surface m OD

- 18.000001 - 20.000000
- 16.000001 - 18.000000
- 14.000001 - 16.000000
- 12.000001 - 14.000000
- 10.000001 - 12.000000
- 8.000001 - 10.000000
- 6.000001 - 8.000000
- 4.000001 - 6.000000
- 2.000001 - 4.000000
- 0.000001 - 2.000000
- -1.999999 - 0.000000
- -3.999999 - -2.000000
- -5.999999 - -4.000000
- -7.500000 - -6.000000

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SCALE

1:3,000 @ A3

0 100m

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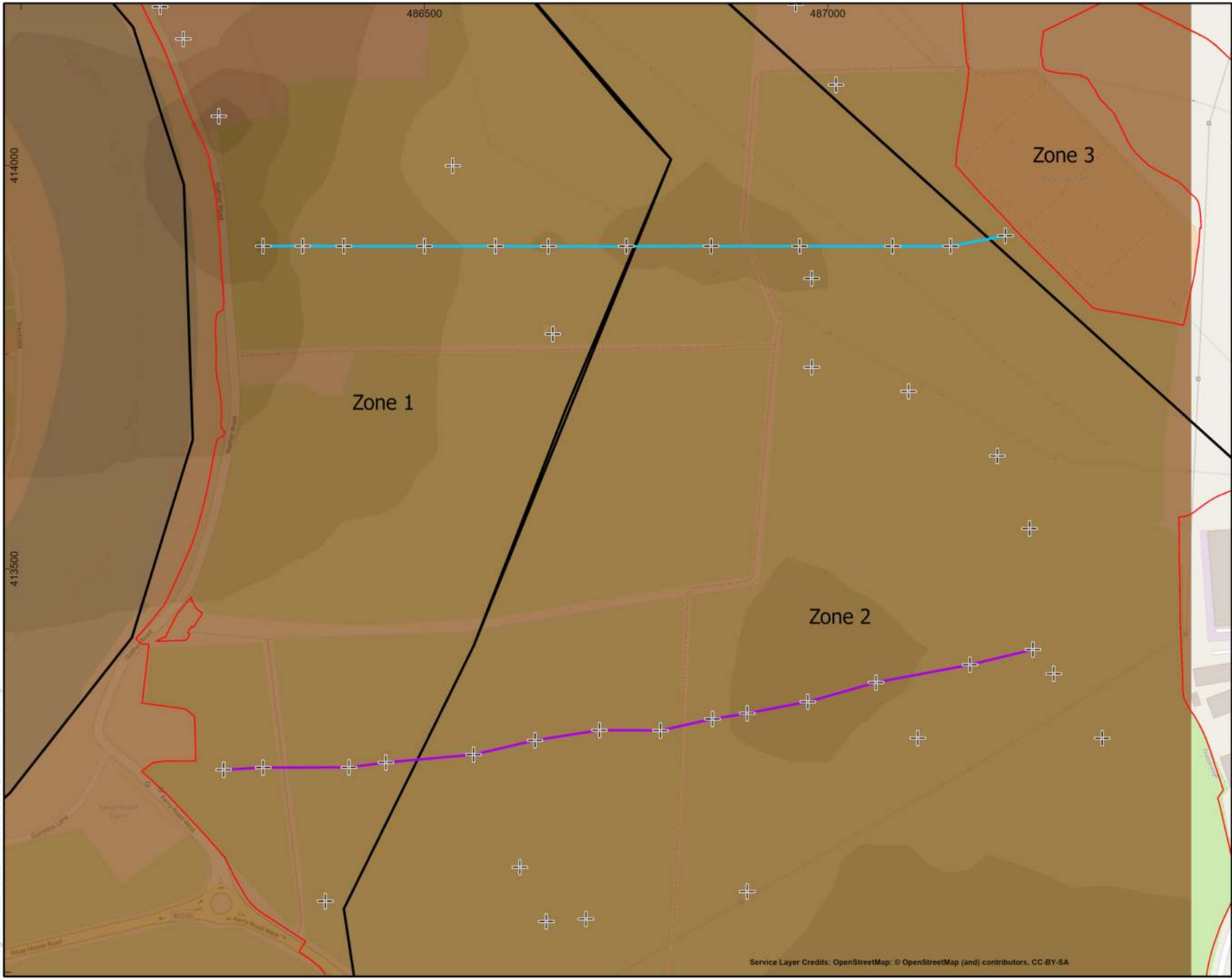

Figure	27

Topographic plot of the surface of the below ground Holocene organic deposits (extrapolated from deposit records)
Transects C and D

Legend

- Data Points
- Site Boundary
- Transect C
- Transect D
- Zone 1
- Zone 2
- Zone 3

Holocene Organics Surface m OD

- 18.000001 - 20.000000
- 16.000001 - 18.000000
- 14.000001 - 16.000000
- 12.000001 - 14.000000
- 10.000001 - 12.000000
- 8.000001 - 10.000000
- 6.000001 - 8.000000
- 4.000001 - 6.000000
- 2.000001 - 4.000000
- 0.000001 - 2.000000
- -1.999999 - 0.000000
- -3.999999 - -2.000000
- -5.999999 - -4.000000
- -7.500000 - -6.000000

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SCALE
1:4,500 @ A3

0 200m

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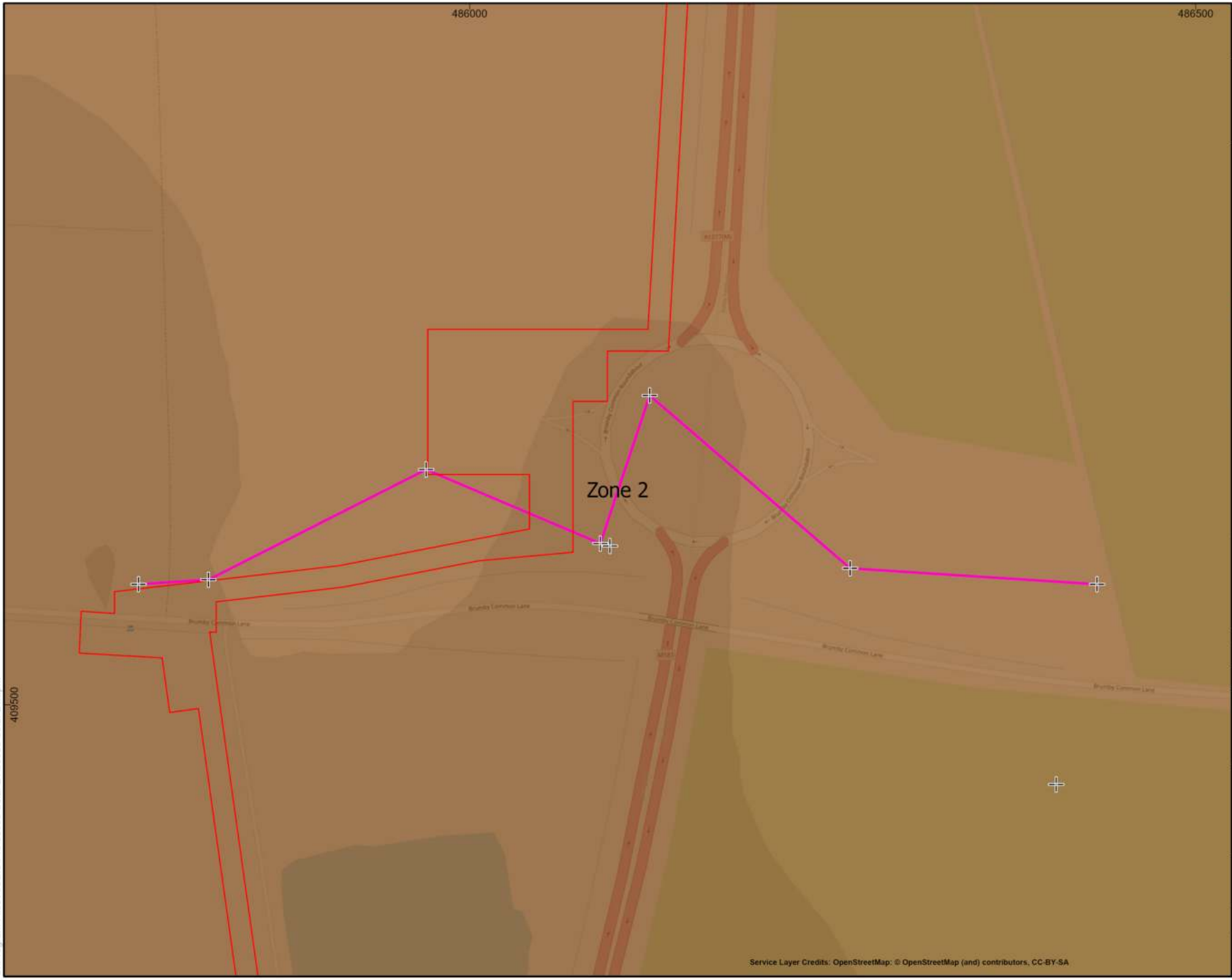

Figure	28

Topographic plot of the surface of the below ground Holocene organic deposits (extrapolated from deposit records)
Transect E

Legend

- Data Points
- Site Boundary
- Transect E
- Zone 1
- Zone 2
- Zone 3

Holocene Organics Surface m OD

- 18.000001 - 20.000000
- 16.000001 - 18.000000
- 14.000001 - 16.000000
- 12.000001 - 14.000000
- 10.000001 - 12.000000
- 8.000001 - 10.000000
- 6.000001 - 8.000000
- 4.000001 - 6.000000
- 2.000001 - 4.000000
- 0.000001 - 2.000000
- -1.999999 - 0.000000
- -3.999999 - -2.000000
- -5.999999 - -4.000000
- -7.500000 - -6.000000

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SCALE
1:2,500 @ A3

0 100m

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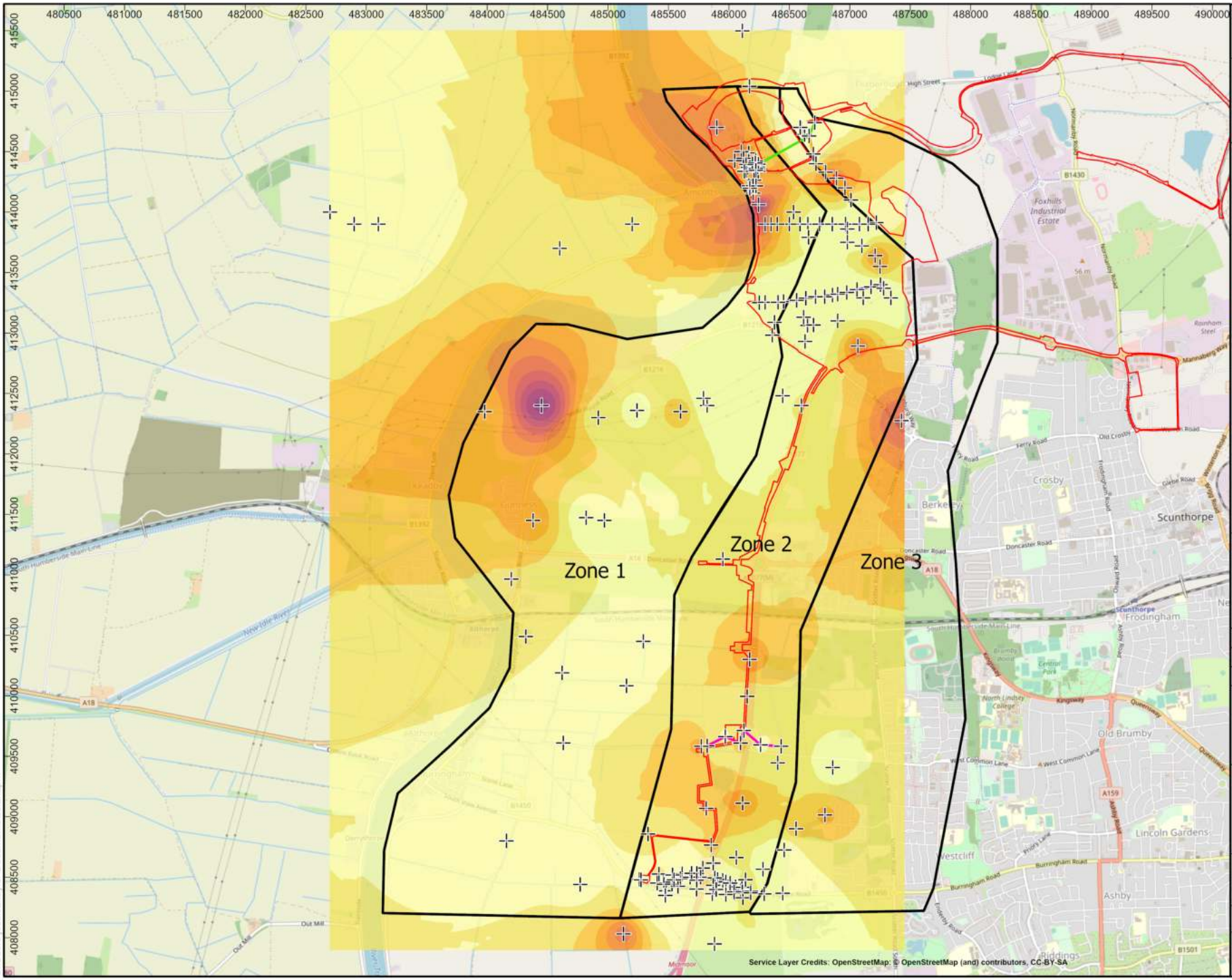

Figure 29

Thickness plot of the below ground Holocene upper alluvium / warp deposits (extrapolated from deposit records), suggesting deposit survival

Legend

- Data Points
- Site Boundary
- Transect A
- Transect B
- Transect C
- Transect D
- Transect E
- Zone 1
- Zone 2
- Zone 3

Upper Alluvium / Warp Thickness m

- 0.000000 - 1.000000
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 4.000000
- 4.000001 - 5.000000
- 5.000001 - 6.000000
- 6.000001 - 7.000000
- 7.000001 - 8.000000
- 8.000001 - 9.000000
- 9.000001 - 10.000000
- 10.000001 - 11.000000
- 11.000001 - 12.000000
- 12.000001 - 13.000000
- 13.000001 - 14.000000
- 14.000001 - 15.000000

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SCALE
1:30,000 @ A3

0 1,000m

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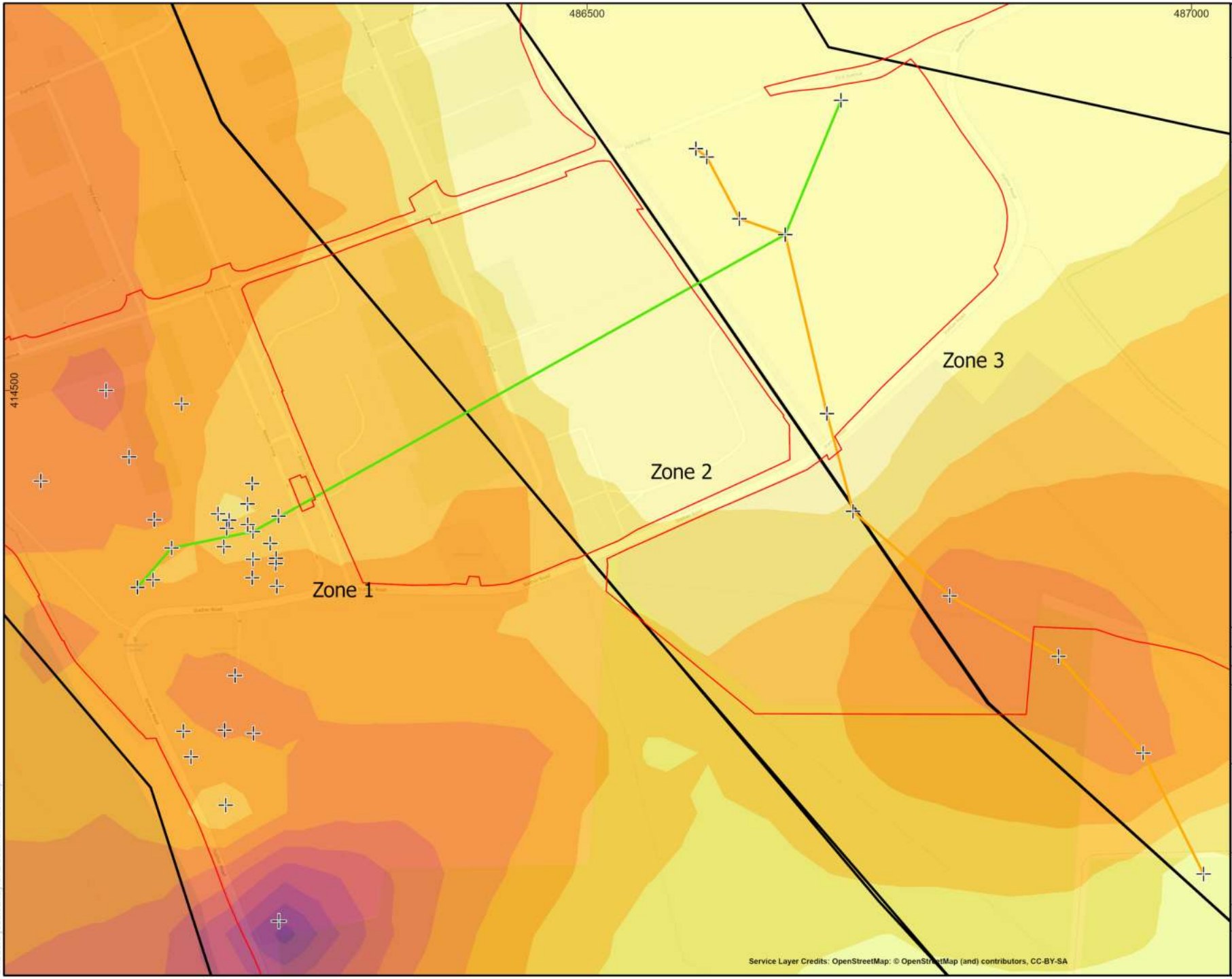

Figure	30

Thickness plot of the below ground Holocene upper alluvium / warp deposits (extrapolated from deposit records), suggesting deposit survival. Transects A and B

Legend

- Data Points
- Site Boundary
- Transect A
- Transect B
- Zone 1
- Zone 2
- Zone 3

Upper Alluvium / Warp Thickness
m

- 0.000000 - 1.000000
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 4.000000
- 4.000001 - 5.000000
- 5.000001 - 6.000000
- 6.000001 - 7.000000
- 7.000001 - 8.000000
- 8.000001 - 9.000000
- 9.000001 - 10.000000
- 10.000001 - 11.000000
- 11.000001 - 12.000000
- 12.000001 - 13.000000
- 13.000001 - 14.000000
- 14.000001 - 15.000000

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SCALE
1:3,000 @ A3

0 100m

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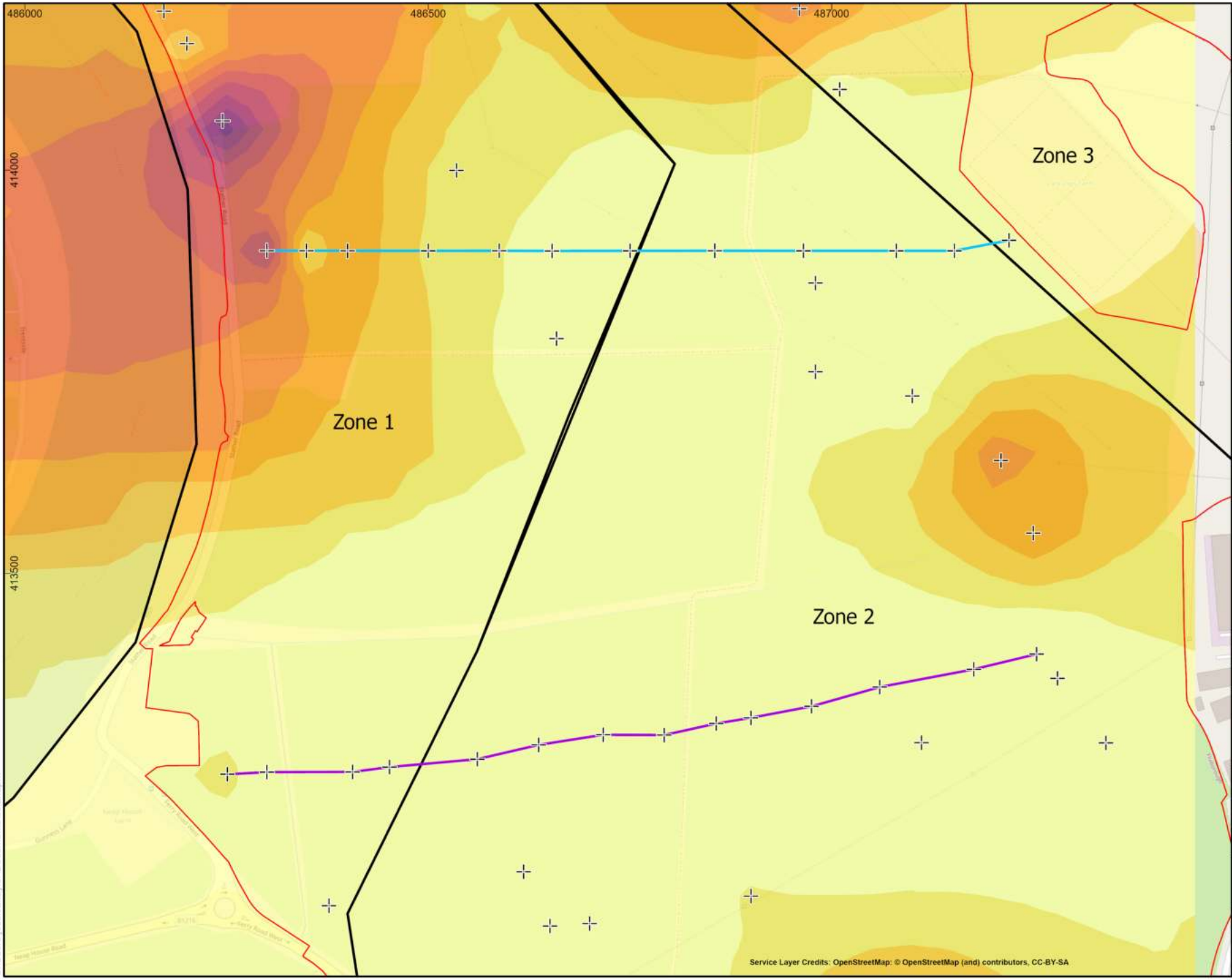

Figure	31

Thickness plot of the below ground Holocene upper alluvium / warp deposits (extrapolated from deposit records), suggesting deposit survival. Transects C and D

Legend

- Data Points
- Site Boundary
- Transect C
- Transect D
- Zone 1
- Zone 2
- Zone 3

Upper Alluvium / Warp Thickness
m

- 0.000000 - 1.000000
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 4.000000
- 4.000001 - 5.000000
- 5.000001 - 6.000000
- 6.000001 - 7.000000
- 7.000001 - 8.000000
- 8.000001 - 9.000000
- 9.000001 - 10.000000
- 10.000001 - 11.000000
- 11.000001 - 12.000000
- 12.000001 - 13.000000
- 13.000001 - 14.000000
- 14.000001 - 15.000000

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SCALE

1:4,500 @ A3

0 200m

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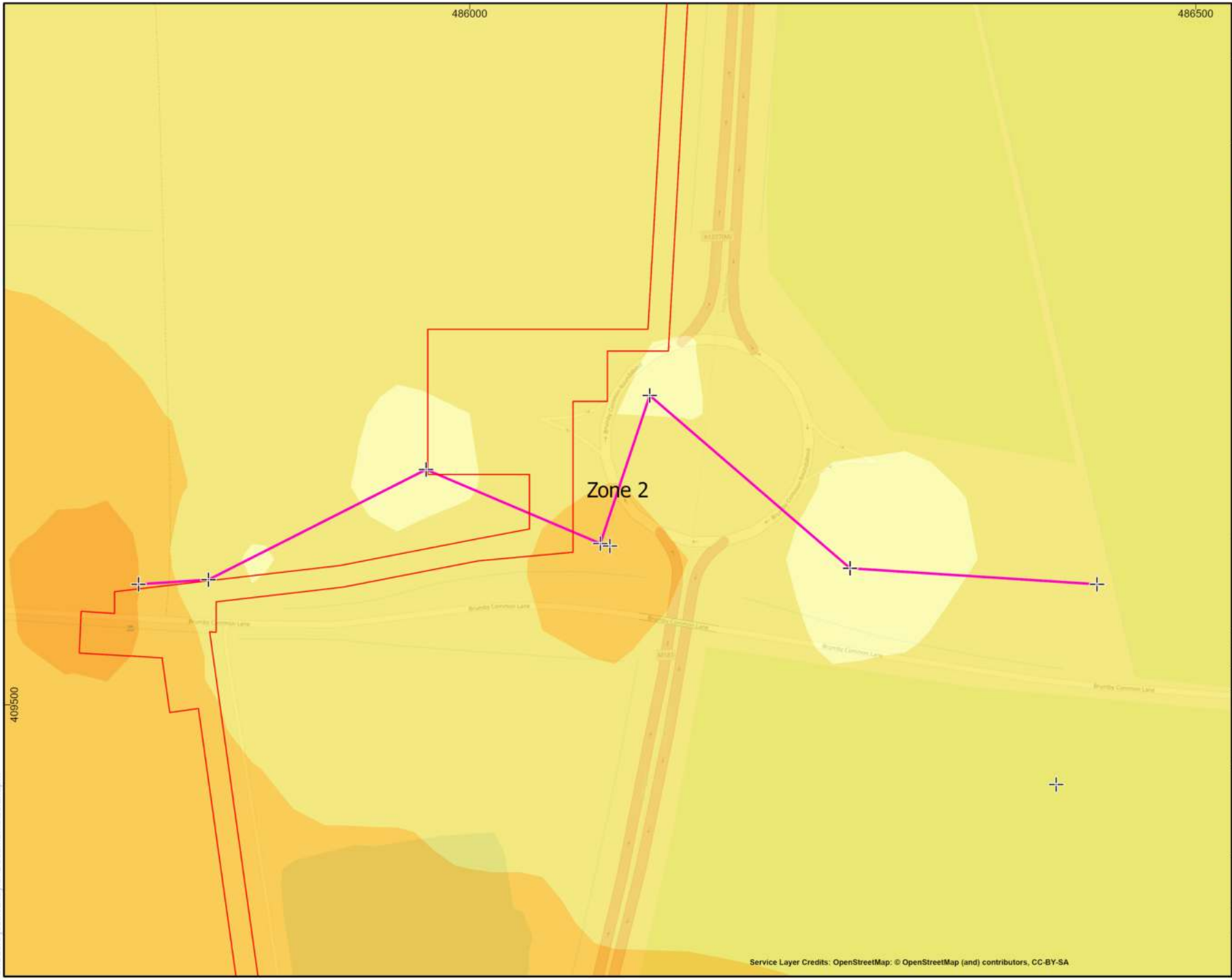

Figure	32

Thickness plot of the below ground Holocene upper alluvium / warp deposits (extrapolated from deposit records), suggesting deposit survival. Transect E

Legend

- Data Points
- Site Boundary
- Transect E
- Zone 1
- Zone 2
- Zone 3

Upper Alluvium / Warp Thickness m

- 0.000000 - 1.000000
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 4.000000
- 4.000001 - 5.000000
- 5.000001 - 6.000000
- 6.000001 - 7.000000
- 7.000001 - 8.000000
- 8.000001 - 9.000000
- 9.000001 - 10.000000
- 10.000001 - 11.000000
- 11.000001 - 12.000000
- 12.000001 - 13.000000
- 13.000001 - 14.000000
- 14.000001 - 15.000000

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SCALE

1:2,500 @ A3

0 100m

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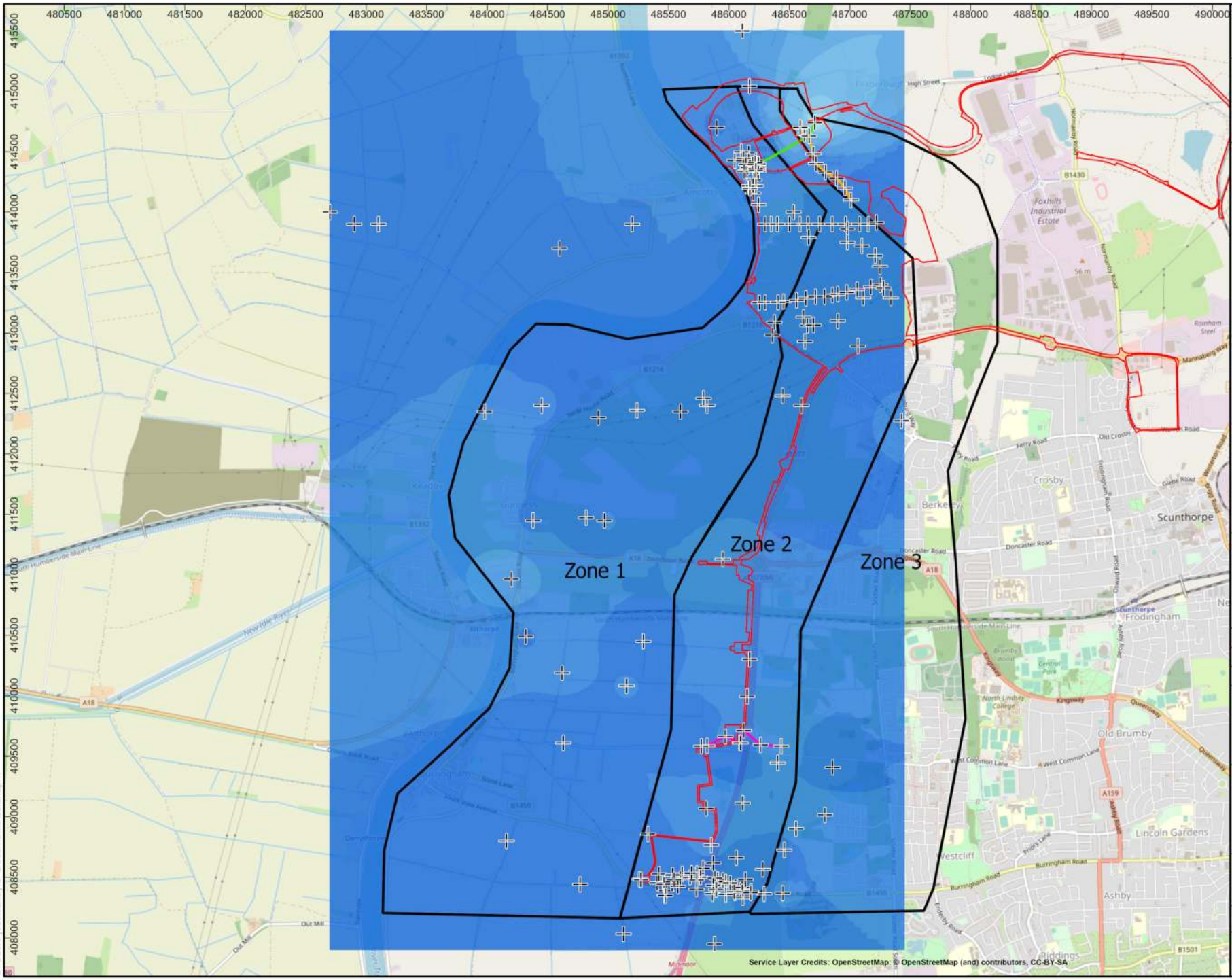

Figure	33

Topographic plot of the surface of the below ground Holocene upper alluvium / warp deposits (extrapolated from deposit records)

Legend

- Data Points
- Site Boundary
- Transect A
- Transect B
- Transect C
- Transect D
- Transect E
- Zone 1
- Zone 2
- Zone 3

Upper Alluvium / Warp Surface m OD

- 18.000001 - 20.000000
- 16.000001 - 18.000000
- 14.000001 - 16.000000
- 12.000001 - 14.000000
- 10.000001 - 12.000000
- 8.000001 - 10.000000
- 6.000001 - 8.000000
- 4.000001 - 6.000000
- 2.000001 - 4.000000
- 0.000000 - 2.000000

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SCALE
1:30,000 @ A3

0 1,000m

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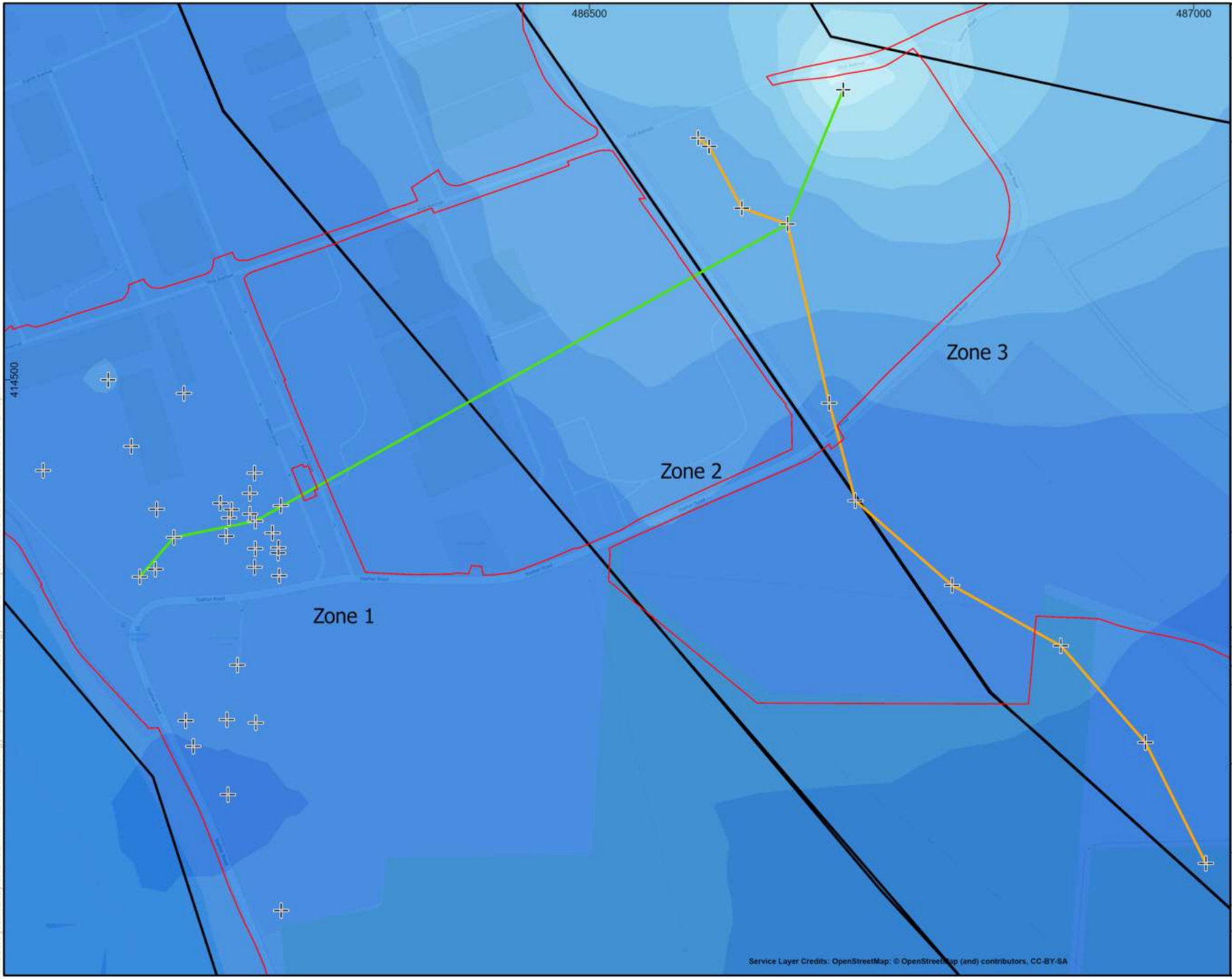

Figure	34

Topographic plot of the surface of the below ground Holocene upper alluvium / warp deposits (extrapolated from deposit records)
Transects A and B

Legend

- Data Points
- Site Boundary
- Transect A
- Transect B
- Zone 1
- Zone 2
- Zone 3

Upper Alluvium / Warp Surface
m OD

- 18.000001 - 20.000000
- 16.000001 - 18.000000
- 14.000001 - 16.000000
- 12.000001 - 14.000000
- 10.000001 - 12.000000
- 8.000001 - 10.000000
- 6.000001 - 8.000000
- 4.000001 - 6.000000
- 2.000001 - 4.000000
- 0.000000 - 2.000000

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SCALE

1:3,000 @ A3

0 100m

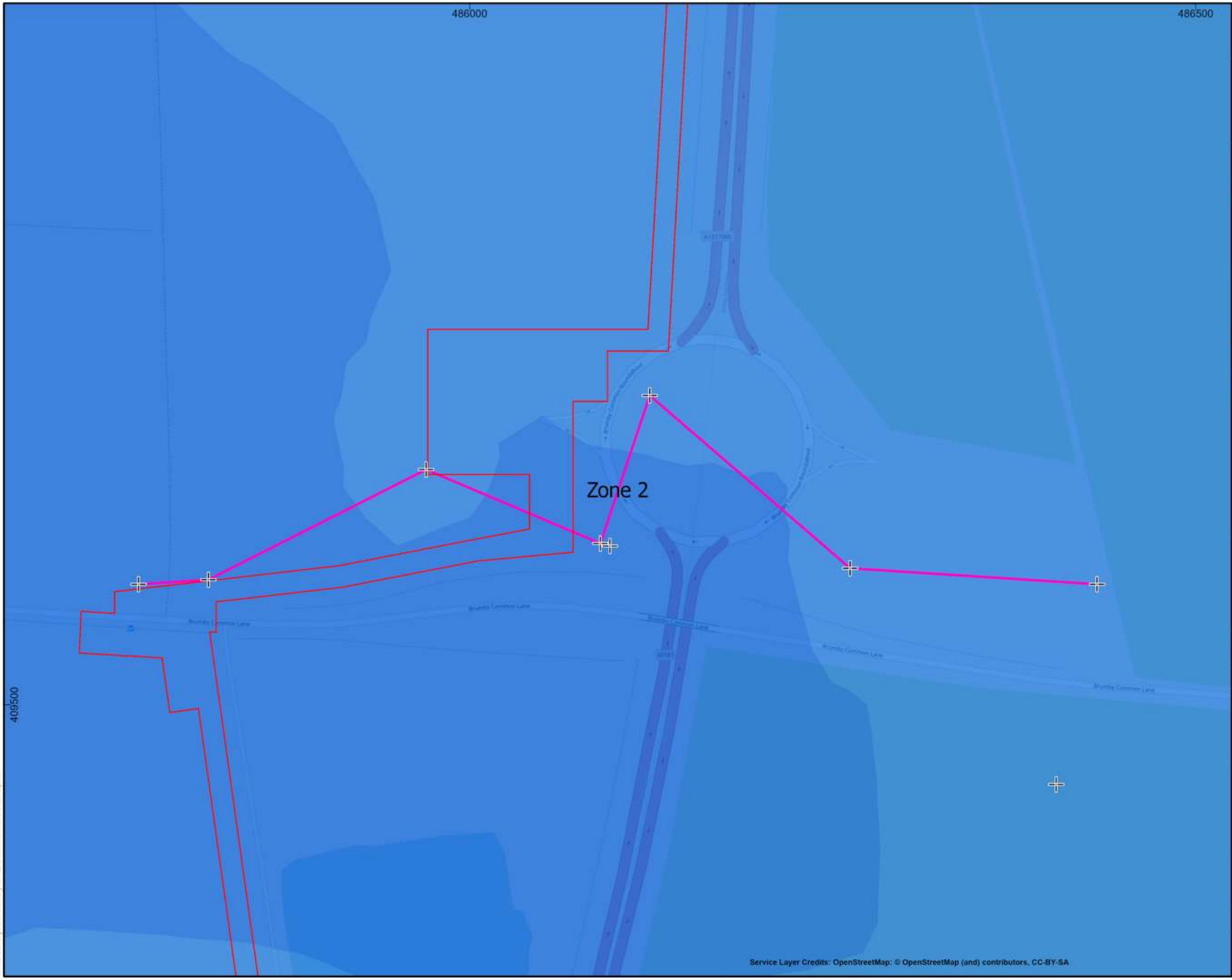

Figure	36

Topographic plot of the surface of the below ground Holocene upper alluvium / warp deposits (extrapolated from deposit records)
Transect E

Legend

- Data Points
- Site Boundary
- Transect E
- Zone 1
- Zone 2
- Zone 3

Upper Alluvium / Warp Surface
m OD

- 18.000001 - 20.000000
- 16.000001 - 18.000000
- 14.000001 - 16.000000
- 12.000001 - 14.000000
- 10.000001 - 12.000000
- 8.000001 - 10.000000
- 6.000001 - 8.000000
- 4.000001 - 6.000000
- 2.000001 - 4.000000
- 0.000000 - 2.000000

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SCALE

1:2,500 @ A3

0 100m

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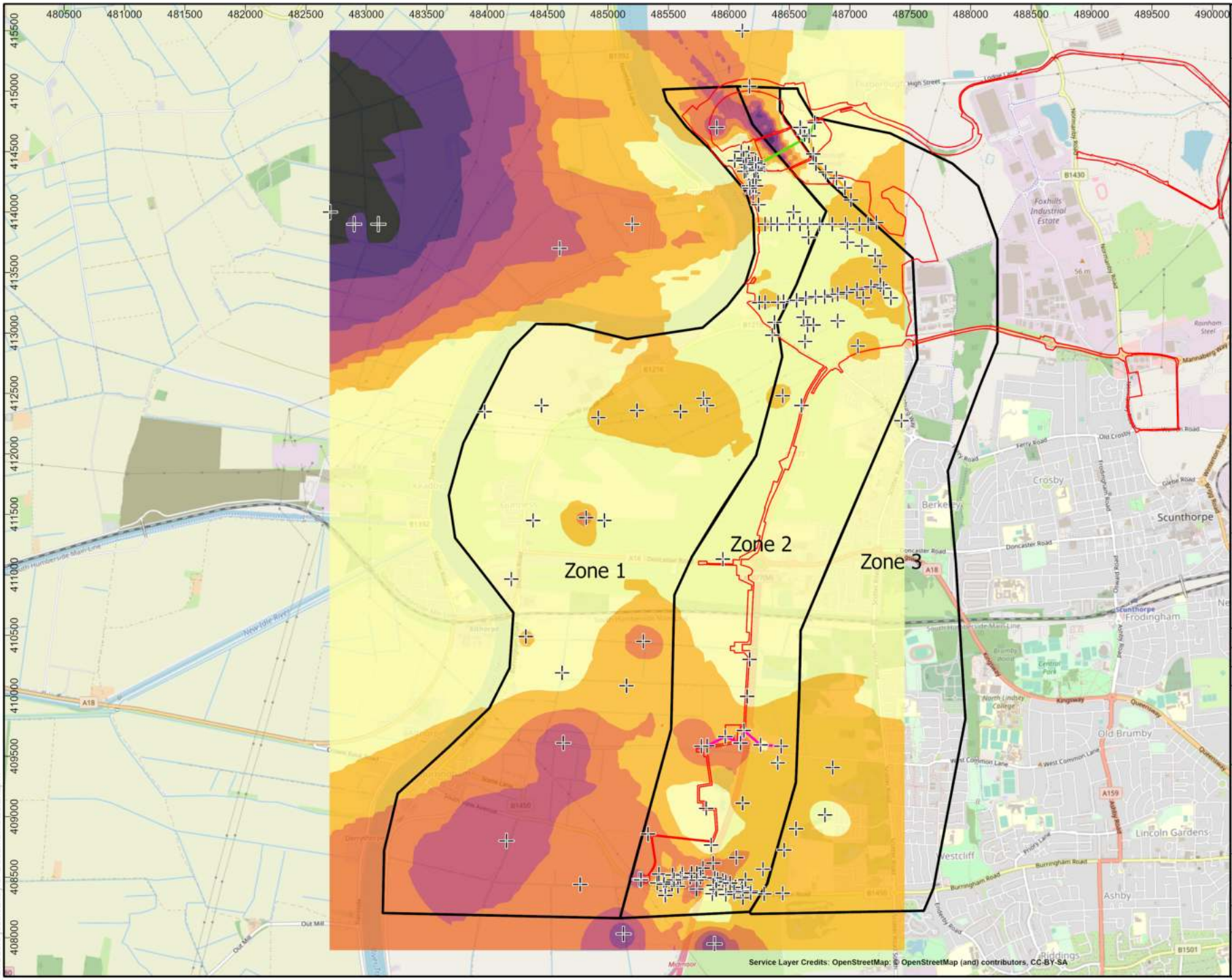

Figure	37

Thickness plot of topsoil and made ground deposits (extrapolated from deposit data)

Legend

- Data Points
- Site Boundary
- Transect A
- Transect B
- Transect C
- Transect D
- Transect E
- Zone 1
- Zone 2
- Zone 3

Topsoil / Made Ground Thickness
m

- 0.000000 - 0.500000
- 0.500001 - 1.000000
- 1.000001 - 1.500000
- 1.500001 - 2.000000
- 2.000001 - 2.500000
- 2.500001 - 3.000000
- 3.000001 - 3.500000

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SCALE
1:30,000 @ A3

0 1,000m

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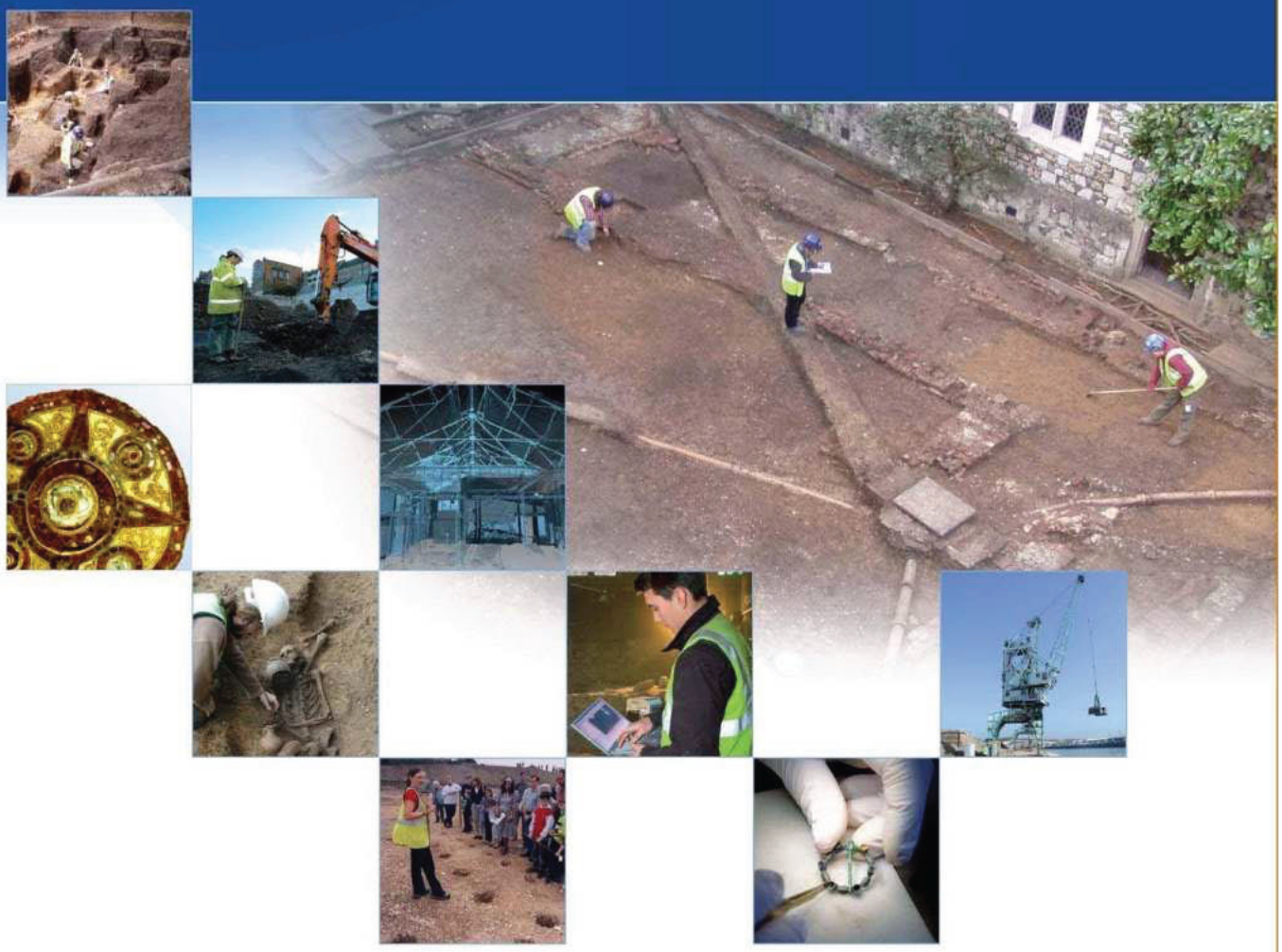

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