AN INVESTIGATION OF THE WIDER LANDSCAPE ARCHAEOLOGY OF BOG BODIES: A CASE STUDY OF LINDOW II AND TOLLUND MAN

By

ZENA MARIE ZEIN-ELABDIN

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Department of Classics Ancient History and Archaeology

University of Birmingham

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This thesis describes an investigation of the wider landscape archaeology of bog bodies: a case study of Lindow II found on Lindow Moss, Cheshire and Tollund Man deposited on Bjældskovdal bog, Denmark. Focused on establishing the surrounding cultural archaeology, pre-peat landscape, development of the bog landscape on Lindow Moss and Bjældskovdal bog. Then locating the positions of Lindow II and Tollund Man in their respective shape of bog basin. A spatial exploration of Lindow II and Tollund Man's relationship to the contemporary edge of the peat landscape was facilitated using 3D models created using newly generated auger data.

A landscape investigation has shown that there was an absence of cultural archaeology surrounding Lindow II and Tollund Man within a 1.9km circumference. Spatial analysis demonstrated Lindow II was placed 164m from the northern contemporary edge of peatland and 169m from the southern edge. Tollund Man was located 91m from the northern edge of contemporary peatland and 64m from the southern edge. Development of the bog landscape has demonstrated accessibility to central areas on both sites were difficult due to open water and pools. This study has demonstrated the potential and significance of a landscape approach to bog body research.

Dedication

To Hassan, for giving me the opportunity and encouragement to embark on this PhD journey. For my children Rania, Hiba, Mustafa and Amjad, always do those things that make you happy and challenged whatever your age….

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CHAPTER 1

1.1 Introduction: Beyond the Body

Human remains found deposited in bogs are referred to as bog bodies, the acidic conditions of the bog preserves soft tissues such as brain, intestines, muscles, hair, nails and skin (Bourke 1986; Brothwell and Dobney 1986; Connolly 1986; Larsen and Poulsen 2007; Wilson *et al.* 2007*;* Harild *et al.* 2007; Lynnerup, Boldsen and Jurik 2007). Human corpses preserved in peatbogs have generated much interest with academics and the public, their macabre end in mysterious bogs intrigues and ignites the imagination. The violence used on some of these prehistoric men, women and children perplexes, disturbs and motivates investigation to find out much more. Morbid curiosity prevails, perhaps without it the research of bog bodies would not have flourished.

Bog bodies are an important and intriguing part of prehistoric archaeological histories that provide insights into past religious, ritual practices and daily life (Glob 1969; Parker Pearson 1986; Green 1998; Fischer 1999a, 1999b; Gill Robinson 2001, 2005; Mannering *et al.* 2010; van der Sanden 2013; Van Beek *et al.* 2019). Some archaeological narratives that have been revealed from these remarkable human remains are mystifying. For example, Dätgen Man had his penis cut off (Gill Robinson 2005), and Oldcroghan Man had both of his nipples sliced off (Mulhall 2010; Lobell and Patel 2010).

The majority of bog body research has to date mainly focused on the investigation of the actual body itself due to its exceptional preservation. There is a lack of landscape context to the deposition of bog bodies. This thesis addresses the imbalance and disconnect between the body and its wider landscape.

This chapter starts with a brief outline of bog body research which has been carried out. It highlights the gaps in current studies and from this, the basis of the research design is presented. This earlier research into bog bodies and the way they were interpreted in the past is explored in more detail in chapter 2.

Bog bodies are known from the Mesolithic to post Medieval period, a lot of attention has been given to those from approximately 800 BC to AD 43 (Iron Age) (Coles and Coles 1989); European Late Iron Age and Roman Period (200 BC-AD 400) (van der Plicht *et al.*2004; Nielsen *et al.*2018) and Early Roman Iron Age (AD 1-200) (Mannering *et al.* 2010). They have been found in Britain, Ireland, Denmark, Netherlands and Germany van der Sanden (2013), Russia, Norway, Poland and Sweden (van der Sanden 1996). Most of the Swedish bog bodies were bog skeletons except Bocksten man from Halland (van der Sanden 1996, 85). Further bog bodies have been found in Windover, Florida which have been interpreted as, from a native Indian cemetery dated approximately 7000 years ago (Coles and Coles 1989; van der Sanden 1996). Bog bodies have therefore been found from different cultural and chronological periods (Coles and Coles 1989). However, Iron Age bog bodies have piqued interest due to the amount of violence and injuries exerted on the body (Glob 1969; Coles and Coles 1989). These were evident on discovery and associated with their death (Glob 1969; Coles and Coles 1989). Many bog bodies have shown evidence of brutal killing which has led to the interpretation of their deposition and death as votive offerings (Glob 1969; Parker Pearson 1986; Chamberlain and Parker Pearson 2001; Fischer 1999; Green 1998), or an opportunistic mugging or murder (Connolly 1985, 17). Research on most bog bodies has focussed on the excavation, conservation and forensic examination of the bodies to understand how they may have died (Glob 1969; Stead *et al.* 1986; Turner and Scaife 1995; Fischer, 2012; Asingh and Lynnerup 2007). These preserved individuals provide a wealth of information that potentially contribute to our better understanding of their past life. However, due to the narrow focus of research on the body itself there is a disconnect between the body and the landscape it was placed in. The limited discussion here will be returned to in chapter 2 where a full presentation of this point and the evidence to support it will be made.

Typically, studies have concentrated on the cause of death, analysis of bones, stomach and large intestine contents, sex determination, dating of bodies and clothing (Bourke 1986; Scaife 1986; van der Plicht *et al.* 2004; Gill Robinson 2005; Gregersen *et al.* 2007; Gregersen *et al.* 2007; Asingh 2009; Frei *et al.* 2009; Mannering *et al.* 2010). Whilst forensic and medical analysis has revealed specific congenital abnormalities, diseases, last meals and old injuries (Jones 1986; Scaife 1986 and 1995; Holden 1997 and 1995; Spiegelman *et al.* 1995; Gill Robinson 2005; ; Boel and Dalstra 2007; Harild *et al.* 2007, 176-181; Searcey *et al.* 2013; Nielsen *et al.* 2018). Also establishing the extent of violence and types of injuries inflicted on the bodies (Connolly 1985, 17; 1986, Bourke 1986, 51; 60; West 1986; Brothwell *et al.* 1990; Brothwell and Gill Robinson 2002; Boldsen and

Lynnerup 2007; Lynnerup, Boldsen and Jurik 2007; Gregersen, Boldsen and Lynnerup 2007; Asingh 2009, 33; 34). More information has been obtained using radiological and computerised tomography to examine the internal structures of bog bodies (Reznek *et al.* 1986; Jurik 2007; Lynnerup, Jurik and Dalstra 2007).

Since the discovery of bog bodies new techniques for radiocarbon dating have been employed to date bodies using tissue and bone samples rather than predominately by pollen analysis of the peat layer the body was associated with (Tauber 1979; Gowlett *et al.* 1986; Otlet *et al.* 1986; van der Plicht *et al.* 2004). However, the radiocarbon dating of bog bodies has encountered problems along the way which needed to be mitigated, now it has been developed into a robust and reliable method to date the body (van der Plicht *et al.* 2004, 490).

Since the initial discovery of bog bodies in the eighteenth century (Mestorf 1871) scientific analysis has moved forward and has provided more detailed information on the body when re-examined (van der Plicht *et al.* 2004; Gill Robinson 2005; Nielsen *et al.* 2018; Asingh and Lynnerup 2007; Nielsen *et al.* 2018). However, the focus of research remained on the body itself, there was a continued disconnect between the bog body and landscape. Scientific analyses of bog bodies have shifted from establishing the cause of death, medical conditions and last meals for example, to reconstructing how the bodies may have looked, whether the skin had been marked with tribal tattoos and the effectiveness of conservation processes (Jones 1986; Taylor 1986 Neave and Quinn 1986; Scaife 1986 and 1995; Holden 1995 and 1997; Spiegelman *et al.* 1995; Prag and

Neave 1997; Gill Robinson 2005; Harild *et al.* 2007, 176-181; Boel and Dalstra 2007; Larsen and Poulsen 2007; Wilkinson 2007; Searcey *et al.* 2013; Nielsen *et al.* 2018).

A further example of scientific analyses on bog bodies, was research on Lindow II that involved analysis of skin for the presence of dyes specifically woad, to determine if the body was decorated with tattoos (Taylor 1986). In addition, analysis of Lindow II skin has revealed dermatological conditions were present at the time of death (Bourke 1986). Examination and analysis of Grauballe Man's skin determined the state of its condition after storage in relation to future preservation treatments (Larsen and Poulsen 2007). Another example of focusing on a narrow aspect of the body itself is using scientific information to create facial reconstructions of Lindow II by Neave and Quinn (1986), Grauballe Man by Wilkinson (2007) and the facial reconstruction of Yde Girl which was created by using a model of the skull from CT data by stereolithography by Prag and Neave (1997).

Since the publication of the monography by Stead *et al.* (1986) there have been only two palaeoenvironmental analyses of the landscape in relation to bog bodies: (1) the findspot of Lindow II (Cheshire UK) and (2) Oldcroghan Man (Clonearl bog, Co Offaly). Comprehensive palaeoenvironmental sampling mainly of the area immediately around Lindow II was carried out but the wider landscape context was not addressed (Stead *et al.* 1986, Barber 1986, Oldfield *et al.* 1986, Dayton 1986). Also, the wider landscape context of Oldcroghan Man on Clonearl bog, Ireland was not investigated (Plunkett *et al.* 2009). Both studies have concentrated on investigating the findspots of Lindow II and

Oldcroghan Man which were very localised in relation to the body within its wider cultural and physical landscape.

There have been only two previous attempts to look at the wider landscape context: (1) the Medieval bog body found in Tumbeagh bog (County Offaly, Ireland) and (2) Yde Girl (the Netherlands). The study of Tumbeagh bog body investigated the wider bog landscape which showed considerable variation in the shape and character of the bog through time (Bermingham and Delaney 2006; Casparie 2006). Subsequently, Bermingham and Delaney's (2006) systematic archaeological investigations of Tumbeagh bog body within its landscape has provided a good example of landscape archaeology with scientific analysis of the bog and bog body. Research has demonstrated important implications to consider in relation to the interpretation of Tumbeagh bog body in its landscape. Having established the form and character of the bog landscape it was demonstrated that Tumbeagh bog body became trapped in a very treacherous area of the bog accidentally whilst travelling across the bog on foot (Bermingham and Delaney's 2006; Casparie's 2006). An important aspect of a broader landscape approach by Bermingham and Delaney (2006) has shown that factors related to the deposition of bog bodies can be missed by solely concentrating on the investigation of the corpse.

Recent research carried out in the Netherlands by Van Beek *et al*. (2019) on the bog Yde Girl was found in was re-investigated and the wider physical and cultural landscape was reconstructed. The study was comprehensive, comprising of geomorphological analysis of the area, Ground Penetrating Radar survey and a borehole survey of the findspot (Van

Beek *et al*. 2019). Palaeoecological analysis established the vegetational history of the wider landscape in addition to surrounding cultural archaeological context (*ibid*). Van Beek's (2019) research provides significant information that improves understanding of Yde Girl's deposition in relation to the surrounding cultural landscape. Yde Girl was placed in a bog that was located 1km from a contemporary settlement, she was nearby but deposited in a distinct area away from cultural archaeology (Van Beek *et al.* 2019).

The landscape investigations of Tumbeagh bog body and Yde Girl have nudged the research focus outwards from the body to include its landscape and as a result the interpretation of their deposition in the bog has more impact and balance. However, despite research on Tumbeagh bog body and this year on Yde Girl showing the potential of investigating the wider landscape of a bog body many lack this perspective, perhaps these studies will provide a greater catalyst for more future studies of the landscapes of bog bodies. Understanding bog body deposition is still dominated by earlier research focused on examining the body.

Similar analyses of bogs have also shown the potential for modelling these environments and understanding the complex patterns of bog evolution was carried out on Hatfield and Thorne moors (Chapman and Gearey 2013). The main aim of Chapman and Gearey's research on Thorne and Hatfield Moors was to understand the formation and landscape development of the bogs (ibid). Additionally, three bog bodies were found in the wider area of Hatfield and Thorne Moors Chase but their exact locations within the bog were unknown (Turner and Scaife 1986, 216).

The example above shows the potential for investigating the landscape, obtaining data related to peat inception, palaeoenvironmental analysis to reconstruct past environmental changes on Thorne Moors and Hatfield which can be correlated to past human interaction and archaeology within both moors (Chapman and Gearey 2013).

Investigating the wider landscape and understanding the character and form of the bog has the potential to provide additional context to human remains found in bogs (Bermingham and Delaney 2006; Chapman and Gearey 2013; Chapman 2015). Through understanding factors such as the location of the body within its contemporaneous bog landscape our understanding of the deposition of bog bodies can be significantly increased and potentially re-interpreted (Bermingham and Delaney 2006; Casparie 2006; Chapman 2015). It is surprising given the potential for a wider landscape investigation of bog bodies to yield new data to contribute, and new interpretations to extend the debate on bog body deposition that very few bog body studies have employed this approach.

A significant imbalance in the research of bog bodies has been identified. Whilst this narrow approach on the body has been informative it has restricted interpretations of bog bodies placed in wetlands. Furthermore, repeated focus of investigation of the body has not shown the potential to consider new interpretations, in fact nothing new that provides a broader depositional history to the bog body has been gained from continued research of the corpse. The corpse is still investigated as an isolated object in the bog.

The bog body debate has not really moved forward when adhering to the same formula of re-evaluation of the bodies themselves. Furthermore, investigation of the findspots of Lindow II and Oldcroghan Man have been very valuable but have not been extended to the wider landscape and fail to connect the body with the wider landscape. It is time to move the academic debate forward and address the gap in bog body research. This narrow focus on the body and the findspot is perhaps not surprising since the exceptional levels of preservation provide unparalleled opportunities for understanding the lives and deaths of these individuals. Consequently, it is appropriate to extend further research to consider the landscape setting of bog bodies in order to generate new data related to their wider landscape and to help understand the mechanisms of how these bodies came to be in the bog. Furthermore, researching the wider landscape enables an understanding of the bog body in relation to surrounding cultural archaeology. Ultimately, with additional data generated from a landscape investigation it will contribute to a new perspective on the interpretation of bog bodies.

The research presented in this thesis aims to address this imbalance in previous research and investigate the landscape archaeology of Lindow II from Lindow Moss, Cheshire and Tollund Man from Bjældskovdal bog, Denmark.

1.2 Research Aims and Objectives

In previous studies of bog bodies, the wider archaeological context and wider landscape environment have not been studied. By undertaking a new approach to bog body research evaluating, surrounding cultural archaeology, recording surface stratigraphy, basin shape and how far from the contemporaneous edge the bog bodies were located there is the potential to address the narrow focus of bog body research which to date as stated in section 1.1 has concentrated on the body itself and the findspot.

The research aim of this thesis was to understand the wider landscape potential of bog bodies. To evaluate the wider cultural archaeological evidence and to have a better understanding of their deposition in relation to their cultural landscape. It is also to see what this approach contributes to understanding and interpretation of bog bodies.

1.3 Research Objectives

The research aims were achieved by the following objectives. Objectives 1-3 reflect the natural landscape and objective 4 the cultural landscape.

1. To determine the morphology of the pre-peat landscape
2. To understand the development of the bog landscape through time
3. To reconstruct the shape of the bog basin and identify the positions of the bodies within it
4. To Interpret the relationships between the human remains within the bog and wider cultural activities as revealed from previous archaeological study.

In order to address these aims fieldwork was carried out at two sites, both chosen due to there being multiple bog body finds in each case. These were Lindow Moss, Cheshire, UK and Bjældskovdal bog, Denmark.

1.4 Summary of Chapter 1

In this chapter an outline of previous bog body research has been presented, which has to date concentrated on the scientific analysis of the body itself and the limited analysis of the findspot. Limitations of the narrow focus of bog body research has been highlighted and through this a research design has been employed.

1.5 Thesis Structure

In chapter 2 there is an overview of Iron Age settlements, burial practices, weapons hoards and votive deposition in Britain and Denmark. Then historiography of bog body research is presented which explains the background of the development of bog body research from the 18th century. The historiography in chapter 2 is followed by previous and current research on bog bodies in north west Europe highlighting the limitations of research so far as the disconnect between the body and landscape is concerned.

In chapter 3 the methodology employed to achieve the aims and objectives stated in chapter 1 are described.

Chapter 4 presents the two sites selected for case studies to test the potential of the aim of the thesis. The background of the two selected study sites include previous research, archaeology found on each bog and their environment.

In chapters 5 and 6 the results are reported for both sites; the data is presented demonstrating what has been learnt from carrying out the aims and objectives set out in chapter 1.

Chapter 7 is the discussion, which evaluates the results in relation to the aims and objectives and assesses the new approach for bog body research. Chapter 7 also explores the potential of a landscape approach to bog body research and its limitations.

In chapter 8 the conclusions state what has been learnt through this thesis and if researching the wider landscape has potential and also recommendations for future research are presented.

CHAPTER 2

2.1 Introduction

The first part of this chapter briefly outlines the background to the Iron Age in Britain and Denmark, providing an overview of settlements, burial practices and weapon hoards and votive deposition for context to this study. The diverse, rich and copious data for the Iron Age for both Britain and Denmark are far too vast to include in this study, so a succinct summary is given for background information. The second part of the chapter describes the scientific research that has been carried out on bog bodies in north west Europe and the British Isles. The limitations outlined in chapter 1 have identified the lack of wider landscape research of bog bodies and that studies have concentrated on investigating the scientific analyses of the preserved corpses and the findspot. Whilst research of the wider landscape context of bog bodies is severely lacking, a detailed appraisal of historical bog body research clearly demonstrates this gap in landscape context.

The beginning of chapter 2 provides a background of the Iron Age period in Britain and Denmark focusing on three key themes. Chapter 2 is then structured around the research that has been done and this highlights the focus on the bodies and findspots. Past scientific studies on bog bodies have demonstrated what has been found out about the body. Interpretations have been formed from the data that the bodies have revealed, this is evident in the previous research that has been presented below. There is a noticeable gap between the body and wider landscape relationship identified in the previous research presented below and stated in chapter 1 which has not been explored.

The early bog body investigations and interpretations provide a background spanning the 18th to 21st century and demonstrate that interpretations of how and why bodies came to be in the bog were mainly based on the ideas of sacrifice and punishment of deviant behaviour. The historiography provides an overview of the early approaches to bog body study.

An outline of modern scientific approaches into the understanding and interpretation of bog bodies is presented which flourished when Lindow II was discovered and the monograph by Stead *et al.* (1986) was published. Scientific investigations of bog body finds have demonstrated how interpretations relating to their deposition have a narrow perspective as the body is continually the focus of investigation and interpretations were based on these results.

This chapter begins with a broad overview of the Iron Age in Britain in 2.2, concentrating on settlements, burials and weapon hoards. This is followed by an appraisal of the Iron Age in Denmark again examining settlement trends, burial and weapon hoards in 2.3 and is summarised in section 2.4. Analysis of early investigations and interpretations of bog bodies gives background to research from the 18th century onwards follows in section 2.5.

Section 2.6 outlines modern scientific approaches into the understanding and interpretation of bog bodies which overviews the medical research which has been undertaken on bog bodies from 1980 onwards. A corpus of material is presented of extensively researched bog bodies which have been included in section 2.6. They range from whole bodies to partial remains such as heads.

Previous studies that have carried out, forensic and medical investigations on bog bodies to identify injuries inflicted on the body and establish how they may have died is presented in section 2.7.

An outline of some problems encountered investigating injuries on bog bodies is presented in 2.8. These emphasise the difficulties surrounding interpretation of injuries identified on the corpse.

The general medical examination of bodies, information about individual bog bodies, their general state of health and congenital abnormalities are assessed in section 2.9,

followed by section 2.10 beyond the body, which looks at research that gains information about the landscape derived from the body and associated objects. The corpus of bog body material included in section 2.10 is different to those included in section 2.6.

Section 2.11 outlines the interpretations that have been generated from scientific analyses of the bog bodies and shows how very little research has been carried out on the landscape context of bog bodies.

The conclusions of chapter 2 are outlined in section 2.12 demonstrating the limitations and major issues that have been identified from the evaluation of previous bog body research.

2.2. The Iron Age in Britain

The next section outlines the Iron Age in Britain. Examining three main themes, settlements, burial practices and weapon hoards and votive deposition.

2.2.1 Iron Age Settlements in Britain

The complexity of Iron Age settlement patterns throughout Britain is not fully analysed in this section, a brief overview is presented for context. Palisaded enclosures were a common characteristic of settlements during the Iron Age and these varied in size (Cunliffe 2005). These were settlements enclosed by fences that were embedded in palisade trenches (Cunliffe 2005). For example, Little Woodbury, Wiltshire, excavations showed the first phase of the farm was enclosed by a palisade, the second phase of its development demonstrated the palisade was replaced by the ditched enclosure (Cunliffe 2005). Excavations of a few British hillforts have shown the pre-existence of palisaded enclosures at Danebury, Hampshire; Quarley Hill, Hampshire; Blewburton Hill, Oxon; and Wilbury, Hertfordshire (Cunliffe 2005).

By the middle Iron Age palisade enclosures were replaced by earthwork-enclosed settlements, characterised by a ditch enclosing the settlement with usually one entrance (Cunliffe 2005). A good example is Gussage All Saints, Wilts, its first phase of development comprised of a ditch that was 1.2m wide and 0.8m deep the size of the ditch increased to 2.2m wide and 1.4m deep in the second phase (Cunliffe 2005). Within the enclosure evidence of pits and four post structures in the first phase and circular huts in the second (Cunliffe 2005). Less common were banjo enclosures, these were found in Wessex and the Cotswolds and were usually located as single sites, it has been suggested by Cunliffe (2005) they were mainly used for animal husbandry.

Iron age settlements patterns in south eastern Britain mainly comprised of open villages (Cunliffe 1995; 2005; Haselgrove 1999;). The sizes and types of settlements varied, large farms and hamlets dominated this region (Hill 2017). Some settlements contained 3-4 round buildings such as, Twywell, Northamptonshire; and Wardy Hill, Cambridgeshire (Jackson 1975; Evans 2003). Whilst larger settlements may have been occupied seasonally, comprised of 10-12 buildings at Cat's Water, Fengate and 10-20 round buildings at Dragonby, Lincolnshire (Pryor 1984; May 1996).

In the Somerset levels a unique settlement was built on the wetlands during middle and late Iron Age on a foundation of brushwood and large timber with rubble and clay packed into it (Cunliffe 2005). Glastonbury Lake Village consisted of approximately eighty circular buildings and was surrounded by a timber palisade which stabilised the manmade island (Cunliffe 2005).

In contrast, in western Scotland, the Hebrides, Orkney and Shetland Iron Age settlements were stone built brochs and duns (Cunliffe 2005). Brochs are categorised as Atlantic roundhouses reaching at least 9m in height built with stone lintels laid vertical every 1.5-1.8m (Cunliffe 2005). Some brochs were located within substantial settlements such as, Gurness of Orkney (*ibid*). The brochs of Shetland were located near to the sea and fertile land for agriculture, research has indicated brochs were self-sufficient and may represent potential economic territories on Shetland (Cunliffe 2005).

Duns were dry-stone walled enclosures with walls approximately 3m high (Cunliffe 2005). Another type of structure identified in this region apart from on Orkney was the wheelhouse, a circular stone house with an interior that subdivided by short radial piers protruding out from the wall with open space in the central area (Cunliffe 2005).

In Britain there were regional differences in type and sizes of Iron Age settlements and within these regions there were further distinct local styles of buildings and social structure (Cunliffe 2005). In most regions settlements evolved through time, perhaps reflecting a growing population, changes in land use or social and territorial restructuring (Cunliffe 2005).

2.2.2 Hillforts

Hillforts are impressive fortified settlements usually located on hilltops, promontories and ridges, they were bounded by circuits of banks and ditches surrounding the settlement (Cunliffe 2005; Oliver 2011; Bowden 2018). The scale, organisation, representation of different manual labour, skills, and beliefs of a large Iron Age community suggest a complex social structure, reflecting group cohesion and negotiation of power (Willis 1997; Cunliffe 2005; Oliver 2011; Bowden 2018). Each hillfort functioned individually and reflected the social group of that area, at Cadbury Castle there was evidence of warfare whereas, other hillforts contained very little explicit evidence to indicate participation in warfare (Bowden 2018).

In the south east of Britain hillforts started to diminish in use and were replaced by enclosed oppida (Cunliffe 2005). These were settlements surrounded by defensive earthworks and situated in river valleys and close to significant rivers to control access across them, for example, Dyke Hills, Oxon, was situated near the rivers Thame and Thames (Cunliffe 2005).

2.2.3 Burial Practices in Britain

In Britain burial rituals during the Iron age show variation and changes through time representing regional practices and external influences (Whimster 1981). During the late Bronze Age, the dead were cremated, and ashes were buried sometimes in urns and unurned in cemeteries often situated close to earlier barrows (Cunliffe 2005). By early Iron Age cremation was no longer a dominant burial rite, complex burial rituals shifted to inhumation and excarnation which were practiced across Britain (Cunliffe 2005).

Whimster (1981) separates inhumation practices into pit burials distinct in central southern England; inhumations in southern Dorset; cist burials in south-west England and La Tène inhumation in east Yorkshire. In northern and western areas of Britain variations of inhumation rites were practiced (Whimster 1981).

In the south east of Britain, a unique burial rite was implemented during the late second century BC which lasted until the Roman invasion (Cunliffe 2005). These were a distinctive group of male elite warrior burials with weapons in single graves that were not located near earlier barrows and rich female burials with mirrors, beads and bronze bowls (Collis 1973; Farley 1983, Cunliffe 2005).

Human remains were excarnated and deposited in pits, ditches or occupation rubbish within settlements consisted of whole burials, partial and articulated bodies, animal remains, human skulls and also parts of human bones. (Hill 1995; Whimster 1981; Cunliffe 2005). For example, at Wandlebury, Cambridgeshire, the body of a child minus both legs was deposited in a pit (Hill 1995; Whimster 1981; Cunliffe 2005). Whilst at Danebury, Hampshire, human limbs and parts of a human torso were deposited in pits occasionally, three legs were found in an elongated pit with a lower jaw and part of a trunk, this pit had lain open for a period of time (Cunliffe 2005). At Danebury animal remains received special ritual treatment, animal burials were also found at Winnall Down, Bury Hill and Maiden Castle (Harding 2016). Complete human articulated remains have been placed in disused storage pits in hillforts and open farms throughout the south east (Cunliffe 2005). High proportions of adolescents were represented in pit burials at Danebury and human remains were not confined to pits, so pit burials have been interpreted as a special burial rite (Harding 2016).

Whereas, inhumations in cist burials were practised in the south west area of Britain, for example, at Harlyn Bay and Trevone, also at Trelan Bahow near St Keverne which contained a grave of a wealthy female accompanied by a bronze mirror, two bracelets, rings brooches and a blue beaded necklace dated approximately to the first century AD (Cunliffe 2005). Cist burials in the south west of Britain showed a regional burial practice that was unique to this geographical area (Cunliffe 2005). Generally, the bodies were buried in a crouched position in graves lined with stone slabs, the location for cist burials were usually in view of the sea (Cunliffe 2005). Cists burials have been identified scattered around other parts of Britain, such as in Wales at Cerrig y Drudion and Scotland at Cairnconan cemetery (Cunliffe 2005).

In east Yorkshire a distinct regional burial practice began in the late fifth century which is generally referred to as the Arras culture which shares comparable cultural associations with the burial traditions of northern Gaul (Dent 1985; Stead 1991). The Arras burials in Yorkshire represented three different ritual practices: groups of small barrows in large cemeteries, vehicle burials and individual barrows that were surrounded by a rectangular ditched enclosure (Cunliffe 2005). Examples of barrow cemeteries are Eastburn which contained 75 burials, Scorborough Park (170), Danes Graves (500) and Burton Fleming (500+) (Cunliffe 2005). In most burials grave goods were absent, a few had brooches and food, richly furnished burials were less common as were vehicle burials (Cunliffe 2005).

Vehicle burials have been excavated at Danes Graves, Garton Slack and Wetwang Slack, burial 1 at Wetwang Slack was of a male accompanied by seven spears, a sword, iron shield coverings, a harness fittings, chariot and forequarters of a pig (Cunliffe 2005). Burial 2 at Wetwang Slack contained a chariot, harness fittings, mirror, decorated bronze box, a gold and iron pin embellished with coral, with two forequarters of a pig lying over the abdomen of the corpse (Cunliffe 2005). Cunliffe (2005) suggests that the vehicle rite was connected to status rather than gender as burial 2 contained female objects and burial 1 weapons. The vehicle burials of Wetwang Slack and Garton Slack were examples of elite burials in much larger cemeteries, the Yorkshire burials show specific ritual practices and differences in status within this region (*ibid*).

Burial practices throughout Britain during the Iron Age were complex and varied (Whimster 1981; Cunliffe 2005; Harding 2016). Three distinctive burial rites were identified: in the west inhumations in cists, Yorkshire inhumation in barrow cemeteries, whilst in central and south excarnation followed by burial was practiced (Whimster 1981; Cunliffe 2005; Harding 2016).

2.2.4 Weapon Hoards and Votive Deposits in Britain

During the Iron Age in Britain weapon hoards, cauldrons, objects, ornaments, skulls and sometimes bodies have been found in a variety of contexts such as, bogs, wetlands, rivers, settlements, hills, beaches, caves and lakes (Coles and Coles 1989; Hunter 1997; Cunliffe 2005; Van de Noort and O'Sullivan 2006; Schulting and Bradley 2013; Bradley 2017). During the late 7th century BC a significant hoard was discovered buried in the peat at the bottom of a very old lake at Llyn Fawr, Glamorganshire (Cunliffe 2005). A variety of objects were deposited, seven bronze axes four of which were locally crafted, three sickles, three chisels, two bronze cauldrons, iron spearhead and two Hallstatt razors (Cunliffe 2005). The two bronze cauldrons suggest associations with Atlantic connections based on typology (*ibid*). At Llyn Cerrig Bach, Anglesey a large hoard of La Tène metalwork, chariot-wheel tyres, 2 slave chains, 5 currency bars, fragments of 3 bronze cauldrons and animals remains were deposited in a boggy pool over a period that probably spanned several hundred years (Parker Pearson 2003; Macdonald 2007). The majority of weapons and artefacts found at Llyn Cerrig Bach are dated approximately between 4th century BC and AD 50 and probably represent a series of depositions with significant periods of time with no deposition of material (Parker Pearson 2003; Macdonald 2007). Macdonald (2007) has postulated that Llyn Cerrig Bach parallels Skedmose, Denmark, because the radiocarbon dates of animal bones deposited at Llyn Cerrig Bach have indicated that animals were sacrificed long before the deposition of metalwork took place. The artefacts deposited at Llyn Cerrig Bach generally parallel the weaponry found at Fiskerton but the slave chains, currency bars and chariot fittings are distinct to Llyn Cerrig Bach (Parker Pearson 2003).

Eastern Lincolnshire is well known for its wet environment dominated by fen and marshland, this region has a distinct identity rich in the deposition of weapons during the Iron Age (Farley 2011). Weapons have been deposited in the River Witham from three prehistoric causeways: Stamp End, Fiskerton and Barlings Beau, of these Fiskerton is the only one that has been fully excavated (Field and Parker Pearson 2003). The weapons at Fiskerton were dropped into the water close to the causeway or underneath, 152 objects were dated to the Iron Age and later Roman period based on typology, possibly 3 objects date from the medieval period (Parker Pearson and Field 2003). There were 17 weapons deposited, 6 swords, one with coral inlaid into the sword hilt, 11 spearheads, 3 objects that were parts of shields and a scabbard, 55 bone spearheads, woodwork and metalworking tools, ceramics, coins and ornaments (Parker Pearson and Field 2003). The swords were decorated with La Tène style motifs which date them broadly to the mid fifth century BC to the early first century AD (Parker Pearson and Field 2003).

The majority of the Iron Age artefacts deposited at Fiskerton are exceptional, especially the La Tène material which are a unique feature of Fiskerton (*ibid*). The distinctive material from Fiskerton has been interpreted as representing a male focused ideology strengthened by their elite status, in contrast the Iron Age ceramics, personal ornaments and a number of the tools have been recognised as belonging to the female domain (Parker Pearson and Field 2003).

In contrast, at Flag Fen the chronology of the deposition of material is generally earlier than at Fiskerton, deposition of artefacts dated to 1300-900 BC at Flag Fen, a number of early Iron Age artefacts were dated to approximately 800-300 BC (Pryor 2005). The Flag fen artefacts deposited in the early Iron Age are quite distinct in comparison with Fiskerton finds as at Flag Fen they comprised of fibulae, swan's neck pins, a spiral ring, , bronze shears and socketed axe (Coombes 2001).

Votive deposits have been found in caves such as, Wookey Hole, the Iron Age artefacts consisted of 5 spears, dagger, dagger handle, iron arrow heads, a La Tène II-III brooch, 3 currency bars, 6 drills, billhook, sickle 7 bronze objects, glass bead and silver earring 2 querns, combs, bone tools, Iron Age pottery and 20 finds of human remains are just a few of the material deposited in Wookey Hole cave (Parker Pearson 2003).

2.3 The Iron Age in Denmark

The following sections provides a background to the Iron Age period in Denmark. Concentrating on three themes, settlements, burial practices and weapon hoards and votive deposition

2.3.1 Iron Age Settlements in Denmark

Two factors seemed to influence the locations of Iron Age settlements; firstly, 80-100% of village land within 1km was arable (Hedeager 1992). Secondly, settlements were situated close to wetlands that provided winter fodder for animals (Hedeager 1992).

Direct access to water was less important as wells were common within settlement sites (Hedeager 1992). The majority of early Iron Age settlements consisted of approximately 5-13 small farmsteads, for example, the village of Grøntoft in west Jutland (Hedeager 1992). Each farmstead comprised of 50-75sq m half of which was a dwelling place for the family (Hedeager 1992). The farmsteads were orientated with the dwelling area to the west and stalls to the east (Hedeager 1992; Fischer 2012). This enabled one long side of the farmstead to face south and benefit from the warmth of the sun, whilst ensuring protection against westerly winds (Hedeager 1992). Most settlement buildings were rectangular, the earliest structures at Grøntoft were 3.5-4m wide and 7-11m long (Hedeager 1992). Although the largest farmstead measured 16m long (*ibid*).

The wall construction of the farmsteads vary across regions, probably dependent upon available materials (Hedeager 1992). Walls were usually built with wattle and daub or turf, in some instances complete timber walls have been built (Hedeager 1992). Double timber post rows provided support for the weight of the roof (Jensen 1982; Lund and Nielsen 1982; Hedeager 1987; 1992). The village of Grøntoft during 500-300 BC was a group of farmsteads in open countryside; in the later phase 300-200 BC the farmsteads of the village were enclosed by a fence, but other sites varied, and some were not enclosed (Jensen 1982; Hedeager 1987; Hedeager 1992).

By the late Roman Iron Age farmsteads increased significantly in size by double or triple compared to earlier ones (Hedeager 1992). In Vorbasse the length of the long houses varied from 20m to 48m, the largest were generally 30-48m and smaller ones were 20-30m (Hedeager 1992). The longhouses in Vorbasse now had up to five rooms and stalls to the east whereas, at Grøntoft the early Iron Age longhouses were divided into two rooms (Hedeager 1992). The nature of the village evolves, individual farmsteads became enclosed by fences and were located side by side (Hedeager 1992). Common land was no longer a feature of the village, at Vorbasse farmstead enclosures were of an area approximately 2,500sq m (Hedeager 1992). The enclosure contained the longhouse in the central area and usually one ancillary building near the fence (*ibid*). Each farmstead was now significantly larger with more inhabitants and became economically independent (Hedeager 1992). The majority of farmsteads had more livestock and increased efficiency of craft and production, iron extraction, smithing, weaving and the building was established and improved (Hedeager 1987; 1992). The old field systems were replaced by more intensive farming methods with shorter cycle of crop rotation which required much more manure for enrichment and cultivation (Hedeager 1987; 1992). The rotary quern replaced the saddle quern and facilitated grinding of larger quantities of corn (*ibid*).

Pollen diagrams showed there was Rye present, although it was not clear whether this was widely cultivated, in the east was open pasturelands and fields which were reforested after the fourth century AD (Hedeager 1987; Robinson and Siemen 1988; Hedeager 1992). In the west forests declined and heath areas became more predominant (Hedeager 1987; Robinson and Siemen 1988; Hedeager 1992).

2.3.2 Burial Practices in Denmark

In different cultures it was believed that the soul or spirit of the dead was set free from the body through transformation by fire of the body to smoke and burnt bones (Fischer

2012). During the Pre-Roman Iron Age cremation rite continues to dominate in some areas of Denmark but in others was succeeded by the new inhumation rite (Hedeager 1992). Both burial rites varied greatly from region to region (Hedeager 1992). Cremation consisted of the body being burnt on a funeral pyre and the remains were usually crushed into smaller fragments, debris from the pyre and remains of the bones were either deposited in an urn or buried in a pit (Fischer 2012). Cremation and inhumation were practiced alongside each other, variations of both burial rites have been identified, for example, burnt bones were put in coffins and treated like inhumations of whole bodies and sometimes accompanied by grave goods (Fischer 2011).

In the early Roman Iron Age cremation dominated southern Jutland, Iron Age cemeteries containing approximately 1,500 burials have been identified, each urn or burnt remains were covered by a mound of earth and were usually discernible with a ring ditch (Fischer 2012). In south Jutland 90% of graves consisted of cremation burials (Hedeager 1992). Whilst, in north Jutland around the area Tollund Man was found there were no cemeteries which parallel south Jutland (Fischer 2012). The burial grounds were significantly smaller perhaps representing family cemeteries which may have been in use for a few generations (Fischer 2012). The graves were covered with stones in a circular shape then a low mound was formed, the diameter was generally no more than 10m (Fischer 2012). Each circular stone grave contained ash and burnt human remains of several individuals (Fischer 2012).

By late Roman Iron Age cremation rites only dominated Vejle, Skanderborg and Fyn, in contrast inhumations were the main burial rite in Viborg, Sjælland and Randers

(Hedeager 1992). The forms of inhumation burials were distinct across different areas of Denmark for example, north Jutland there were inhumations graves with unusual tent type structures (*ibid*). Whereas, in east Jutland large plank coffins with a frame of reinforcing stones, known as the east Jutlandic pot graves and in contrast, long narrow stone-packed cuts with log coffins were found in south Jutland (Hedeager 1992).

Variations across regions were not so marked with cremations, urn graves, cremation pits and cremation patches as these were found in all places but their quantities in relation to each other was diverse (Hedeager 1992).

Hedeager (1992) suggests that the diverse burial rites across Denmark were a characteristic of funerary rituals that were used to reinforce regional and local identity, similarities and differences.

2.3.3 Weapon Hoards and Votive Deposits

Many lakes and Peat bogs in northern Europe were the focus of sacred ceremonies and deposition of pottery, farm tools, animals, ornaments, boats, weapons and sometimes bodies (Glob 1969; Hedeager 1992; Todd 1992; Kaul 2003a; Asingh 2007; Fischer 2012). A votive deposit is defined as an offering made to supplicate, thank, appease, and gain success/fertility from the gods and goddesses (Darvill 2002; Asingh 2007; Fischer 2012). The main emphasis of votive deposition evolved through time perhaps to reflect the changing social structure and political and military development towards control of larger areas of territory (Hedeager 1992). Earlier votive deposits were pottery probably containing food and may have been fertility offerings (Kaul 2003a; Andersen 1996). As well as offerings of pottery, deposition of farming equipment, human and animal bones, whole tethered animals, quartz stones were offered in bogs sometimes placed around anthropomorphic figurines such as the Foerlev Nymølle goddess (van der Sanden 1996; Kaul 2003a; Asingh 2007; Fischer 2012).

By Late Roman Iron Age votive deposits showed a shift to large weapon deposits (Hedeager 1992). The majority of weapon hoards in Denmark are found along the eastern coast of Jutland, at Nydam bog, Sundeved, approximately 13,000 objects were found which represented six offerings (Jørgensen and Vang Petersen 2003; Nielsen 2016). Three offerings were associated with boats that had been placed in the lake well before the weapon hoards were deposited (Hedeager 1992; Nielsen 2016). The majority of objects recovered from Vimose, Odense, were mostly weapons and military equipment, approximately 5700 objects were found and represented eight war booty offerings (Hedeager 1992; Jensen 2003b; Nielsen 2016). Numerous weapons were deliberately damaged or destroyed prior to placement in the bog, although it was evident that the weapons had been used actively in battle (Hedeager 1992).

By 400-600 AD votive deposits showed a noticeable shift to large quantities of gold jewellery (Hedeager 1992), for example the gold hoard from Broholm, Funen, which contained gold arm rings, necklaces, bracteates, finger rings, fibulae of exquisite designs (Hedeager 2011).

2.4 Summary of Iron Age Britain and Denmark

The types of settlements in Britain were strikingly diverse in each region throughout the Iron Age period. Settlements were located in both wetland and dryland contexts. The various types of settlements represented throughout Britain also reflected the complex social structure of the communities they represented (Willis 1997; Cunliffe 2005; Oliver 2011; Bowden 2018). In contrast, settlements in Denmark were mainly farmsteads that evolved in size and form through time which varied from region to region (Hedeager 1992). Burial rites in Britain were more diverse during the Iron Age, the two main rites were inhumation and excarnation, regional differences have been classified together with external influences from Europe (Whimster 1981). There were two main burial practices in Denmark, inhumation and cremation, variations of both rites were classified across the different regions (Hedeager 1992) There were more deviations of inhumation burial rites than of cremation (Hedeager 1992). Burial rites were more complex and varied throughout Britain in contrast to Denmark, three types of burial practices have been categorised in three different regions in Britain (Cunliffe 2005). In Britain weapon hoards and objects have been discovered in wetland and dryland environments, their assemblages have been exquisite and diverse, some artefacts demonstrating European associations with la Tène style metalwork. In contrast, the landscape of Denmark is densely packed with ritually deposited weapon hoards and votive objects of outstanding quality throughout the Iron Age period. Initial offerings were simple and eventually changed to large depositions weapons and objects. The following section outlines the historical development of bog body investigations in northern Europe.

2.5 Early Bog Body Investigations and Interpretations

The intention of this section is to provide a historiography of bog body research. The first systematic investigation of a bog body find was carried out by Countess Moira in Drumkeeragh, County Down, Ireland. She gathered information related to the burial context and recovered textiles and plaits of hair from her tenant who found the body (Rawdon 1785). Analysis of the textiles was undertaken to provenance the garments. It was suggested in her letter to John Theophilus Rawdon, that Countess Moira believed the Drumkeeragh bog body found on her estate had perhaps been involved in a druid ceremony (Rawdon 1785, 91, 109). Countess Moira accurately described the findspot in detail and the associated textiles were compared to clothing from Europe and Phoenicia (near east) (Rawdon 1785, 99). Lady Moira attempted to establish a chronology of the bog body by trying to match the style of textiles to ones described in primary texts and by also examining the findspot, she deduced that the body was buried a considerable time ago.

A topographical survey of east Friesland and Harlingland was carried out 44 years later by F. Ahrends in (1824). In Ahrends' (1824) topographical survey which included the bog body of Marx – Etzel man who lay underneath 2 crossed posts (van der Sanden 1996, 49). Ahrends' (1824) theory that the Marx-Etzel body represented a link to Tacitus' text was the first association with Tacitus' *Germania*, which has been interpreted to imply tribes immersed *corpore infames* (homosexuals), *imbelles* (deserters) and *ignavos* (*cowards*) in bogs and covered them with wooden hurdles, additionally, 'hanging deserters and cowards' (Tacitus 12.2-7).

Tacitus (12.7) makes the point that 'shameful deeds' should be concealed away from the public, which seems to emphasise the isolation of the locations of bogs for indiscrete behaviour. Hence, the inception of the theory linking bog bodies which were secured in the bog by stones, hurdles or stakes were related to Tacitus' *Germania*. Ahrends' (1824) interpretation and association to Tacitus' *Germania* is quite polarised as it has failed to consider the limitations of primary texts and together with the lack of systematic investigation like the Countess of Moira previously carried out, it fails to be a balanced approach.

In 1871 the first catalogue of bog bodies was published by Johanna Mestorf and she was the first archaeologist to use the term 'bog body' and believed initially the individuals were executed prisoners (van der Sanden 1996, 49, 2013, 405). Over a period of 36 years Mestorf's interpretations of bog body deposition evolved from execution, murder and natural death to individuals executed according to Tacitus' text (Ravn 2010, 108). Further bog body catalogues were updated and published by Mestorf (1873) and Heinrich Handelmann and Adolf Pansch (1873). This was followed by another amended survey of bog bodies by Johanna Mestorf in 1900 and 1907 (Handelmann and Pansch 1873, Ravn 2010, 108, van der Sanden 2013, 405). Publications of bog body finds, and their associated artefacts were documented by Hans Hahne in 1918 primarily to date the inception of the *Grenzhorizont* which was a 'recurrence surface', indicating rapid change in the bog environment from dry to very wet conditions Godwin (1981). By using the stratigraphy of bog bodies, Hahne (1918) anticipated that datable objects associated to bog bodies found *in situ* would help establish the formation of the *Grenzhorizont*.

Hahne's (1918) research posited that bog body deposition in north Europe demonstrated a cohort of culturally and chronologically discrete phenomena. Hahne's (1918) approach has indicated that from a very polarised focus of interpretation as stated above by Ahrends (1824), a wider geographical perspective was insightful.

Furthermore, in 1922 Karl von Amira widened and expanded Mestorf's interpretation and suggested that bog bodies were propitiatory sacrifices to deities (von Amira 1922). Von Amira (1922) argued that the lack of garments, extreme violence inflicted on the body and the unusual disposal of the corpse supported his theory of sacrifice to disgruntled deities. von Amira's (1918) viewpoint on bog body deposition refocuses our attention from the geographical patterns (above) to theories on why these bodies came to be in the bog.

During the Nazi era (1933 – 1945) archaeology was used as a propaganda tool in Germany. The Nationalist Socialist party actively sought to redefine prehistory as Germanic and by linking German descent to direct lineage with the Proto-Germanic race, it historically gave them rights to these areas (Kossina 1926, 126; Schwantes and Kossina 1935; Lund 1996; Lund 2002; Leube 2007, 94). By 1935 Professor and SS Untersturmfürhrer Karl August Eckhardt interpreted that Tacitus' text in chapter 12 *Germania* referred to *corpores infames* (homosexuals) (Ravn 2010; van der Sanden 2013). He went further and published a newspaper article boldly stating that Germans guilty of cowardice, traitors, and homosexuals would be sacrificed in bogs to appease the gods (Lund 1995, 65). This concept was used as a basis to implement a campaign by Heinrich Himmler, Rudolf Klare and Professor Hermann Hoffmeister who lobbied for punishments for homosexuals (Lund 1995, 62). This ultimately culminated in Adolf Hitler creating a law that sentenced homosexuals in the Waffen-SS and police to death, whereas, other homosexual individuals were incarcerated in concentration camps (Lund 1996). In Germany, archaeology was used to advance their Nazi conquests and theories of bog body deposition were linked to modern society in order to manipulate and cleanse the German population from perceived weaknesses in behaviour.

Alfred Dieck researched bog bodies in the 1930's, and for approximately 50 years he catalogued physical, oral and paper bog body finds. Oral and paper finds were bog bodies recorded orally or documented that no longer exist (Dieck 1965, 1986; Eisenbeiss 1994). Dieck was a member of the Nazi party but did not share their theories on bog body deposition, Dieck did not align himself with the Nazi party interpretation; he suggested that bog bodies were geographically widespread and were not restricted to one period (Dieck 1965, 9-10). At the time Dieck was regarded as an expert in bog body studies, but it has since been established that Dieck may have embellished factual finds and fabricated several bog body finds (van der Sanden and Eisenbeiss 2006). For example, it was discovered that he changed the text documenting a find of a hafted axe so it could be read as a bone from a bog body (Eisenbeiss 2003, 147; van der Sanden and Eisenbeiss 2006). Furthermore, manipulation of data, invention of finds and failing to evaluate bog body evidence in a critical manner highlighted the need for extreme caution when using references to Dieck's work (Eisenbeiss 1994; Eisenbeiss 2003; van der Sanden and Eisenbeiss 2006). The historiography of Alfred Dieck has emphasised that even if you have the passion to investigate an interesting subject, there is a need to critically evaluate sources of data in a methodical way to obtain truth and accuracy.

A new interpretation of bog body deposition was posited by Elise Thorvildsen in the 1950's (1952) who associated bog body finds with sacrificed objects deposited in bogs. Thorvildsen (1952, 44) returned to the idea that bog bodies were sacrificed to the gods. Until this point in the history of bog body research the punishment theory prevailed, Thorvildsen's (1952) interpretation gave a different perspective to consider.

In 1965 archaeologist P. V. Glob published *Moselfolket Jernalderens mennesker bevaret I 2000 År* which translates to 'The Bog People Iron Age Man Preserved for 2000 Years'. An English translation came into print in 1969 ('The Bog People Iron Age Man Preserved'). Interest in bog bodies piqued with these investigations carried out by archaeologist P. V. Glob (1969) by a combination of fieldwork and scientific investigations. His book was mainly about Tollund and Grauballe man, but other bog bodies were included such as, Windeby I and Borremose bodies 1946 (man), 1947 (woman I), and 1948 (woman II) (Borremose bog bodies are referred to and identified by their year of discovery or man, woman I or II). In addition, he related the placement of bog bodies to artefacts deposited in bogs, such as the Gundestrup cauldron, thus enabling a wider more contextual interpretation (Glob 1969). One of the reasons for the success of this book was that it was rapidly translated into English, and this accessibility enabled a broader range of scholars to engage with the subject for the first time.

In Glob's view, bog bodies which were placed in bogs were sacrificed to the gods Nerthus, mother earth or Odin (Glob 1969, 112 – 132), whilst some bog bodies were the result of murder and accidental death (Glob 1969, 109 – 110). Theories of the sacrifice of bog bodies continues to thrive and have dominated this area of research.

In 1979 Christian Fischer studied the geographical relationship between bog body finds and pottery and objects placed in peat bogs and suggested that both types relate to activities in the bogs (Fischer 1979). Subsequently, Fischer interpreted the deposition of bog bodies, pottery and objects as thank offerings to a god or gods (Fischer 1979). In his book Tollund Man Gift to the Gods (Fischer 2012) which was previously published in Danish in 2007, he suggested that hanged bog bodies were sacrificed to Odin, god of the hanging cult of the Ase religion (Fischer 2001; Fischer 2012, 180-181). For example, Tollund Man, Elling Woman, and Huldremose Woman were hanged and supported Fischer's (2012, 180) interpretation. Christian Fischer sought to provide a wider context to bog body studies by looking at the geographical associations between bodies and objects in peat bogs to understand them better.

The discovery of Lindow II in the 1980's, and its comprehensive medical and palaeoenvironmental investigation, led the way to new developments in approaches to researching bog body burials (Stead *et al.* 1986). For example, computed tomography (CT) of Lindow II's remains was carried out (Reznek *et al.* 1986). Computed tomography is a type of X-ray which captures thin slice images of the body and shows the internal structures in cross section in great detail (Reznek *et al.* 1986). His hair and nails were also examined under a binocular microscope (Brothwell and Dobney 1986). Following its reassessment in the 1990's, an updated set of analyses was published (Turner and Scaife 1995). An example of further analysis was carried out on skin and bone for potential evidence of body painting on Lindow II and Lindow III (Pyatt *et al.* 1995, 62). Additionally, Lindow III was radiocarbon dated (Housley *et al.* 1995) and the peat stratigraphy was examined, and pollen analysis of peat sequences carried out in relation to Lindow III (Branch and Scaife 1995).

Research conducted on Lindow II provided the catalyst for further re-evaluation of several north western European bog bodies, as the value of the application of more sophisticated techniques of analyses had been demonstrated. For example, the stomach contents of Huldremose Woman were analysed to identify the types of materials remaining in the gut (Holden 1997) and a few years later Grauballe man had new radiography and computed tomographic analyses of his body (Jurik 2007). Re-examination of Grauballe Man's injuries were re-evaluated in conjunction with new radiography and computer tomography investigations (Gregersen *et al.* 2007) and an endoscopic examination was undertaken by Kruse *et al.* (2007). Huldremose Woman's garments and textiles found 17 years afterwards were analysed for age and origin (Frei *et al.* 2009, Frei 2012). The discovery and research of Lindow II was clearly a turning point in bog body research. The extensive research of Lindow II had demonstrated new techniques which yielded accurate information, could be applied for the re-investigation of already existing bog bodies. However, the focus was still primarily on the body.

The landmark publication of a volume in the 1990's van der Sanden (1996) *Through Nature to Eternity: the bog bodies of northwest Europe* in English, provided a synthesis of bog body finds and research across north western Europe which integrated the results from much of the new scientific work. This volume presented the bog bodies thematically, including the history of bog body research and exploring the lives and circumstances of the individuals represented.

Van der Sanden's (1996) approach to the evidence considered all possibilities for bog body deposition, and critically assessed researchers work on bog bodies to establish their reliability, evaluated the various types of evidence available and as a result he produced a very informative and balanced book. According to van der Sanden (1996, 178) the bog body phenomena was difficult to understand. He believed that bog bodies may have been sacrificed as votive offerings for fertility, or prosperity, martial success and possibly divination purposes. An example of divination was suggested by van der Sanden (1996, 178) whereby, one of the Weerdinge bog bodies who was found with their intestines on the outside of the abdomen may have been evidence of the practice of divination. This theory was interesting to consider but difficult to prove.

In summary, since initial identification of bog bodies in the 19th century, there have been numerous new discoveries as well as considerable development in the techniques used to investigate them. Such developments have led to the re-investigation and re-interpretation of several earlier bodies. There has been a lack of research which investigates the bog bodies within their landscape, studies to date focus on the body itself and the findspot and clearly demonstrates there is a disconnect with the body in relation to its landscape context. The paucity of landscape investigation of bog bodies is clearly missing the opportunity to obtain new data that may relate to the impact of the bog landscape and how and why the individual came to be deposited in the bog. By having such a narrow focus on the analyses of the body itself other factors have been ignored, this impacts on the potentially flawed and incomplete interpretations of bog body research.

2.6 Modern 21st Century Scientific Approaches to Understanding and Interpretation of Bog Bodies

In section 2.5 the early bog body investigations and interpretations of bog body research was described. This section outlines the principal avenues of previous scientific research that have been applied to bog bodies and the frameworks for interpreting them that have emerged. Most bog body research has investigated the body itself. The corpus of material in this section has been selected on the basis of examples that have been extensively researched and radiocarbon dated. Due to the prolific quantities of bog body finds it has not been possible to include them all. The bog bodies were selected based on recent radiocarbon dating, forensic and scientific investigations of the bodies. Additionally, bog bodies that also included analyses of findspots and broader landscape investigations. A number of bog bodies have not been researched or radiocarbon dated.

Further advances were made during the first decade of the 21st century. The problems associated with the dating of bodies were re-visited with the systematic radiocarbon dating of a collection of bog bodies (van der Plicht *et al.* 2004) which provided the first comprehensive chronological framework for these remains. A separate study comprehensively re-investigated the collection of bog bodies held within the Archaeologisches Landesmuseum in Germany, (Gill Robinson 2005) which incorporated forensic examination with a range of other techniques, including radiography, stable isotope work and DNA. In Denmark, a similar re-examination took place on the remains of Grauballe man approximately 50 years after his discovery, using multidisciplinary medical analysis using most recent techniques, thus increasing our knowledge about the body in more detail (Asingh and Lynnerup 2007).

In 2009 a study by Lynnerup (2009) re-evaluated the injuries of Borremose 1948 and Grauballe Man and medical imaging of these bog bodies showed that Borremose 1948's leg fracture was post-mortem due to the weight of the peat; the nature of the fracture indicated it was not sustained peri-mortem. Subsequently, Grauballe Man's leg fracture was also found to have been sustained post-mortem (Lynnerup 2009; 2010). Further studies of skeletal analysis investigated the effects of the acidic environment of the bog on three bog bodies from different periods (Pestka *et al.* 2010). Taphonomic factors have been known to complicate and disguise original pathological changes in bog bodies (Brothwell and Gill–Robinson 2002) and as a result interpretations of bog body deposition and injuries resulting in death were previously incorrect and can now be amended. New scientific research and reinvestigation of bog bodies clearly has an impact on their interpretation.

More recently, Tollund Man has been reinvestigated, samples of bone collagen from his femur and rib were analysed for stable radioisotopes and accelerator mass spectrometry (AMS) (Nielsen *et al.* 2018). Results from reinvestigation of Tollund Man have narrowed his radiocarbon date to 405 -380 cal BC (95.4% confidence interval) and established his diet was mainly plant based foods (Nielsen *et al.* 2018). Additionally, initial results from strontium isotopes have revealed that within the last 10 years of

Tollund Man's life before death, he lived approximately 40kms away from Bjældskovdal bog (Nielsen *et al.* 2018). Furthermore, strontium analysis of Tollund Man's hair indicated that the last 4 months prior to death he lived very close to Bjældskovdal bog (Nielsen *et al.* 2018).

In 2017 endogenous fluorescence analysis of Tollund Man's feet was carried out, which is a non - invasive medical technique developed to diagnose basal cell carcinoma or melanoma, this modern technique was employed to study the feet of Tollund Man and a mummy hand to identify skin pathologies for the first time (Zanello *et al.* 2017). This non–invasive technique allows soft tissues to be examined without damaging the corpse, examination demonstrated its suitability to use as a part of bog body investigations and identified 3 warts and a scar on Tollund Mans feet (Zanello *et al.* 2017).

Concurrently, new bodies were discovered in Ireland providing additional opportunities for applying the broadening range of techniques for analysis. These new bodies included those from Clonycavan, Oldcroghan, Tumbeagh, Cashel and Moydrum. For two of these bodies, investigations included considerations of their landscape context at the time of deposition. For Oldcroghan man this included a multi-proxy palaeoenvironmental analysis of the find site (Plunkett *et al.* 2009). However, for the body from Tumbeagh, although Medieval in date, this included a more comprehensive analysis of the wider landscape context of the body including the evolution of the wetland landscape (Bermingham and Delaney 2006). Other than the bodies from Tumbeagh and Oldcroghan, none of these examples has been yet fully published.

The next section 2.7 will focus on the forensic and medical investigations of several bog bodies for evidence of violence and cause of death that have been undertaken on the bodies themselves. This section shows the research undertaken on bog bodies has concentrated on gaining information about the body.

2.7 Forensic and Medical Investigations: Evidence of Violence and Cause of Death

One of the key areas relating to bog bodies is the exploration of violence and cause of death. Previous forensic and medical research carried out on bog bodies which established the cause of death and injuries sustained prior to death is examined. Furthermore, re – examination of some bog bodies has provided new information which has contributed to more accurate interpretations of their death and the violence exerted on their bodies peri-mortem and post-mortem. However, despite new information about the body itself nothing new has been gained in terms of interpretation and a refocus of looking beyond the body to a landscape context. It is evident from previous studies evaluated below that they have concentrated on the medical analysis of the body. The bog bodies that have been scientifically investigated are presented in this section.

The corpus of material presented below concerns the forensic and medical investigations of the bog bodies in section 2.7.

2.7.1 Tollund Man

Tollund Man was found in 1950 on Bjældskovdal bog, Denmark. The presence of a noose deeply embedded into his neck tissue suggested he was hanged particularly since no other medical evidence of injuries to the body was observable (Thorvildsen 1951; Glob 1969; Fischer 2012, 39; 44). Cut marks were identified on the back of the corpse and it was concluded they were due to damage from peat cutting (Glob 1969, 28; Thorvildsen 1951). Furthermore, x-rays carried out on Tollund Man were difficult to assess due to demineralisation of the bones as the result of taphonomic changes to the body, although the neck vertebrae seemed unbroken. This does not discount hanging as the cause of death (Thorvildsen 1951; Thorvildsen 1962; Glob 1969). Tollund Man was radiocarbon dated to (GrA-14179, AAR -3328, AAR-2638.1, AAR-26387.1) 405-380 cal BC at 95.4% confidence (Nielsen *et al.* 2018). Analysis of Tollund Man's stomach were carried out by Helbæk (1951) and are reported below. The research carried out on Tollund Man has concentrated on scientific analysis of the body.

2.7.2 Grauballe Man

By 1952 Grauballe Man was discovered approximately 11 miles from Tollund Man (figure 2.2), he was excavated and forensically examined, fingerprints were taken, and he was radiocarbon dated (Jørgensen 1956; Munck 1956; Andersen 1956; Tauber 1956). The Grauballe man's body was scientifically investigated to determine the violent injuries inflicted to the body, and the cause of death (Glob 1956). Initial results were interpreted as a skull fracture of the upper temple from a blunt instrument (Krebs and Ratjen 1956). Additionally, fractures to the left tibia, femur and a very deep incision to the neck from one ear to the other ear resulting in severing of the carotid artery indicated a cut-throat (Krebs and Ratjen 1956; Munck 1956). Initial research concluded Grauballe Man's cause of death was a cut-throat ear to ear so severe it severed the jugular vein and carotid artery; a skull fracture was associated with his death and shin fracture from a direct blow (Munck 1956; Krebs and Ratjen 1956). However, in 2001-2002 further medical investigations by CT scan with segmentation and analysis determined that the skull fracture was a result of taphonomic influences as the consequence of the pressure of the accumulated peat bog on decalcified cranial bones causing them to eventually break, or it was suggested, the fracture may have been due to being stepped on prior to excavation (Gregersen *et al.* 2007, 244; Asingh and Lynnerup 2007; Asingh 2009, 80; 76).

2.7.3 Elling Woman

Another example of neck trauma was identified on Elling Woman found in 1938 on Bjældskovdal bog, Denmark and re-examined in 1978. She had a deep furrow around the neck and a noose (a belt) was found near her body (Gregersen 1980). Interpretation of cause of death was by hanging (Gregersen 1980). Radiological investigations established Elling had fracture type lesions probably due to post-mortem damage (Langfeldt and Raahede 1980). Subsequently, no other signs of violence were determined, radiology established there were no degenerative diseases (*ibid*).

The first interpretation of the sex of Elling Woman was that the body was a man (Glob 1969; Fischer 1979; Gregersen 1979; Langfeldt and Raahede 1979). The sex was confirmed by radiological examination as female with an age of mid 20’s – 30’s (Gregersen 1980; Langfeldt and Raahede 1980).

Despite having no evidence of other forms of violence exerted on the body does not necessarily mean that there was an absence of violence, but that evidence could not be identified (van der Sanden 1996, 154). When violence or the cause of death cannot be established through medical investigation and analyses it may be attributed to the poor preservation state of the bog body and consequently remain undetected. In addition, it is necessary to consider that some forms of violence will not be evident on skeletal remains (ibid) so can effectively contribute to alternative interpretations which may not necessarily be accurate.

2.7.4 Lindow II

Lindow II (II) was found on Lindow Moss in 1984 (figure 2.1), non–invasive techniques were used by Bourke (1986) to medically investigate Lindow II. The forensic investigation of Lindow II’s preserved remains established the extent of violent injuries that resulted in death, stab wound to chest, head injuries received ante-mortem as there was evidence of tissue swelling on edges of the wound (West 1986, 77-80). The neck was cut severing the jugular vein and a garrotte was deeply embedded around the neck (West 1986, 77). In fact, there were 2 skull fractures, posterior fossa and a depressed coronal fracture as well as a rib fracture and C3/C4 cervical spine fracture (Bourke 1986, 51).

Figure 2.1 Lindow II Displayed in the British Museum, London (photo taken by author)

The head wound had bone fragments embedded in the brain tissue and indicated two blows by a weapon such as a small axe were received. The location of these head injuries suggested Lindow II was kneeling or standing (West 1986, 77). A wound in the occipital area of the skull was identified but it was unclear as to whether this was a peri–mortem injury or damage to the skull due to decomposition and taphonomic processes (West 1986). Also the stab wound in the chest could not be established, it may have been as a result of decomposition and taphonomic effects (West 1986, 80).The sinew garrotte was used for strangulation by twisting it tight at the back of the neck probably using a stick or straight piece of metal, this can be attributed to the fracture and dislocation of the 3rd and 4th cervical vertebrae in Lindow II (West 1986, 79). Additionally, severing of the jugular vein with the applied pressure from the garrotte would have caused profound and dramatic haemorrhaging (ibid). West (1986) suggested Lindow II's death was the result of a ritual sacrifice, whereas, Connolly (1985, 17; 1986, 60) postulated that the Lindow II's injuries paralleled those of a murdered individual.

Lindow II's forensic and medical investigations have provided information on how he died, the violent injuries inflicted prior to death and has also distinguished potential injuries which in fact maybe due to taphonomic processes and decomposition of the body. Consequently, distinguishing between the two has an impact on interpretations of bog bodies. The specifics of Lindow II injuries will be described in detail in chapter 3.

2.7.5 Worsley Man

Worsley Man was found in 1958 at Worsley Moss Lancashire. He consisted of a skull, mandible, first cervical vertebra, partial second vertebra and soft tissue covering most of the skull (Garland 1995). Shortly after the head was discovered Dr Manning the county pathologist concluded the individual was male 40 years of age, the jaw was fractured, and the skull had been in the peat for 100 – 500 years (ibid). In 1987 the skull was re–examined using new scientific methods. The skull was radiocarbon dated OxA-1430 to 1800±70 BP (Housley *et al.* 1995, 45) and calibrated to 95.4% confidence cal AD 75-387 (using calib 7.1 software) which is contemporary with Lindow II. New investigations revealed Worsley Man's age was 20 – 30 years, the top of his skull was fractured, a cord was wrapped around his neck, and his head had been decapitated from his body at the second cervical vertebra (Garland 1995, 107). Skull fractures were seen extending to the frontal and parietal bones, the second vertebra was visualised with a straight sharp cut and the garrotte was seen embedded in the soft tissue at the base of the neck (Garland 1995, 106). Re – investigation of Worsley Man has provided new data that has informed us of the violent injuries which led to his death, and radiocarbon dated the remains which have implications relating to the interpretation of his deposition in the bog. This evidence indicates that within the county of Cheshire Worsley Man, Lindow III and Lindow II were brutally killed and placed in bogs within the country's wetlands. Both deaths of Lindow II and Worsley Man involved violence directed to the head.

2.7.6 Osterby Skull

The Osterby skull was found in 1948 in Køhlmoor, north Germany. The skull was swathed in a skin cape and fixed down in the bog by stakes (Asingh and Lynnerup 2007, 309). Initial examinations revealed the head had small amounts of skin preserved and well preserved hair (Kersten 1949). The left side of the head had been severely struck by a blunt object causing the skull to fracture and bone splinters were embedded deeply into brain tissue (Kersten 1949, 2). The blunt instrument used to bludgeon Osterby skull left a 12cm wide indentation in the crania (Kersten 1949, 2). Most striking was that the head was violently decapitated from its body, 2 cervical vertebrae found loose near the skull had clear cut marks (Kersten 1949, 2; van der Sanden 1996, 159). Furthermore, the hair was studied under microscope by Schlabow (1949); to form the 'Swabian knot' hairstyle he suggested the length of hair would have been 28cm. The 'Swabian knot' hairstyle has not been identified on bog bodies from the UK, but in Ireland Clonycavan man's hairstyle had a distinctive upwards rolled under quiff (Mulhall 2010). Clonycavan man's hair was 17-20cm long and may have contained a resin 'gel' to help maintain the shape of his quiff (Mulhall 2010). The 'Swabian knot' hairstyle was related to the Germanic society as pictures of this hairstyle were depicted in ancient texts (Schlabow 1949, 3). Reconstruction and preservation of Osterby skull was carried out by K. Schlabow (1949).

The first investigations of Osterby skull have provided a hint of landscape context, even though the primary objective to sample peat was to provide pollen data of the local area it has indicated a clue to the bog landscape at the time the skull was placed in the bog. Samples of peat were taken 2 – 3m away from Osterby findspot and peat was obtained from within the skull cavity, both samples were analysed for pollen (Schütrumpf 1958). The crania was found 65-70cm below the surface of the peat (Kersten 1949). The peat layer related to the crania at 65-70cm depth was mixed *Eriophorum* and *Sphagnum* peat (Schütrumpf 1958). Below *Eriophorum* and *Sphagnum* peat was a further layer of sedge (Schütrumpf 1958).

According to the peat stratigraphy Osterby skull was deposited in a wet area of the bog with open water, shallow pools with acidic *Sphagnum* moss, mixed with *Eriophorum*. This indicated the bog landscape consisted of clumps of *Eriophorum* with pools in between (Schütrumpf 1958). Lower sediments of sedge suggest an earlier landscape preceding the deposition of Osterby skull, of wet fen with open water. Osterby skull was radiocarbon dated to 1895±30 BP cal AD 75-130 (GrA-822) (van der Plicht *et al.*2004). However, the sample used for dating was unable to be pre-treated because of its fragility and as a result there is doubt on its reliability (van der Plicht et al. 2004, 485).

Gill Robinson (2005) carried out a recent investigation of the Osterby skull and identified that the mandible was not related to the crania. In fact, the mandible belonged to a second unknown individual, it was doubtful it came from a bog body as it was probably treated to appear like the Osterby skull and glued into place for display (Gill Robinson 2005, 200).

Re–investigation of Osterby Skull has obtained new radiocarbon dates, and determined the mandible was not a part of the crania but of another individual who was most likely not a bog body (*ibid*). The crania was deposited at a time when then bog landscape was wet with open water and pools (Schütrumpf 1958). However, no further investigation of the broader bog landscape apart from pollen analysis was carried out.

2.7.7 Dätgen Man

A decapitated corpse was found on Grossen moor, Landkreis Rendsburg – Eckernförde in 1959, the body lay in the peat on its back naked, pinned down by three wooden stakes driven in at different directions across the body (Struve 1967, 34; van der Sanden 1996). The fourth wooden stake was secured between Dätgen Man's thigh's, despite his nakedness textile fibres were detected around the right ankle (Struve 1967). Preliminary examination of the body revealed extensive injuries were inflicted on this individual, stab wounds to the chest, heart and hip were identified (Schiebler and Schaefer 1961). The chest wound was approximately 3.8cm long and was visibly open, a second wound was 1.4cm length and the stab injury close to his right hip was 3.2cm (Struve 1967).

On the first thoracic vertebrae there was evidence of two cut marks into the bone which indicated two forceful blows were received by a sharp implement. Additionally, a cut mark on the seventh cervical vertebra, further cut marks on were on the back of the vertebrae (Struve 1967). Fractures to Dätgen Man's legs and pelvis were also reported (ibid).

Dätgen Man's penis had been cut off with surrounding inner thigh tissue, all his genitalia had been chopped off (Struve 1964; 1967). There was no evidence of his penis being deposited near the body Struve (1967), it's a mystery to think what may have happened, what did Dätgen Man's executioners do with his penis after his death? Initial research on Dätgen Man established death was from decapitation and stab wounds to his heart and further stab wounds to back and hip (Struve 1967; van der Sanden 1996; Asingh and Lynnerup 2007, 307). The internal organs were well preserved, and the stomach contents are discussed below (Struve 1961a).

Dätgen skull was found approximately six months after the body, according to Struve (1961a). It was 3m from the body and secured down in the peat by two wooden stakes and the cranial bones were broken. It was assumed the head belonged to the decapitated body, brain tissue and hair were examined by X-rays and electron microscopy and Dätgen skull had the same hairstyle as Osterby skull the 'swabian knot' (Struve 1967; Herrmann 1974). Pollen analysis dated the Dätgen body to approximately 100 BC, but this method is not entirely reliable used as a sole source for dating the corpse (Aletsee 1960; Struve 1961a).

Recent research on Dätgen Man confirmed the above fatal injuries were sustained peri – mortem. Fractures to the left humerus, right clavicle, right femur were the result of taphonomic damage (Gill Robinson 2005, 261). Further examination of the body confirmed the penis had been sliced off with a sharp instrument and the scrotal sac was present (Gill Robinson 2005, 261). According to Gill Robinson (2005) Dätgen Man's penis was cut off peri–mortem, or at the time of death because, the tissue margins were consistent in colour with all wound margins and indicated they were not done at the time of excavation. When compared to an area on Dätgen Man's leg where a small 1cm section was taken for radiocarbon dating, the wound edges were distinctly different in colour and correlated that the penis was removed peri – mortem or at death (Gill–Robinson 2005, 261). Dätgen Man was radiocarbon dated to cal AD 135 – 385 (van der Plicht *et al.* 2004). Re-examination of Dätgen Man has established several fractures were sustained as a result of taphonomic damage in the bog rather than peri-mortem injury, cause of death was confirmed as decapitation and a stab wound to the heart. It is unclear whether Dätgen skull belongs to Dätgen Man body. Research to date has not investigated the bog landscape and the position of the body within it. However, valuable information about this individual and what injuries were inflicted on the body contributes to understanding bog body deposition. This individual was brutally killed and placed in the bog.

2.7.8 Weerdinge Men

In 1904 two bog bodies were found in Werdingerveen, Drenthe, both bodies were naked and lying on their backs on the peat; the smaller of the bodies rested on the larger body's extended arm (Schlabow *et al.* 1958; Glob 1969, 81). The largest bog body had a stab wound to the heart (Schlabow *et al.* 1958; Glob 1969, 81; Asingh and Lynnerup 2007, 303). One Weerdinge bog body had a wound in the abdomen area, the intestines were found exposed outside of the abdominal cavity resting on the surface of lower chest area with the right arm positioned across the body as if cradling the intestines (Schlabow *et al.* 1958; van der Sanden 1996, 179; Asingh and Lynnerup 2007, 303). The two bog bodies were interpreted as man and woman (Glob 1969, 81; van der Sanden 1996, 102).

Approximately eighty five years later after their discovery Weerdinge bog bodies were re–investigated. A radiocarbon date of 1980±70 BP (OxA–1723) calibrated to cal BC 171-cal AD 145 at 95.4% confidence was obtained and both blood types were identified as type A (van der Sanden 1990, 83-86, 98; 1995, 157; 1996, 137, 191). Furthermore, it was established by pathological examinations the Weerdinge bog bodies were two men (van der Sanden 1990; 1995, 154; 1996, 102). Further research has obtained new radiocarbon dates for the Weerdinge Men from the average of two dates hair 2035±60 BP (GrA-12442) and skin 1990±40BP (GrA-14310) which correlates to 40 cal BC-cal AD 50 (van der Plicht *et al.* 2004). Additionally, it has been suggested by Van Vilsteren (2015) after re-examination of the bog bodies, the exposed intestines resting on the right body may in fact belong to the left bog body. The Weerdinge Man on the left had a triangular section of skin missing from his groin area including his penis (Van Vilsteren 2015).

Further exploration of the Weerdinge Men's position within the bog and the bog landscape has not yet been forthcoming, research has focussed on the examination of the bodies and lacks cultural context from the local landscape around them that has the potential to add a different perspective to their deposition. It is apparent that initial interpretations of the sex of these individuals were incorrect and based on the size of the bodies and assumptions of intimacy were influenced by their positions together in the bog. Scientific re-investigation of the Weerdinge Men bog bodies has clarified violent injuries, potential cause of death for one, sex, radiocarbon dates, and revealed another bog body which has had his penis removed.

2.7.9 Yde Girl

Yde bog body was discovered in 1897 in Vries, Drenthe, early examinations of the body detected a curvature of the spine, it was suggested the spinal anomaly was due to a pseudopathology (Uytterschaut 1990). Yde Girl was found with a 220cm 'sprang band' wrapped around her neck three times, a deep furrow mark was present around the neck, the body was wrapped in a textile cape, and the hair was lying close to the naked body (Asingh and Lynnerup 2007, 302; van der Plicht *et al.* 2004; van der Sanden 1996; 1995; 1990; Uytterschaut 1990). It was observed that over Yde girl's left ear there was an indentation which corresponded to the knot of the 'sprang band' being tightened and cause of death was by strangulation (van der Sanden 1996). Additionally, a stab wound was identified on the left collar bone (van der Sanden 1996, 161).

Further medical investigations followed. CT scans were undertaken on the body, this revealed S – shaped curvature of the spine (van der Sanden 1995; 1996). Scoliosis was evident from the CT scan, the sacrum was seen to be asymmetrical, tissue around the region of the right toe there was evidence of swelling and a callous on the neighbouring toe (van der Sanden 1996, 139; 1995, 155; 1994). Yde Girls scoliosis impaired her ability to walk with a normal gait, the swelling, callous and asymmetrical sacrum caused this individual to bear most of her body weight on the right side of the body and the right foot was angled inwards (van der Sanden 1996, 138). Yde bog body was first radiocarbon dated in Oxford to 1980±80 BP (OxA-1724) (van der Sanden 1995) more recent extensive radiocarbon dating was carried out in a study by van der Plicht *et al.* (2004), the weighted average of four dates is 1990±20 BP. Yde girl died approximately 40 cal BC-cal AD 50 (*ibid*).

Medical re-examination of the body has established the curvature of Yde Girl's vertebrae was due to scoliosis not pseudopathology. Furthermore, the difficulties this individual experienced walking were detected in CT scans and the effect it had on the Yde Girl body as a result were seen in detail. Cause of death was related to strangling. Research on Yde Girl has concentrated on forensic and medical analysis, until 2019 when Van Beek *et al.* (2019) carried out a multiproxy investigation of Yde Girl's landscape.

2.7.10 Borremose 1946 (man)

Borremose Man was found in 1946 in Borre fen, Himmerland deposited in a peat cutting, his lower limbs were contracted and crossed in a sitting position, his upper body was twisted to the left against the left thigh (Glob 1969; van der Sanden 1996; Asingh and Lynnerup 2007, 297; Fischer 2012). Borremose 1946 corpse was well preserved, his right thigh was broken, the back of his skull was crushed exposing brain tissue, a hemp rope was wrapped around the throat with the type of knot that was able to tighten using one end (Glob 1969). A birch branch 3 feet 4 inches was found lying across the body (Glob 1969; Holden 1997). Borremose 1946 was hanged or strangled (Brandt 1951; Glob 1969; Asingh and Lynnerup 2007, 297). The initial radiocarbon date for Borremose 1946 was 770 BC (Thorvildsen 1947; Brandt 1951), it has been since been AMS radiocarbon dated with an approximate date of cal BC 365-116 (AAR-11678) (Mannering *et al.* 2010). The contents of Borremose 1946 stomach were analysed by Brandt (1951) and are reported below. The height of this individual was 155cm, he lay naked in the peat cutting, on his face was 6mm of stubble (Glob 1969, 68-70; van der Sanden 1996, 162). Further research on Borremose 1946 in the 1990's has established the back of the skull was crushed post-mortem, but it was unclear whether this was due to taphonomic damage or if a couple of blows to the skull was inflicted after hanging or strangulation (van der Sanden 1996, 162).

It is clear from Borremose 1946 that investigations have centred on the body trying to establish how the individual died, his last meal, and general medical information. Data related to the findspot was limited, no local landscape investigation of the bog was carried out and this means additional information which had the potential to contribute to the overall interpretation was absent. Furthermore, the nearby Borremose fort was subject to excavations on two occasions by Glob and Brønsted 1929 to 1945 and in 1991 by Martens (1994) but was limited to the settlement site itself. Boreholes were carried out which extended approximately 70m outside the fortified settlement (Martens 1994). The boreholes did not investigate the bog basin and locate the positions of the bodies within it. Borremose bog has yielded two other bog bodies, Borremose 1947 (Woman I) and Borremose 1948 (Woman II) (Asingh and Lynnerup 2007, 298, 299). The cause of death for both Borremose 1947 and 1948 was not established (ibid).

2.7.11 Clonycavan Man

The severed body was found in 2003 Ballivor, Co Meath, and the precise findspot was unknown as the body was found on peat screening machinery. The body was well preserved and consisted of the upper torso two arms and head (Asingh and Lynnerup

2007, 313; Mulhall 2010). Pathological and anatomical analyses of the body were carried out. Clonycavan Man was killed by blows to the chest and head probably by an axe (Asingh and Lynnerup 2007, 313; Mulhall 2010). Below the abdomen his body was severed (*ibid*). It was radiocarbon dated to 392–201 cal BC and he was approximately 1.68m in height (Mulhall 2010, 36, 35). There was a 40cm long cut along the abdominal area, it was possible that disembowelment occurred (Giles 2006; Mulhall 2010). Both nipples were cut off, a heavy blow across the bridge of Clonycavan's nose which fractured the skull open was most likely received from a weighty object with a cutting edge, probably an axe type implement, analysis of the hair was carried out and is reported below (Mulhall 2010).

Considerable violence was inflicted on Clonycavan Man. So far research has concentrated on the scientific and medical analysis of the body and very little data has been gained from the bog it was deposited in. For example, the bog landscape, shape of the bog basin and a hypothetical position of the body within the basin has the potential to provide better understanding of the body's deposition.

2.7.12 Oldcroghan Man

This well preserved dismembered corpse was found in Oldcroghan, Co Offaly in 2003 approximately 25 miles away from Clonycavan Man (Mulhall 2010). The head, lower abdomen, pelvis and legs had been cut off prior to being placed in the bog (Mulhall 2010; Lobell and Patel 2010). Oldcroghan Man was decapitated, stabbed in the left side of the chest and on the left arm there was a cut wound (Mulhall 2010). Both nipples were cut off, both upper arms were punctured right through with a sharp object, withies were inserted through the puncture holes and were seen *in situ* (Mulhall 2010; Lobell and Patel 2010). Oldcroghan Man was investigated at the findspot by Mulhall (2010). The body was naked, however, on the left upper arm there was a leather plaited band with copper alloy fittings (*ibid*). Scientific analysis of the body was carried out, showing Oldcroghan Man was approximately 1.82m in height (*ibid*). Radiocarbon dates suggest he died approximately 362-175 cal BC (Mulhall 2010). There was evidence from analyses of lung tissue that he had suffered from a pleurisy infection at some point, nail and stomach contents were analysed and are reported below (Mulhall 2010; Lobell and Patel 2010).

To date the research carried out on Oldcroghan Man has focussed on the scientific and medical analysis of the body and findspot (Plunkett *et al.* 2009). Very little information about the landscape and the shape of the bog basin and position of the body within it has been carried out.

2.7.13 Gallagh Man

In 1821 Gallagh Man was found in Gallagh, Co Galway, he was naked wrapped in a leather cape and around the neck of the corpse was a band of willow rods (Ó Floinn 1995, 139; Asingh and Lynnerup 2007, 312). Either side of the body were sharp wooden stakes (Ó Floinn 1995, 139; Asingh and Lynnerup 2007, 312). Gallagh Man was strangled (Ó Floinn 1995, 139; Asingh and Lynnerup 2007, 312). In 1995 radiocarbon dating was carried out and the average of two dates were 2270±65 BP, 489-167 cal BC (Brindley and Lanting 1995). Investigation of Gallagh Man is limited and is on the body itself.

2.8 Problems Encountered Investigating Injuries of Bog Bodies

This section aims to outline the main problems encountered whilst investigating the injuries and cause of death of bog bodies. The corpus of material used for the studies of the bodies are presented below.

Scientific investigation of human fleshed remains preserved in wetlands environments can be impeded by diagenetic and taphonomic changes, as well as other changes occurring during and following recovery such as, damage during discovery, excavation, subsequent drying out, and shrinkage (Brothwell and Gill Robinson 2002). This is made more significant for bog bodies being scientifically investigated many years after excavation, if the bodies have not been preserved or adequately stored (Brothwell and Gill Robinson 2002; van der Sanden 1996, 154). In these cases, degradation of the body impedes the quality of the physical evidence of violence and as a result interpretations of the cause of death and extent of violence becomes difficult to establish and indistinct (van der Sanden 1996, 154).

Furthermore, identified signs of violence can be detected but are the result of damage done to the body during excavation and can be misinterpreted as violence received prior to death (van der Sanden 1996, 155; Gregersen *et al.* 2007, 244; Asingh 2009, 80; 76) and can lead to archaeological misinterpretation. For example, to determine death by strangulation forensic evidence considers firstly external indicators to confirm such as a noose or type of rope around the neck, secondly physical marks around the neck and thirdly evidence of haemorrhages around the eyes and neck (van der Sanden 1996, 156). Internal structures of the airways and lungs were analysed to identify strangulation (*ibid*). Signs of strangulation which can be identified in a medical post-mortem are lung changes and a fractured hyoid bone, both of these medical markers cannot always be determined in bog bodies due to variations on bone and tissue survival (van der Sanden 1996, 156). In a medical report Emmer-Erfscheidenreen man's hyoid bone was shown to be fractured which suggested he was strangled (ibid).

Even though there is a forensic framework to establish causes of death and violence it still can be difficult to interpret; in fact, at times perhaps quite ambiguous. There are many problems to mitigate in relation to the interpretations of bog bodies which need to be considered during research. For example, Borremose 1948 (woman II) was found with her face crushed and back of her head scalped and first interpretation was that severe violence caused the injury, that she was hit in the face with an implement (Glob 1969; 69, 70; Green 1998). Further research carried out by Munksgaard, Andersen and Geertinger (1984) established the crushed face was the probably the result of pressure from the peat and scalping from the peat cutters spade. However, Andersen (1994) suggested the face was crushed shortly after death, interpretation is equivocal. Borremose 1948's body was poorly preserved, and it has not been possible to establish the cause of death (Glob 1969; Andersen and Munksgaard 1984; Andersen 1994; Asingh and Lynnerup 2007, 299; van der Sanden 1996; Fischer 2012).

Lynnerup (2010, 441) draws attention to the difficulties faced when assessing x-rays and CT scans of an individual bog burial where the human remains have undergone a significant amount of diagenetic changes which have taken place on the preserved bog body whilst lying in the peat bog for many centuries. These changes include severe damage to soft tissues and bones of the body which, for example, make it extremely difficult to see skeletal bones during x-ray and CT scan for analyses (ibid). For example, examination of Borremose 1948, using 3D CT scans were carried out to obtain an age of the body at the time of death, these investigations were problematic (Villa *et al.* 2011). Borremose 1948's bones were significantly demineralised due to being immersed in an acidic bog (Villa *et al.* 2011). Decomposition of the tissues and bones impeded visualisation of the skeletal markers used to identify age, due to the poor preservation of the body the 3D scan required significant manual post processing (ibid). This meant that using the auricular surface method required accuracy visualising morphological characteristics of the bones (Villa *et al.* 2011). Subsequently, the age range for Borremose 1948 was very broad, 20 to 73 years, it was concluded that bog bodies were unsuitable due to taphonomic changes and the accuracy of the structures required to establish age from skeletal markers using the auricular surface method (Villa *et al.* 2011).

For Grauballe man, it was necessary to apply a significant amount of post processing techniques to determine and extract data as there were a lot of taphonomic changes to the body to mitigate (Lynnerup 2010, 441). The study conducted by Lynnerup (2010) highlights the difficulties in analysing and interpreting bog bodies from a medical perspective to establish not only evidence of violence and cause of death but to also provide more extensive information such as diseases suffered in their lifetime. It also emphasises that potential mistakes can be made with interpretation of the evidence if diagenetic, and taphonomic changes are not taken into consideration, and addressed appropriately. Consequently, archaeological interpretation of medically investigated fleshed human remains depends on as much accuracy as possible to put forward sound theories to debate within the archaeological arena.

2.9 General Medical Examination of the Bodies: Information about the Nature of Individual Bodies

Pathological research undertaken on bog bodies can show diseases, abnormalities, gender and a variety of observations that can provide information about the individual. However, re-investigation of samples and bodies can in fact cast doubt on original interpretations. Medical examination of the remains of Lindow III (almost a complete body but found in fragments) revealed the right hand had a congenital abnormality called pre-axial polydactyl (extra phalanges) (Brothwell and Bourke 1995, 56-57; Turner 1995). Furthermore, Lindow II's nails suggest that he did not participate in heavy labour for a living (Brothwell and Dobney 1986, 66-70; Brothwell and Bourke 1995, 54-56).

Zweeloo woman's skeleton exhibited a disease that affected her arms and legs which were very short (van der Sanden 1996, 141). It was identified as dyschondrosteosis (van der Sanden 1996, 141). The asymmetry of the skeleton specifically the pelvis, humerus and tibia was interpreted as pseudopathology (Uytterschaut 1990). Analysis of Zweeloo Woman's intestines and liver established that she was infected with *Dicrocoelium dendriticum* and probably became infected with the parasitical eggs from eating infected cow's liver (Searcy *et al.* 2013).

It was discovered that Elling Woman had a condition called osteoporosis which is typically a disease of the elderly, but Elling was approximately 30 years of age at death (van der Sanden 1996, 141). The age at death can be established by examining skeletal markers and this was undertaken on re-examination of Grauballe man who was found to be approximately 25-35 years of age (Lynnerup *et al.* 2007, 227-233).

Trying to establish biological sex from gender related artefacts, clothing and hair styles has resulted in inaccurate sexing of individuals. For example, 2 Weerdinge bog bodies were interpreted as man and woman, and this was based on the positions and size of the bodies, medical re-assessment established they were in fact 2 men (see above) (van der Sanden 1990).

Previous interpretations of Windeby I by Glob (1969, 114), Turner and Briggs (1986, 159), van der Sanden (1996 93), Parker Pearson (1999, 68), and Aldhouse Green (2001, 117, 129), suggested she was a girl, because her hair was shaved off. This was associated to Tacitus' *Germania* XII stating punishment for adultery for women was to have their hair cut off and be drowned in the bog (Tacitus trans. by Mattingly 2009). Furthermore, Windeby I was found close to Windeby male bog body which seemed to support the idea it was male, and female punished for adultery (Glob 1969 114; Parker Pearson 1999; Aldhouse Green 2001). Fischer (2012, 137) emphasises Windeby I was a girl based on her body shape and build, fine bone structure and fat thighs. More recent thorough medical re-examination of Windeby I by Gill Robinson (2005, 229-236) established Windeby I was male.

General medical investigations of bog bodies provide exceptional information about these individuals' diseases, age, sex and injuries, which contribute to a better understanding of their life. Consequently, it is very apparent most research is concentrated on the analysis of the body and very little landscape investigation of the bog the bodies were deposited in has been undertaken. The shape of the bog basin, the positions of the bog bodies within it and reconstruction of the bog landscape from stratigraphy is absent, but for a couple of studies.

2.10 Beyond the Body

This section now examines research that has been carried out on a few bog bodies that relate to the local palaeoenvironment of the findspot area which have moved the focus a little away from the body. The corpus of bog body material used for section 2.10 is a group of examples that are different from those examined in sections 2.6, 2.7, 2.8 and 2.9. The studies have mainly related to the local findspot around the body. These comprised of investigating the peat stratigraphy and depositional context of bog bodies. Some of which were placed in old peat cuttings on the bog. Votive objects that have also been placed in bogs and are examined below.

Section 2.10.1 begins with analysis of stomach contents. Analysis of stomach contents is a scientific investigation of the body. The contents within the stomach have the potential to indicate types of plants and grains that may have been grown locally. Establishing the different types of food contents within the stomach can indicate the local landscape, vegetation and potentially suggest season of the year. Therefore, are relevant to gain information about the landscape around the bog body. Research carried out on textiles are also examined and have the potential to reveal origins of raw materials and so may demonstrate if they were all sourced locally or further afield.

2.10.1 Understanding the Local Context: Stomach Contents and Last Meals

Even though analyses of stomach contents are a scientific investigation of the body the contents within the stomach have the potential to indicate types of foods that may have been grown locally in the landscape and suggest season of the year. Therefore, this is relevant to gain information about the landscape around the bog body. Research carried out on textiles are also examined and have the potential to reveal origins of raw materials and so may demonstrate if they were all sourced locally or further afield.

This section outlines evidence obtained from analysis of stomach contents to establish the last meals ingested. Stomach contents have been analysed to detect evidence related to Iron age diet, which has been mainly based on animal bones and plant remains from archaeological sites (Holden 1986). The opportunity to gather data about Iron age diet from a bog body directly is very valuable. Last meals provide information such as, types of food eaten, how it was consumed e.g. boiled, baked over fire, it may indicate the season of death, types of crops grown and social status (van der Sanden 1996, 107).

Only a small number of bog bodies have stomach and intestines preserved and from those few have been scientifically examined with variable efficacy (Holden 1986). These examinations have been carried out many years after excavation and therefore samples may have started to deteriorate or those undertaken initially their samples have been lost or degraded with only a very basic report of questionable robustness (van der Sanden 1996, 107-119). Consequently, vital evidence may be undetected due to partial desiccation of samples. Also, the sample size of bog bodies with available stomach and small intestine contents to examine is far too small to establish secure archaeological theories that can be used as an interpretation of ritual meals.

Analysis of Zweeloo woman's gut contents demonstrated the presence of a large amount of blackberry pips in her small intestine which can be gathered for eating August to October, they do not store well so give a good indication for season of death (van der Sanden 1996, 116). Lindow III yielded a small amount of gut contents to analyse and it was discovered that he ingested significant number of hazelnuts together with cereals, pollen analysis established hazelnuts were in the area of Lindow Moss (Holden 1995, 81). Lindow II's stomach contents were found to contain emmer, spelt wheats and barley which were probably ingested in the form of unleavened bread, *Sphagnum* leaves and also *Viscum album*, mistletoe (Holden 1986, 1995, 82; Scaife 1986, 131). Whereas, Tollund Man ate a type of porridge containing barley, oats and linseeds (Fischer 2007, 49). Recent re-analysis of Grauballe man's contents further revealed his last meal consisted of weed seeds, small quantities of meat and grain, rye was identified as a component (Harild *et al.* 2007, 176-181).

The first analysis of Grauballe man's stomach contents showed it contained significant amounts of Ergot, a hallucinogenic derived from fungal disease of cereals and today the drug Lysergic acid diethylamide (LSD) is a derivative of ergot (Helbæk 1951; 1958; van der Sanden 1996, 119). The presence of Ergot in Grauballe man's gut contents has been associated with ritual meals van der Sanden (1996, 118). More recent re-evaluation of the stomach content samples established it was unlikely that Grauballe man experienced any effect from the presence of ergot sclerotia, which was probably accidently ingested with the gruel type food of weed seeds, grains and meat (Harild *et al.* 2007, 181). The type of meal eaten by Grauballe Man prior to death was very poor quality (ibid).

Lindow II's last meal consisted of mainly cereals of spelt, emmer, wheats and barley (Holden 1986). It was unclear whether barley and wheat components formed the same type of food item or separate and consumed together, evidence obtained from electron spin resonance suggested the wheat was heated to 200-250˚C (Holden 1995). Moreover, the boiling temperature of liquids reach 100˚C, it seems more likely the wheat was cooked over a fire (ibid). Fragments of alder charcoal was identified, it was suggested that an unleavened bread was made with the cereals and grains and consumed by Lindow II prior to death (Holden 1995, 79).

The discovery of 4 grains of mistletoe pollen in Lindow II's stomach and small intestines has led to questions around whether he was drugged. In 1986, no other bog body was found to have mistletoe pollen in their gut contents (Scaife 1986, 132). Mistletoe is used in herbal medicine as a narcotic and Scaife (1986, 132) and Ross (1986 167-168) associated the mistletoe with religious rituals practiced by druids. The small quantity of mistletoe may be of little significance, but interpretations of its presence suggest it formed a component of a ritual meal or drink ingested before sacrifice (Scaife 1986, 132; Ross 1986 167-168).

Ross (1986) argues that the last meal eaten by Lindow II was part of Iron Age ritual practice, Ross (1986) associated the unleavened bread and presence of mistletoe seeds to Druid ceremonies. Subsequently, Holden (1995, 82) suggested that the composition of Lindow II's last meal contained no special ingredient to indicate it was of a ritual nature. However, it is difficult to identify aspects of a ritual meal from samples that are centuries old, the evidence that relates to ritual may not have survived or is ambiguous.

Lindow III's stomach contents were contaminated by surrounding peat and Sphagnum and yielded very little food residues to analyse (Holden 1995). The two samples that contained remains of food indicated for the last meal this individual ingested hazel nuts and small quantities of rye and wheat (Holden 1995).

The stomach contents of Oldcroghan Man were analysed, and his last meal consisted of ground cereal and buttermilk (Mulhall 2010, 38). Whereas, with Clonycavan man palaeodietary analysis of his hair showed high levels of hydrogen at death which indicated he ate a diet rich in plant – based foods, the season of death was suggested as summer because plant produce would have been more abundant (Mulhall 2010). Subsequently, isotope analysis of Dätgen Man's hair indicated his diet was mainly vegetarian (Gill Robinson 2005). A post–mortem examination of Borremose 1946 included microscopic analysis of stomach contents and results showed his last meal was vegetarian; it consisted of corn spurrey, knotweed, seeds, fruits, grasses and herbs (Brandt 1951; Glob 1969; van der Sanden 1996; Asingh and Lynnerup 2007).

Analysing stomach contents of well-preserved bog bodies provides information about some of the food components that were eaten prior to death. Additionally, types of crops grown within the surrounding landscape and eaten in the Iron age, season of death and social status if their diet was considered rich and nourishing.

2.10.2 Understanding the Local Context: Preservation of Clothing and Artefacts

This section aims to outline the preservation of clothing, textiles and artefacts associated with bog bodies, analysis of textiles has provided data that contributed to further understanding of bog body deposition, whilst dating of objects according to style helps to situate the body within a timeframe linked to the object.

Several bog bodies have been found with accompanying grave goods. Windeby I burial contained 1-4 pottery vessels containing food and drink close to the body (Fischer 2012, 135; Burmeister 2013, 491). Huldremose woman was found with a string of 2 amber beads, a horn comb and bone pin to fasten an accompanying shawl (Glob 1969, 62-63; van der Sanden 1996, 93-96; Asingh and Lynnerup 2007; 296; Fischer 2012, 116; Burmeister 2013, 491). Borremose 1947 was deposited with the remains of an infant burial and against her arm lay a black burnished half of a pottery vessel, an amber bead and bronze disc (Glob 1969, 70; van der Sanden 1996; Chamberlain and Parker Pearson 2001, 61; Asingh and Lynnerup 2007, 298). The body of Borremose 1947 was radiocarbon dated to approximately 416-209 cal BC (Mannering *et. al.* 2010).

Near Lindow II, an iron ridged tapering rod 61mm in length was found, however this object was dismissed as having no function, but it may be possible that it was used to twist and tighten the garrotte around Lindow II's neck (Budworth *et al.* 1986, 38) or it may have been a fibula pin to secure a garment.

Several bog bodies have been found with garments such as skin capes, textile items of clothing such as shawl, skirt and leather caps and fur arm bands. Lindow II wore a fox fur band on his left arm (Budworth *et al.* 1986, 38) and Tollund Man was found wearing a leather cap on his head and leather belt around his waist (Glob 1969; Fischer 2012, 39). Additionally, Oldcroghan Man was wearing a leather plaited band on his upper left arm (Mulhall 2010). Whereas, Huldremose woman was found with a textile skirt, 2 skin capes and a shawl which was fastened by a bone pin (Glob 1969; Asingh and Lynnerup 2007; Fischer 2012, 116). Borremose 1946 had 2 skin capes and Borremose 1947 was found with 2 woollen blankets and shawl wrapped around his legs (Glob 1969; Fischer 2012, 125). Windeby I also was found with a skin cape (van der Sanden 1996, 93-96; Fischer 2012, 135).

A study undertaken by Frei *et al.* (2009) analysed textiles from Huldremose woman who was deposited in a Danish bog and a garment found near the body, using a method based on strontium isotopes that facilitate identification of the origins of raw materials of the garments. This was carried out in order to establish if the materials were local or from further afield (Frei *et al.* 2009, 1965). The results of the study suggested the materials were both local and non-local in origin from the area of Norway and Sweden, furthermore, skin analysis of her abdomen suggested she may have originated from outside of Denmark, but further analysis to substantiate this will be required (Frei *et al.* 2009, 1971). The implications of the study suggest that trade and movement over wider geographical areas took place and, for Huldremose woman it is an indication of high status (Frei *et al.* 2009, 1971). A study by Mannering *et al.* (2010) analysed textiles associated with bog body finds and results have shown that Huldremose I garments have a new date of approximately 210-41 cal BC (AAR-11675, K-1396) at 95.4% confidence and Huldremose II garment was dated to 210-30 cal BC (Ua-33204) which was found 17 years prior to Huldremose Woman and had not been dated before.

Clothing associated with bog bodies can be AMS radiocarbon dated to determine dates to age the bog body by comparing textile and bog body dates, van der Plicht *et al.* (2004) study has demonstrated that radiocarbon dating bog bodies generate a reliable date. Analysis of textiles by strontium isotope tracing can establish the geographical origin of the textiles used to make a garment (Frei *et al.* 2009). Similarly, the style of garments can also help to determine a period it was associated to and provides an additional source to establish chronology of bog body depositions (Countess Moira 1785; Mannering 2007).

Research related to analysis of textiles has provided important information about radiocarbon dates and have sourced the approximate origin of materials. Examining artefacts associated with bog body deposition has helped to link the body with a period.

2.10.3 Understanding the Local Context: Old Peat Cuttings and Burial

In north western Europe at least 300 bog bodies have been deposited in old Iron Age peat cuttings (van der Sanden 1996, 98; Asingh 2007). In 1952 Troels Smith and Jørgensen investigated the findspot of Tollund Man and established from the peat stratigraphy that he was deposited in an old peat cutting (Fischer 2012). Beneath Tollund

Man's body the peat stratigraphy indicated the pit had been exposed for some time before deposition of the body, the peat sequence demonstrated a dark sandy layer with no evidence of plant regrowth, samples for pollen analysis were taken but never analysed (Glob 1969, 22; Fischer 2012, 39).

Windeby I and II, Zweeloo Woman, and Elling Woman were deposited in old peat cuttings (van der Sanden 1996, 91, 97; Fischer 2012, 135). In addition, Borremose 1946 and Borremose 1947 and 1948 were found were also placed in old peat cuttings (Glob 1969; van der Sanden 1996; Fischer 2012, 81, 125-129). It was suggested that Huldremose woman and Dätgen man were placed in a peat cutting as the bodies clearly lay in a depression in their respective bogs (Asingh 2007, 296, 307). Re-use of Iron Age peat cuttings for burial and deposition of objects took place in areas that were used for Iron age exploitation of resources and suggest that bog bodies were sacrificed as thank offerings to gods, goddesses who may have been needed to placate for use of the bog (Fischer 1979). The bog landscape was used for resources, thank offerings of human remains and objects, burials, and re-use of peat cuttings (Fischer 1979). This demonstrates the multiplicity of the uses of wetland landscapes.

The Windeby bog bodies were found near the edge of the peat bog, Windeby I was lying on a bed of heather and covered by cotton grass, it suggested he was buried with some care (Schlabow *et al.* 1958). Next to Windeby I body were four pottery vessels and placed on top of the body a stone slab (Schlabow *et al.* 1958; Fischer 2012, 135). Also found in an old peat cutting was Borremose 1947, her body was laid to rest on a bed of birch bark and around the body were heather twigs (Fischer 2012, 125).

According to Burmeister (2013), the above 2 examples of bog body deposition demonstrated normal burials. Burmeister (2013) has defined normal burial of bog bodies as having characteristics such as, a dug pit, associated with ornaments or objects, and a layer of 'bedding' on which the bog body lies or is covered with and care taken to place the corpse to rest. Additionally, bog bodies which had no violent injuries to the body were one of the features of burials (Burmeister 2013). Borremose 1947 (above) was also found in an old peat cutting with the remains of a baby, palaeoenvironmental analyses of peat stratigraphy demonstrated the body was found to be covered by cotton grass (Fischer 2012, 129). Next to the body was half of a pottery vessel of black burnished type which demonstrated pottery used by local elite and an amber bead with bronze disc (Chamberlain *et al.* 2001, 61). Borremose 1947 would also be interpreted as a burial (Burmeister 2013).

Furthermore, on Dätgener Moor an urn containing a cremation burial was found deposited in the peat bog and demonstrated that bogs were sometimes used as places for burial (Burmeister 2013, 491, 494). The relevance of Burmeister's (2013) research is the distinct perspective he uses to try to understand the bog body phenomenon by looking at the wider use of the landscape for burials in wet and dryland together with ritually deposited artefacts.

2.10.4 Understanding the Local Context: Environmental Analysis of Bog Body Findspots

This section aims to outline environmental research carried out on bog body findspots. Bog body burials that have been found within their original place of deposition undisturbed have the potential to be investigated fully by multiproxy palaeoenvironmental analysis and peat stratigraphy. These investigations provide evidence to reconstruct the local palaeoenvironment at the time of deposition, and to establish the preservation state and date of the body.

A multiproxy palaeoenvironmental study was conducted by Plunkett *et al.* (2009) in Clonearl bog to reconstruct the local landscape in the periods surrounding the deposition of Oldcroghan man dated to the Iron Age. Oldcroghan man was found *in situ* within the bog, this enabled a detailed investigation of the findspot, and its surroundings (Kelly 2006c; Plunkett *et al.* 2009; Mulhall 2010). Analyses of plant macrofossils, pollen, testate amoeba and coleoptera were carried out. Additionally, the archaeological landscape history of the area surrounding the bog was investigated (*Ibid*). Results were able to contextualise the bog body burial within the wider landscape environment and cultural changes that were happening at that time (Plunkett *et al.* 2009, 275). The investigation of the Oldcroghan Man's findspot has shown how new information can be gained from a local landscape analyses (*ibid*). The study showed that the area surrounding the findspot of Oldcroghan Man was subject to intense human activity during the Late Bronze Age, of woodland clearances and this period of activity diminished around the Late Bronze Age-Iron Age transition and Early Iron Age (Plunkett *et al.* 2009). The pollen record indicated the landscape surrounding Clonearl bog was open, with both arable and pastoral farming (Plunkett *et al.* 2009). The period of intense woodland clearance may have reflected the areas importance as a settlement (*ibid*). Analyses of plant macrofossil and beetle remains from Oldcroghan Man's fingernails indicated he was placed in a pool, which was contemporary with the body (Plunkett *et al.* 2009). Testate amoeba and coleopteran assemblages have demonstrated a shallow *Sphagnum*-dominated pool and there was no evidence to indicate exposure and decomposition of the body (*ibid*). The study has identified from analyses of the pollen record that Oldcroghan Man was placed in the bog around the time when human activity was increasing, it has given a wider landscape and cultural context to his deposition in the bog (Plunkett *et al.* 2009).

Pollen stratigraphical analysis was carried out to establish if Lindow III was deposited in a dug pit or on undisturbed natural bog surface (Branch and Scaife 1995). The majority of Lindow III was not found in situ apart from one piece of leg which was embedded in undisturbed peat (Branch and Scaife 1995). Being embedded in undisturbed peat was key to analysis, as peat samples taken from the excavation of Lindow II (column I) and peat samples related to Lindow III (column II) were analysed and compared with the peat surrounding the leg (Branch and Scaife 1995). Correlating three peat samples pollen stratigraphically facilitated in establishing that the leg was deposited on a natural bog surface 10 – 15cm above the *Grenzhorizont* (Branch and Scaife 1995).

The term *Grenzhorizont* relates to the boundary horizon which is seen in peat stratigraphy layers (Barber 1981, 7). Usually a distinct dark humified lower layer of peat contrasts with upper pale *Sphagnum* peat (*ibid*). The decline of the climate to colder and wetter conditions enabled regrowth of *Sphagnum* forming an upper layer of paler peat on existing dark humified oxidised lower peat (Barber 1981, 7). The *Grenzhorizont* is dated to approximately the Late Bronze Age-Iron Age 800-500 BC (*ibid*). The significance of the *Grenzhorizont* in relation to Lindow II and III is that these bodies were deposited above the boundary horizon (Branch and Scaife 1995, 20-24). Peat samples from above and below the *Grenzhorizont* on Lindow Moss were radiocarbon dated to approximately 763-677 cal BC (UB-3241) (below boundary horizon) and 407-392 cal BC (UB-3239) ((Branch and Scaife 1995, 20). The radiocarbon dates from Lindow Moss correspond with the European *Grenzhorizont* (RY III of Granlund) (Branch and Scaife 1995, 21).

Analysis of pollen samples obtained from Lindow II's area of deposition has enabled the identification of forest clearance and crops grown during agricultural use (Oldfield *et al.* 1986). Peat macrofossil analyses was able to distinguish surface wetness conditions on the Lindow Moss (Barber 1986). Furthermore, coleoptera analysis was carried out on samples of peat adhering to the Lindow II body to identify localised vegetation, palaeoenvironmental local landscape conditions, and the degree of potential decomposition of the corpse (Girling 1986). Analyses of insects by Girling (1986) showed Lindow Moss was a neutral to acid bog with peaty pools, with wetland plants and other bog vegetation growing within the area and edges of the bog. Virtually no beetles were associated to the decomposition of the body, beetles that feed on *Eriophorum* (cotton-grass) and species of *Carex* (sedge) were identified and indicated the types of bog vegetation (Girling 1986). Hydrophilids can be found in weedy pool margins, Scirtidae are aquatic, Caddis-fly larvae are also aquatic and provided evidence of pools on Lindow Moss within the area Lindow Man was placed (Girling 1986). The presence of trees on Lindow Moss was indicated by *Rhynchaenus* and *Rhyncolus lignarius* (Girling 1986).

Environmental investigation of bog body findspots provides a wealth of information which is crucial to the better understanding of bog body deposition and conditions of the bog landscape. It is clear that very little environmental analysis of findspots has been carried out.

2.10.5 Understanding the Local Context: Depositional Context and Peat Stratigraphy

Some bog bodies have been found in their original findspot, but due to lack of detailed documentation, crucial information has been lost. To add to the difficulties of researching bog bodies at least 6 individuals and 70 fragments of Lindow III's corpse were found by peat extractors on the conveyor belt during peat cutting of areas some distance away from their precise original findspot (Turner 1995 14; Mulhall 2010; Bermingham 2016). Lindow III whose body parts were scattered on machinery, but fortunately his leg was found in a large lump of peat with stratigraphy intact (Turner 1995). Moydrum Man was also found some distance from his original findspot (Bermingham 2016). This individual was found in a stock-pile of peat on Kinnegad bog Co. Meath (Bermingham 2016, 52).

More recently there are bog body burials that fortunately have been discovered *in situ*, in their original burial context for example, Lindow II (Man), Tollund Man, Grauballe man, Oldcroghan Man and Clonycavan Man. Finding a bog body *in situ* can facilitate valuable archaeological and environmental information which can be gained from closely examining the depositional context of bog body burials, the peat stratigraphy surrounding the body and the local landscape (Casparie 2006; Plunkett *et al.* 2009; Bermingham 2016).

Lindow II was found *in situ*; he was not buried within a grave or old peat cutting, as stratigraphic evidence did not indicate disturbance (Buckland 1995, 47). Data obtained from peat stratigraphy for analysis and radiocarbon dates of Lindow II's burial context within the peat was found to pre-date the body (Ambers *et al.* 1986). This anomaly was surrounded by contention between Buckland (1995) and Barber (1995). Buckland (1995) suggested the irregularity of dates can be as a result of taphonomic processes and radiocarbon dates should not be doubted. He indicated that interpretation relies on the longevity of pools in the bog (*ibid*). As evidence from Girling's (1986, 91) analysis of fossil coleoptera and Skidmore's (1986, 92) analysis of Dipterous remains demonstrated the body was submerged into the bog immediately. There were no necrophilous fauna identified in both insect analysis to indicate a decaying and exposed corpse (Girling 1986, Skidmore 1986). This was also confirmed by further insect analysis of the environmental history of Lindow Moss carried out within the area of Lindow III (Dinnin and Skidmore 1995, 31-38). Whereas, Barber (1986; 1995) argued that evidence from plant macrofossils demonstrated that formation of *Sphagnum* layers would have taken 30mm per annum to accumulate over the body and the pools were too shallow for the body to be fully immersed far. Therefore, they must have been covered over after the peat was cut, and rolled back over the body, which does not disturb peat stratigraphy, and as a result the inconsistency of dates can be explained in this way (Barber 1986; Barber 1995, 51). Briggs (1995, 172) suggested that Lindow II was deposited in the bog pool after it was well established, and relatively deep; he goes on to criticise Stead *et al.* (1986) for failing to consider the character of the pool and undertaking further investigation to understand it within the wider landscape of Lindow Moss. In addition, environmental conditions at the time of deposition were not fully explored by research (Briggs 1995, 172).

In the case of Lindow III, samples of peat were taken from the area excavated and were analysed for peat stratigraphy, insect assemblages and pollen analyses (Branch and Scaife 1995) in order to reconstruct the palaeoenvironment within the localised area of the findspot, around the time Lindow II and Lindow III were deposited on Lindow Moss (Branch and Scaife 1995; Dinnin and Skidmore 1995).

Peat associated with Tumbeagh and Wijster bog bodies and the bodies themselves, were radiocarbon dated (van der Plicht *et al.* 2004). The results showed in both cases that the peat was older than the bodies deposited within it (van der Plicht *et al.* 2004, 489). It was concluded from this study that when peat samples are pre-treated, reliable radiocarbon dates are generated, which supports the discussions around the radiocarbon dating of peat related to Lindow II (van der Plicht *et al.* 2004, 489).

2.10.6 Understanding the Local Context: Votive Objects

Artefacts deposited in the bogs have indicated cultural activity within the landscape. The corpus of objects deposited in the bog landscape are examined below. Objects that have been votively deposited in watery contexts have the potential to provide a wider interpretation for bog body deposition. A votive deposit is defined as an object or group of objects that have been intentionally placed in a location that was perceived to facilitate communication with gods or goddesses and supernatural powers (Osborne 2004). The Gundestrup cauldron, which was found near the Borremose bog bodies, and depicts scenes of sacrifice (Glob 1998, 171-180). Artefacts of carved wooden deities have been found in bogs. For example, the Bräddenbjerg figurine discovered in Bräddenbjerg fen and the Freya figure at Rebild Skovmose Glob (1998, 180-191; Fischer 2012). Some of the carved figures had pottery deposited near to them, which indicated offerings were made to the god, goddess represented by the figurine (Glob 1998, 180-191, Fischer 2012).

On Fuglsøgaard Mose approximately 700 peat cuttings located along the edge of the bog contained ritually deposited artefacts such as, white quartz, horse skulls, wood items, butchered animals in pots, tethering, grain, and stakes (Asingh 2007b, 283; Fischer 2012). In Foerlev Nymølle bog there was a 3-metre-high goddess surrounded by more than a 100 pots and contents, parts of butchered domestic animals were deposited in peat cuttings (Asingh 2007b, 284-285). The objects placed in Fuglsøgaard Mose and Foerlev Nymølle bog have shown how the landscape was used for non-domestic activities. The votive deposits placed in peat cuttings and surrounding the wooden goddess suggest these areas of the landscape were believed to have a connection with deities and reflect aspects of their cosmological beliefs associated to their landscapes (Asingh and Lynnerup 2007).

According to the study carried out by Fischer (1979) in Jutland, pottery and bog body finds were predominantly distributed in bogs that were cut for peat and exploited for resources in the pre- Roman Iron age. Furthermore, single bog body deposition was not dominated by age or sex (ibid). Whereas, some bog body finds formed part of a more complex sacrifice (Fischer 1979). For example, at Rappendam, Zealand approximately 28 wheel rims, hubs and parts of waggons were deposited in the bog with animal skeletons (Fischer 1979; Glob 1998). Human remains were also found (ibid). There were a higher proportion of women and children deposited at Rappendam (Fischer 1979; Glob 1998).

In Ireland artefacts have been found placed in bogs (Kelly 2006b, 2). For example, on Lisnacrogher bog, situated on boundaries between two baronies and intersecting three townlands, had weapons, personal ornaments, iron tools and bronze objects found deposited within it (Kelly 2006b, 2). Further finds such as the Ardbrin trumpet dated to the Iron Age was found deposited in a bog on a barony boundary (Kelly 2006b). Cauldrons dated to the Iron Age have been discovered in bogs on barony boundaries at Ballyemond, Co. Galway, Urlingford, Co. Kilkenny, and Drumlane, Co. Cavan (ibid).

Objects placed in bogs have the potential to improve our understanding of the bog body phenomena. Bog bodies and pottery in Jutland indicated geographically the link between human activity on bogs and their deposition (Fischer 1979). Whereas, in Ireland they seemed to be placed in association with townland, parish and older territorial and barony boundaries (Kelly 2006b). Furthermore, figurines in bogs seem to have been the focus of offerings of objects reflecting a similar 'thank offering' to the gods and goddesses of the bogs posited by Fischer (1979).

2.11 Interpretations

This section outlines the interpretations of bog body deposition which has resulted from research undertaken on the bodies from the corpus of material. The interpretations of bog bodies have all been based on medical analysis of the bodies as most studies have solely focused on the body and very little on the wider landscape.

2.11.1 Sacrifice

A number of scholars have interpreted many of the north west European bog bodies as human sacrifices to deities worshipped in the Iron Age, and are suggestive of cult practices, some of which include the veneration of watery places and head worship (Glob 1998; Hald, 1980; Ross, 1986, 162; Stead, 1986, 180; van der Sanden 1995, 148; 174; Briggs 1995; Asingh 2009; Fischer, 2012; Armit 2012; Burmeister 2013). Numerous severed skulls have been interpreted as head cult because they were deposited in peat bogs, and rivers which were perceived as sacred places where sacrificial offerings took place (Green 1998, 179; Glob, 1998, 146; Bradley 2000; Armit 2012). An important aspect to their rationale of human sacrifice was that watery places were perceived as liminal areas (Green 1978; Brothwell *et al.* 1990, 175; van der Sanden 1996, 174; Glob, 1998; Bradley 2000). Bog bodies found deposited in peat bogs were associated with the interpretation of sacrifice because during the Iron age period in Britain and north west

Europe sacrificial offerings of foods, pottery and animals were connected to marsh and water (Glob 1969, 107).

One of the first theories of votive sacrifice was proposed by Thorvildsen (see section 2.5) (1952, 44) who associated sacrificed objects in bogs with bog body deposition. The theory of sacrifice has been widely accepted; Glob (1969, 105 - 132) believed most bog bodies were sacrificed but he also considered alternative interpretations were possible suggesting bog bodies were either murdered, accidently became a victim of the harsh bog landscape or were sacrificed to a deity.

The theory of sacrifice has been supported by most academics with subtle differences on who these individuals were sacrificed to. Fischer (1979) proposed bog bodies were offerings to gods and goddesses that needed to be placated because of activities and exploitation of bog resources, and as mentioned above were associated with pottery. In Fischer's (2012, 186) publication of *Tollund Man Gift to the Gods* he suggested that most bog bodies which were hanged and strangled were sacrificed to the god of the hanged, the precursor to Odin in the Ases religion.

Archaeological evidence such as, the Gundestrup cauldron dated to approximately 100 BC, depicted a sacrificial scene using a cauldron and Celtic gods were identified in the imagery on the cauldron (Fischer 2012, 180). Further evidence to support his theory was gained from the wooden figure Broddenbjerg Man, incised around the neck was a deep furrow which according to a pathologist, correlated to a hanging furrow (Fischer 2012, 178). Fischer (2012) posited wooden figures were representations of the gods and precursor to the Ases religion. Additionally, the Oseberg tapestry depicted a grove with multiple sacrificed hanged individuals, the picture stone from Bote, Gotland shows seven humans hanging from a branch which according to Fischer (2012, 182–187) suggested hanging was practiced as part of cult activities. Whereas, Ebbesen (1986, 101) has suggested that bog bodies were sacrificed in accordance with a fertility cult.

In general, van der Sanden (1996) interpreted most bog bodies as sacrifices, but emphasised the difficulties faced in having a singular theory for all bodies. According to van der Sanden (1996, 178 – 181) bog bodies may have been sacrificed for fertility as they were valuable votive offerings; for example, the Rappendam assemblage was associated with offerings to Nerthus. Bog bodies were also potentially sacrificed for martial victory (ibid). The individuals may have been prisoners of war for example, human remains were associated with large quantities of weapons at Skedmosse (van der Sanden 1996, 178-181). In contrast, the Weerdinge Men may have been sacrificed for the practice of divination because intestines were strewn over the abdomen of one of the men (van der Sanden 1996, 178).

Different types of sacrifice were suggested by Parker Pearson (1986), including execution of prisoners of war, the sacrifice of social outcasts, and high ranking members of society. Parker Pearson (1986) stated there were difficulties to consider in assigning one motive and that modern interpretations of sacrifice may not represent those used in the Iron age period.

Asingh (2009, 221) argued the sacrifice of inanimate objects such as, weapons and ornaments had different value as votive offerings to gods and goddesses compared to the sacrifice of fleshed humans and animals. Humans and animals are '…in the presence of a spirit and the breath of life…', transformation occurs from living to a dead corpse which was imbued with energy and power; sacrifice was the discharge of blood which was full of power (Asingh 2009, 221). Human sacrifice was the most highly valued type of offering by exerting violence and brutality, the individual was rendered damaged and removed from the living world into the other world; placement in the bog was perceived as the boundary for both worlds argued Asingh (2009, 227).

On the basis of evidence posited by Armit (2012), Asingh (2009), Bradley (2000), Green (1998, 179), Glob (1998, 146), van der Sanden (1996), and Glob (1969) it was clear that interpretations of sacrifice were mainly based on the violence and brutality inflicted on the bog bodies and the distinct locations of their deposition. Scientific and medical analysis of the bodies have provided information to consider which may support the theory of sacrifice. Subsequently, deposition of pottery and objects associated with bog bodies indicated both were votive sacrifices. However, evidence becomes equivocal when the reasons for sacrifice were sought.

2.11.2 Punishment and Deviant Behaviour

In 1922 von Amira argued bog bodies which were secured down in the bog, naked, with evidence of excessive violence and not buried in the normal custom were propitiatory sacrifices to appease the gods or goddesses which had been offended (Amira 1922). Mestorf's interpretations of bog body deposition prior to Amira's (1922) theory changed three times (Mestorf 1900; 1907). Firstly, she argued they were executed prisoners; by 1900 she posited bog bodies were murdered, executed or deceased (Mestorf 1900; 1907). By 1907 based on classical text from Tacitus' *Germania* associated bog bodies that were naked, with evidence of extreme violence, secured down in the bog and not buried in the normal custom; Mestorf argued bog bodies were executed individuals (Mestorf 1900; 1907; Ravn 2010, 108). For there are difficulties applying one theory to explain the bog body phenomena, restraint can be demonstrated in approximately 21 individuals only (Ravn 2010). Whereas, nakedness was frequent, according to Mannering *et al.* (2010) out of 52 there were 30 skins and textiles which were associated with bog body finds in Denmark. Subsequently, a naked bog body does not substantiate the theory of execution by Mestorf and Amira (1922). Furthermore, excessive violence inflicted on a bog body does not necessarily indicate execution, or punishment for transgression, but offering a gift to the deities required the ‘object’ to be removed physically and metaphorically from the everyday world (Asingh 2009). Removing the ‘object’ from the human world entailed its destruction, loss of normal use, animals and humans were slaughtered, which symbolised destruction (Asingh 2009, 227). Consequently, when the arguments for execution, punishment and deviant behaviour were examined evidence did not fully support this theory strongly for bog body deposition.

The execution theory has referred to classical texts of Tacitus and the notion of *corpore infames* has been debated and interpretations have been based on this concept (Munksgaard 1984, 122; van der Sanden 1996; Chamberlain and Parker Pearson 2001, 79; Taylor 2003, 158; Ravn 2010), which stated homosexuals (*corpore infames*):

‘those who disgrace their bodies were drowned in miry swamps under a cover of wicker’

…’shameful deeds should be hidden away’

(Tacitus *Germania* 12.4-7 trans. By Mattingly 2009).

A sequence of events followed when ancient texts and bog body phenomena were used to steer political propaganda and implement new a law in Germany. In 1935 Karl Eckhardt interpreted the phrase *corpore infames* from Tacitus' *Germania* as describing homosexuals; he went on to write a newspaper article about how Germans sacrificed worthless individuals *corpore infames* (homosexuals), *ignavos et imbelles* (cowards), *proditores* (traitors) and *transfugas* (renegades) in bogs to placate the gods (Ravn 2010). Furthermore, the concept of *corpore infames* was adopted by the Nazis, Heinrich Himmler, Rudolf Clare, and Professor Hermann Hoffmeister for a political agenda, they lobbied for homosexuality to be severely punished (Lund 1995, 62; van der Sanden 1996; Ravn 2010). Ultimately this lead to Adolf Hitler implementing the death sentence for homosexuality in the Waffen-SS and German police, whilst other members of society were sent to concentration camps (Lund 1996). The Germans dominated bog body research in the 1930's and 1940's and their interpretations of bog bodies were based on punishment of individuals (Lund 1996).

Using Tacitus' *Germania* is problematic. Translations of Latin text have been difficult to ascertain precise meanings of phrases. For example, *inbelles* could mean deserters not cowards, Livy used *Ignave et imbelles* which means men who are untrustworthy in war, *Corpore infames* means those with disreputable lusts or 'those who disgrace their bodies' (Tacitus *Germania* 12.4-7 trans. by Mattingly 2009). Whereas, it has been taken to mean homosexual by numerous archaeologists (Taylor 2003, 158). Consequently, interpretations surrounding punishment of bog body individuals and relating it to Tacitus' texts is subjective and the evidence is ambiguous.

The interpretations of bog bodies continued to follow the same themes of death of a punished member of society, who was deviant, homosexual or a criminal (Munskaard 1984; Andersen and Geertinger 1984, 117; Brothwell, Liversage and Gottlieb 1990, 176). Munskgaard (1984, 121-122). Munksgaard (1984) based her argument on Tacitus' text *Germania* (19.1-16), classical texts continued to influence interpretations of bog bodies, adultery was subject to punishment. For example, Windeby I and II were initially interpreted as bog bodies that represented individuals who were punished for committing adultery as it was thought they may have been illicit lovers (Munksgaard 1984, 122; Fischer 2012, 135). Although, since then, both bodies have been re-interpreted and so no longer support this theory as radiocarbon dating of the bodies has revealed they were placed in the bog at least 200 years apart and Windeby I was not female as once interpreted, but in fact male (van der Plicht *et al.* 2004; Gill Robinson 2005; Fischer 2012, 135; Burmeister 2013). Subsequently, Windeby II bog body was radiocarbon dated to 385 – 185 cal BC and Windeby I was 150-135 and 115-0 cal BC (GrA-10687, GrA-14175) which makes it impossible for them to have been lovers (van der Plicht *et al.* 2004).

It is apparent that archaeologists sought additional information from primary sources to corroborate their theories despite its biases; however, further research now provides new re-interpretations. Nazi political propaganda seemed to heavily influence bog body theories despite the problems associated with translation of ancient texts and the physical evidence from the bodies themselves. The punishment theory of deviant behaviour and homosexuality is insecure.

2.11.3 Murder

Whilst Connolly (1996; 1986, 60; 1985, 17) disputed the interpretation of sacrifice and has suggested that the bog body burials were victims of violent mugging or murder, he refuted the possibility of ritual killing, despite medical examination of Lindow II. He dismissed the evidence of the garrotte being deeply entrenched in neck tissue due to bloating of the decaying body rather than evidence of garrotting (ibid). However, Girling (1986, 90-91) carried out coleoptera analysis on the body and Skidmore (1986, 92) analysed Dipterous remains associated with Lindow II and both concluded there was no evidence of carrion to indicate putrefaction had initiated. Connolly's viewpoint was not well received and was dismissed by Stead (1986, 178), Parker Pearson (1986, 15-18) and Chamberlain *et al.* (2001, 70). Whilst medical investigation can elucidate the extent of violence and the cause of death, as in the case of Lindow II, its interpretation can vary depending on the individual looking at the evidence, their current professional background may influence analyses, and interpretation of the evidence (Chamberlain *et al.* 2001, 70).

Connolly failed to put Lindow II's violent injuries into a wider archaeological perspective and neglected to make comparisons with bog body burials in northern Europe, assigning his modern perspective of murder and in doing so, his interpretation was heavily criticised. Connolly was perhaps basing his theory purely on physical evidence to demonstrate a different perspective to more mainstream interpretations of sacrifice as an explanation of the violent injuries meted out on bog bodies.

2.11.4 Wiedergänger

The interpretation of 'wiedergänger' was based on German folklore, which was defined as, the fear of dead individuals that were criminals, suicides, victims of violence, and accidental deaths who would come back to haunt the living (van der Sanden 2012, 406; 1996, 168). Certain folklore suggested a normal burial would not pacify this type of death (ibid). To prevent repercussions of a restless evil spirit it was proposed that isolated bog body burials were made harmless by violently mistreating the corpse after death (van der Sanden 2012, 406). Hence, bog bodies exhibited violence on their bodies, were stripped naked, had their hair shorn and were deposited in a bog (van der Sanden 1996). By mistreating and disposing of these individuals it would protect them against evil restless spirits (van der Sanden 1996, 168). For example, Struve (1967) investigated Dätgen Man and argued the injuries on Dätgen Man's body were inflicted after decapitation and supported the theory of wiedergänger. Single bog body finds according to Struve (1967) represented individuals whose family feared wiedergänger, restless evil spirits haunting the living.

Windeby I was investigated by Gebühr (1979). He associated the wiedergänger interpretation to Windeby I because of the shorn hair and the sprang band which covered the individual's eyes (Gebühr 1979). Gebühr (1979) posited the sprang band was placed over the eyes to protect relatives from the 'evil eye' of Windeby I. Subsequently, Gebühr (1979) formulated alternative explanations to interpret Windeby

I’s hair and sprang band, he also suggested Windeby I bog body may represent a normal burial and the cemetery was situated close by.

Gebühr (1979) tried to rationalise the evidence of Windeby I, at first it seemed he was fully focussed on the interpretation of wiedergänger and then he sought further explanations to understand the deposition of the body. Interpretations of wiedergänger for bog body deposition were hard to establish, the evidence is subjective and ambiguous.

2.11.5 Normal Burial

Normal burial has been interpreted for a few bog bodies that have no detectable sign of violence or obvious cause of death and whereby, the burial context was intact and assessed. The variety of burial practices means some bog bodies may have been considered a representation of normal burial in their period (Chapman 2015). Burmeister (2013, 491) interpreted bog bodies that were buried in old peat cuttings with grave goods or bedding under the corpse correlate to burials. For example, Windeby I was found with 4 pottery vessels and the corpse displayed no evidence of violence (Burmeister 2013, 491) and Huldremose Woman was associated with a horn comb, 2 amber beads and a bone needle and her corpse was covered with 2 fur capes, a skirt and scarf (Asingh and Lynnerup 2007, 296).

Burmeister (2013, 494) suggested bog bodies found deposited close to the bog edge were burials that may represent a funerary practice that comprised of different stages, for example at Cladh Hallan bodies were preserved in a peat bog, recovered, rearticulated and reburied under the foundations of Iron Age round houses (Parker Pearson *et al.* 2005).

Applying the interpretation of burial to bog body deposition is extremely difficult because evidence has focussed on the scientific and medical analysis of the body and very little investigation of the findspot and local bog landscape the body was deposited in has been carried out. Research related to the bog landscape can hypothetically show the position of the body from the edge of the bog, the pre-peat landscape and development of the bog landscape in relation to the placement of the corpse (Chapman 2015). Further information such as, analyses of the surface wetness of peatlands through time shows its variable pattern across the bog (Caseldine and Gearey 2005). The wetness of the surface of the bog can then be related to archaeological structures such as, wooden trackways that may correlate with an increase in wet climate conditions and show the bog was very difficult to access (Chapman 2015) and subsequently, integration of landscape data has the potential to provide alternative interpretations of the deposition of the body.

2.11.6 Boundaries

In Ireland, Kelly (2006a; 2006b) proposed that bog body burials have been votively deposited along significant parish, townland and barony boundaries and that these boundaries were previous prehistoric tribal boundaries. Based on decapitated heads and dismembered body parts, Kelly (2006b, 1) proposed that bog bodies were deposited close to important boundaries and may have had a protective function. Kelly has analysed other artefacts deposited in peat bogs throughout Ireland such as, weapons included swords, spearheads, scabbards, a wooden knife, personal ornaments, for example, bracelets, spiral rings, a gold neck torque, rings and harness mounts and bridle bits and concluded they provide further evidence to support boundary depositions (2006b). Research carried out by Matthews (2006, 42) shared Kelly's view at the time, and interpreted bog body depositions as demarking tribal boundaries, Matthews argued that the tribal lands of the Deceangli were demarked by bog body burials. Both Matthews (2006) and Kelly's (2006a; 2006b) interpretation of bog body burials considered the surrounding characteristics of the landscape and put the burials in a wider context.

2.11.7 Hair as Votive Offerings

Displayed in the National Museum of Denmark, Copenhagen were several examples of preserved hair which had been found deposited in bogs. They consisted of 7 plaits of hair which were found in Stenbygårds bog, Døstrup North Jutland dated to approximately 350 BC. Plaits deposited in Fårup; Vindum Central Jutland were 4 in total interlaced with each other, shown in figure 2.2. Thorup, Simmersted yielded 4 plaits whereby 3 were braided into 1. Although not published it offers another tantalising way in which a wetland landscape was used to deposit a variety of artefacts whether human or inanimate objects. (Seen in the National museum of Denmark, Copenhagen September 2017 by the author). The relevance of hair deposited in bogs relates to how the wetland landscape was used to deposit an unusual object within it.

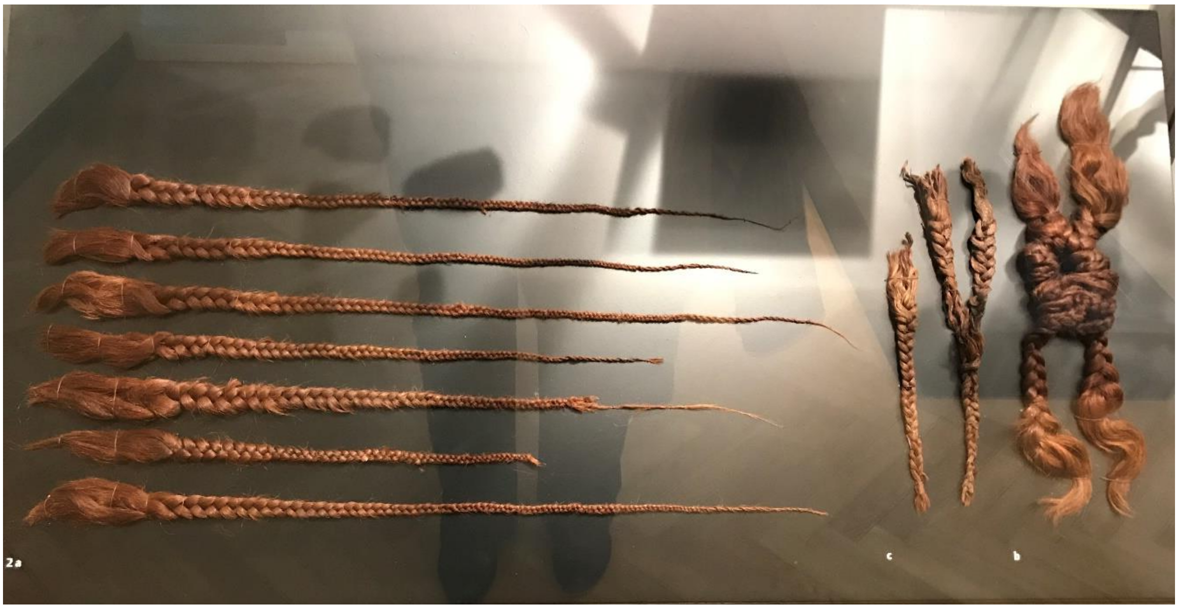

Figure 2.2 Hair found placed in bogs (photo taken by author)

2.12 Conclusions

The types of settlements in Britain were distinct and located within wetland and dryland landscapes. Fortified settlements in Britain reflected an intricate social structure within the community. Whereas, in Denmark settlements were generally farmsteads that evolved in size and form and generally were situated close to a wetland area to utilise its resources. Although, the Borremose settlement on the edge of Borremose bog was a fortified settlement (Martens 1994). It is striking from the burial rites practiced in Britain and Denmark that within inhumation, cremation and excarnation burial practices, there was diversity within each rite which varied geographically. Only a minority of the Iron Age population has been represented by these burial rites (Hedeager 1992, Carr 2017). Weapon hoards and votive depositions were prolific and unique in both Britain and Denmark, located in wetlands and on dryland demonstrating how ritual deposition changed through time.

It is clear from the analysis of the literature relating to the study of later prehistoric bog bodies, that research has concentrated on the scientific and medical analysis of the body itself. Information gained from this avenue of research has established injuries inflicted on the body and whether these were violent acts or taphonomic damage. Analyses of stomach contents have provided data about the last meal; crops grown and indicated the possible season of death. The cause of death in most bog bodies have been demonstrated and diseases identified. However, very few investigations of bog bodies have examined the findspot and local bog landscape and the position of the body within it. Where palaeoenvironments have been considered, they have been restricted to the local environment context of individual bodies. For example, Oldcroghan Man, analyses of pollen, plant macrofossils, testate amoebae and coleoptera analysis reconstructed the landscape surrounding the findspot during the period of Oldcroghan Man's deposition (Plunkett *et al.* 2009). Additionally, palaeoenvironmental analyses of Lindow II's findspot was also carried out although in neither case was the general peat landscape of the bog investigated. The shape of the bog basin was not identified and the positions of the bodies within it were not identified.

The relationship between the bog landscape and bog body has largely not been addressed, apart from Kelly's (2006a; 2006b) association of bog bodies and objects deposited near barony boundaries in Ireland. The interpretations made by (Kelly 2006a; 2006b) were general and do not consider the shifting nature of the bog landscape, shape of the bog and the bog body located within it. Whereas, with Moydrum Man dated to 753–409 cal BC early Iron age was found on Kinnegad bog, the landscape was re-surveyed generally to identify archaeological features and artefacts (Bermingham 2016). The additional information was valuable, especially as the site was still commercially cut for peat. However, no investigation of the development of the bog landscape from peat stratigraphy, shape of the bog and the hypothetical position of the body within it was carried out.

There is a fundamental lack of studies of the wider landscape context of bog bodies, identifying the shape of the bog basin, general bog landscape around the time of deposition and the positions of the bodies within the bog basin. A broader landscape approach to bog body research will determine the contemporary cultural archaeology in relation to the bog the bodies were placed in and enable more context within their cultural landscape. Hence, providing new data to analyse that contributes to new interpretations of bog body deposition.

The statistics shown in figure 2.3 are based on the corpus of bog bodies included in the analyses of modern studies in chapters 1 and 2 (above) is a table to show the types of bog body research. A wider landscape investigation is classified as the wider bog landscape, providing context to the body within the bog landscape at meso scale (10-100m) and macro scale resolution which integrates palaeoenvironmental analyses, cultural archaeology and the relationships between wetland and dryland landscapes and bog body deposition (Chapman *et al.* 2019). The graph clearly shows that 97% of bog bodies have been radiocarbon dated and 82% of bog bodies have undergone forensic and scientific analyses of the body.

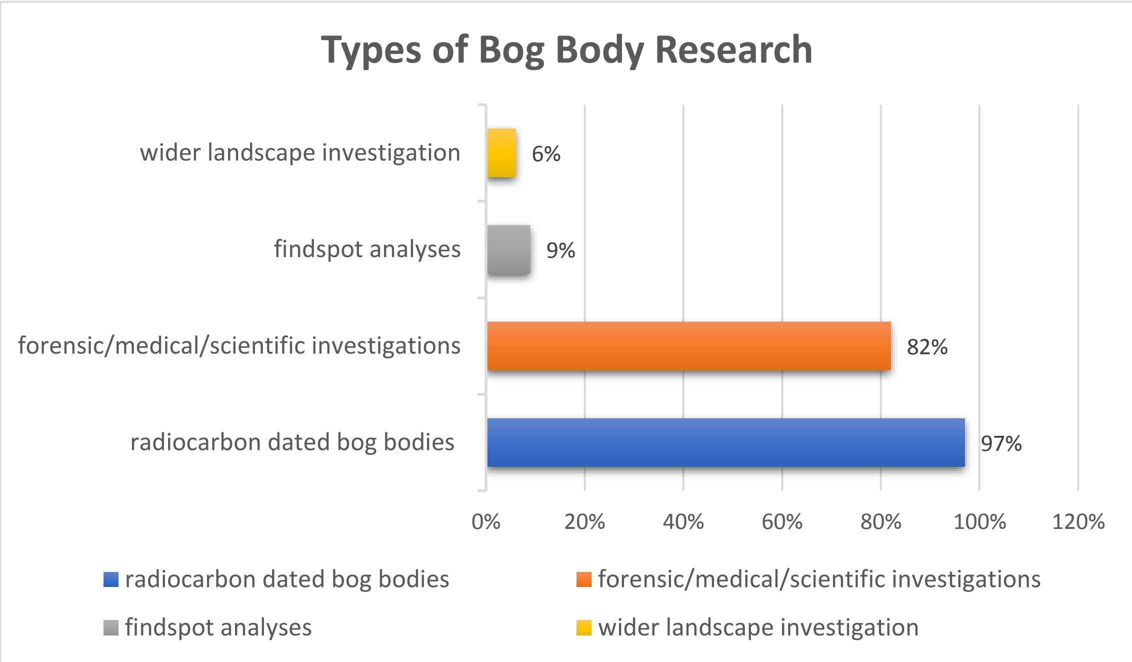

Figure 2.3 Statistics of bog body research

In contrast, only 9% of bog body findspots have undergone palaeoenvironmental analyses and a mere 6% of bog bodies have had a wider investigation of their landscape. These statistics highlight the lack of wider landscape research of bog body phenomenon and further emphasises the purpose of this thesis to address this gap in current research.

A review of the historiography of bog body research has shown the development of bog body research from the 18th to 21st century and the interpretative frameworks that emerged were predominately based on classical texts, violent injuries and their place of deposition in an isolated peat bog. The previous research carried out on bog bodies and the interpretations that developed were presented and the trends within the scientific analysis of the body and findspot were highlighted. This was a very localised and narrow approach, limitations were outlined, mainly that there was a disconnect between the body itself and the wider landscape context. The limitations of previous studies have outlined a need to a new approach to bog body research, that is to investigate the wider landscape of bog bodies with the potential to contribute to the interpretations of bog bodies. Chapter 3 follows below and outlines the two case study sites investigated to achieve the aims and objectives of the research design in chapter 1.

CHAPTER 3 CASE STUDIES: LINDOW MOSS AND BJÆLDSKOVDAL BOG

3.1 Introduction

This chapter explains the background of each case study site. In chapter 1 the aims identified a significant gap in the research of bog bodies, and it was decided to select two study sites that produced multiple bodies from their respective bogs. The first site was Lindow Moss, Cheshire (figure 3.1); the second, Bjældskovdal, Denmark as a comparison. The next section provides a background to Lindow Moss and explains previous research that has been carried out so far.

Lindow Moss and Bjældskovdal bog were selected for research because both sites yielded multiple bodies from a wetland context; their respective bog bodies Lindow II and Tollund Man were very well preserved. The two bog bodies are well known in the academic and public arena. Lindow II is exhibited in the British Museum, London and Tollund Man in Silkeborg Museum, Denmark. Investigations undertaken on these human remains were mainly forensic. Whilst medical analyses provided distinct information on these two individuals, current research has not considered the broader landscape and we now need to move away from the body and findspot. By investigating the broader landscape of both bogs there is the potential to explore the connections between the bog bodies to their contemporary cultural archaeology. Establishing the development of the hydrosere on Lindow Moss and Bjældskovdal bog shows the conditions of the bog around the time of deposition. Ultimately, reconstructing the bog landscape and identifying different types of peat and characteristics such as, formation of pools helps develop a better understanding of the difficulties of accessibility across the bogs. Additionally, determining the pre-peat landscape and the positions of the bog bodies within their bog landscape can enable spatial analysis to take place. By examining the broader landscape of Lindow Moss and Bjældskovdal bog has the potential to help us understand the deposition of bog bodies on both sites and to explore alternative interpretations with the new data acquired through this research.

Chapter 3 commences with the definition of a landscape context in relation to this study in 3.2 followed by the methodology for the selection of both study sites in 3.3 and section 3.4 outlines the background to Lindow Moss. This is followed by section 3.5 which provides an overview of Bjældskovdal bog including archaeological finds, environment and scientific investigations of Tollund Man. The conclusion of Chapter 3 is outlined in 3.6.

3.2 A Landscape Context

The landscape context for this research is defined as the investigation of the wider bog landscapes of Lindow Moss and Bjældskovdal bog. First to provide a meso scale context which includes background of the bog bodies within their peatland and reconstruction of the morphology of the bog basin and of the bog landscape (Chapman *et al.* 2019). Secondly, at macro scale, which was a broader context, investigating contemporary cultural archaeology within 5km of both study sites, and analysis of the wider landscape using LiDAR, and previous pollen studies to understand the broader landscape better and the impact of the extent of wetland and dryland interface on bog body deposition (Chapman *et al.* 2019). For Lindow Moss the area of investigation was widened because in contrast to Denmark, Historic Environment records and Portable Antiquities Scheme were easily accessible to obtain archaeological data.

3.3 Methodology for selection of study sites

The first stages of the methodology were to identify two suitable sites for research. The main site had to be in the United Kingdom for convenient access to carry out fieldwork and archive research. Another key factor in selection was that the sites had yielded multiple bog bodies which so far research had not considered in a landscape investigation. Practical issues during the selection process were considered such as accessibility and land ownership to obtain permissions were important. For example, Grauballe Man's find spot Nebelgaard Mose was not picked because the small bog is privately owned and now flooded (*pers. com*. O. Nielsen 2017) so accessibility and viability of fieldwork was not possible, and permissions not guaranteed. Well-known preserved human remains that were exhibited in a museum from each site was crucial to selection because the research gained from this thesis could build upon previous studies carried out on the bodies. Information related to the exhibited bog bodies were also relevant for vital background data associated with both the corpse and the types if any of landscape scale investigations. Additionally, recent radiocarbon dating of the bog bodies associated to the study sites were important to identify the period to which they were associated to and importantly, be within the Iron Age-Early Roman of which this thesis focuses on.

The first study site selected was Lindow Moss. Permissions were applied for and granted by both landowners. The second site chosen for the study was Bjældskovdal bog; the author was fortunate to be awarded a grant which facilitated a field trip to Denmark. Permissions were applied for and granted with the help of Mr Ole Nielsen, Director of Silkeborg Museum. Fieldwork took place over three days in October 2017.

Sites in Denmark were identified (van der Sanden 1996; Asingh and Lynnerup 2007; Fischer 2012). Another bog that yielded multiple preserved human remains was identified in Denmark as a potential study site. This was Borremose bog where three bog bodies were deposited close to fortified settlement. In Denmark several bogs were considered. The selection criteria were relative fast accessibility to the site with not too much time spent travelling, as time spent in Denmark was restricted and so the size of the bog had to be reasonable, so fieldwork could be carried out in a few days. On this basis, Bjældskovdal bog was selected.

Figure 3.1 map of Britain and study site at Lindow Moss

The topography of both bogs have not been fully researched to date. The bog basins and the bodies positions within their respective bogs have also not been previously established. Additionally, the hypothetical depths of the bodies and their distance from the contemporaneous peat edges have not been explored. Past research in relation to both bodies was very narrow. Investigations and analyses were restricted to medical examination of the bodies and of the immediate areas around the body. Research on Lindow Moss and Bjældskovdal bog had not previously been investigated to include the wider landscape which would contextualise these bodies much better.

Palaeoenvironmental analyses of the immediate area around the findspot of Lindow II had been carried out. A borehole survey for general bog stratigraphy was carried out as part of an archaeological and palaeoecological study of the wetlands of Cheshire (Leah *et al.* 1997). These will be discussed below.

On Bjældskovdal bog, the area close to where Tollund Man was found previously had palaeoenvironmental analyses carried out. The palaeoenvironmental study was not published and is discussed below. No comprehensive borehole survey had been carried out on Bjældskovdal bog apart from a small number of cores taken at the time of the palaeoenvironmental analyses near to the body.

3.4 Lindow Moss

Lindow Moss is located in the county of Cheshire East near Wilmslow and is centred on grid reference NGR SJ 820 805.

3.4.1 Background of Archaeological Finds on Lindow Moss, Cheshire East

Lindow Moss has yielded multiple body parts of human remains. Lindow I was found in 1983 by commercial peat cutter workers, and was a preserved crania (Turner 1995, 12). Lindow I was radiocarbon dated to approximately cal AD 84-290 (OxA-114) (1740±80 BP) (Gowlett *et al.* 1986, 22; Housley *et al.* 1995, 45). In 1984 a well preserved foot was discovered by peat workers on the peat elevator (Turner and Scaife 1995, 13). This led to an archaeologist going out to Lindow Moss within 24 hours to examine the peat stack that the foot derived from (Turner 1995, 13). By examining the adjacent areas of peat which were still intact, a piece of skin was identified bulging from the peat (Turner 1995, 13). Lindow II's body was excavated within a larger block of peat enabling him to be removed and examined carefully in the laboratory (Stead *et al.* 1986; Turner and Scaife 1995).

In 1987 a part of Lindow III's back was discovered on elevator machinery by peat workers (Turner 1995, 13). An archaeologist visited the site to assess the remains and a team of people set about examining the contents of peat contained on the peat elevator and railway trucks at the depot (*ibid*). Seventy pieces of soft tissue and bone fragments were found (Brothwell and Bourke 1995, 52). Partial remains of the scrotal sac identified Lindow III as male (Brothwell and Bourke 1995, 57). A congenital anomaly of the thumb called polydactyly was identified (*ibid*).

Lindow IV was found in 1988 and comprised partial buttocks and the skin of a leg and other skeletal remains (Brothwell and Bourke 1995, 52). Lindow IV body parts are thought to be part of Lindow II because of the location of the finds, how they match the anatomy of Lindow II and because they have the same preservation condition as Lindow II (Brothwell and Bourke 1995, 52).

Forensic investigations of Lindow II demonstrated that the individual was male, approximately 25 years of age (West 1986). He had received two head injuries which may have been the result of being struck by an axe type weapon (West 1986). Lindow II had also been garrotted and his throat was cut (West 1986, 80, Leah *et al.* 1997, Turner and Scaife 1995, Stead *et al.* 1986). Further forensic details have already been described in chapter 2. Radiographs were taken of the body of Lindow II and showed evidence of Schmorls's nodes (Connolly 1986, 56). These nodes were caused by arthritic changes to the spinal discs (Connolly 1986). A fox fur arm band was found on Lindow II's left arm (Budworth *et al.* 1986, 40).

Other objects found on Lindow Moss were an iron pin which was found at the same time as the discovery of Lindow I crania (Budworth *et al.* 1986, 40). The peat surrounding Lindow I was examined closely for further remains and even peat that had been removed from Lindow Moss and dispatched to Somerset was examined (Budworth *et al.* 1986, 40). The iron pin was unearthed from peat in Somerset (Budworth *et al.* 1986, 40). It is 61mm long ribbed iron rod that tapers to one end with both ends incomplete (*ibid*). The Iron pin has been investigated by experts in prehistoric, Roman and Medieval artefacts and it is undated with an unknown function (Budworth *et al.* 1986, 40). It is possible that the iron pin was used to provide tension and force during garrotting, or maybe an incomplete part of a fibula.

A jawbone of *Bos taurus* (SMR 1472/0/1) was found on the peat elevator on Lindow Moss in 1991 (Roberts 1991; Stallibrass 1993; Leah *et al.*1997). It was examined and evidence of burning was present on the lower mandible edge (Roberts 1991; Stallibrass 1993). There was no evidence of butchery; general wear of the teeth suggested the *Bos taurus* (domestic cattle) was around 2-3 years of age (ibid). It was suggested that the jawbone was approximately Iron age (500 BC-42 AD) in date from its stratigraphy context, although the accuracy of this is unconfirmed (Roberts 1991; Stallibrass 1993). Furthermore, the decomposed remains of a boar were found on Lindow Moss in the lower area nearest Mobberley (Norbury 1884, 65).

On the western edge of the moss lies two sand islands, both of which were partially excavated (Leah *et al.* 1997). Archaeological excavations on the larger eastern sand island revealed a scatter of more than 20 flints derived from four different types of flints (Turner, 1995, 17; Leah *et al.* 1997, 49). The high wastage of flints suggested that there were one or two events of flint knapping (*ibid*). A retouched piece of flint, a flake knife and utilised flake were produced from the flint knapping (Turner 1995, 17). The flint implements were dated to approximately the Neolithic period (4000-2200 BC) which correlated to radiocarbon dates of charcoal dated cal BC 3849-3651 at 95.4% confidence 2 sigma, (HAR-8875) (4980±70 BP) from the smaller sand island (*ibid*).

The flints were encased in a layer of podsolic soil which was intact, and this indicated that cultivation of the sand island had not been carried out since development of the podsol (Turner 1995, 17). Although, the two sand islands were partially excavated there was no evidence of settlement around the edges of Lindow Moss which could be associated to Lindow II (Turner 1995, 17).

A wooden trackway (SMR 1472/0/2) at location (SJ 8100 800) may have run the entire length of Lindow Moss and was located on the Mobberley side (Norbury 1884, 65). The description given by Peter Cash who found the trackway was as follows: 'the logs were placed end to end with sleepers across laid close together' and was described as 'at the bottom of the bog' (Norbury 1884, 65).

The archaeological finds that were found within the local environment of Lindow Moss have been described. Further archaeological objects and remains from further afield in the surrounding wider area of the Cheshire wetlands follows below.

The next section describes the environment of Lindow Moss and its surrounding wetlands. Research undertaken on Lindow Moss is also described. Pollen evidence is discussed in relation to the vegetation history and impact of human activity around Lindow Moss's landscape.

3.4.2 Environment of Lindow Moss

Lindow Moss (NGR SJ 820805) is situated 12 miles south of Manchester. Originally the Lindow Moss was quite a widespread peat bog covering 600 ha (15000 acres) (Norbury 1884). Around 1830 Lindow Moss was reported to be around 7000 acres (Norbury 1884, 62). It now has diminished in size to approximately 60 ha (Turner 1995). It is located approximately 2.5 miles north-west of the Keuper sandstone escarpment of Alderley edge (Birks 1965, 299). The solid geology of the area was covered with glacial deposits formed of gravel, till and glacial sand and various undistinguishable fluvio-glacial gravels (Leah *et al.*1997). The wetlands of Cheshire have developed in the hollows from the ice thaw of the last glaciation (Turner 1995, 10). Lindow Moss is one of many lowland peat bogs within this area (ibid). Soil characteristics were determined by glacial deposits of gravels and sands which dominate, consisting of stagnogley soils with various brown sands and earths (Leah *et al.* 1997, 45). Lindow Moss is bounded by till derived soils of Salop Association (*ibid*). In the northern most section of the Lindow Moss peat has been lost due to a landfill site (Leah *et al.* 1997, 46). In contrast, the south-western section it is still commercially cut for peat (*ibid*). The southern area of Lindow Moss is protected and is managed by the Cheshire Wildlife Trust.

A palynological investigation of the south-western (SJ 820807) area of Lindow was carried out by Birks (1965). The results of this demonstrated presence of 3.5m of gyttyas, carr brushwood peats, *S imbricatum, Eriophorum* peats and reed peats; it revealed a vegetation history between 6000 and 400 cal BC and up to the early 19th century (*ibid*). Seven forest clearance events were interpreted from the pollen record which were associated to the post Elm decline in the pollen record (Birks 1965).

Pollen analysis shows that human activity impacted on the vegetational history of Lindow from the Neolithic period onwards; forest clearance and regeneration occurred, and the results demonstrate they are connected to archaeological activity and settlement surrounding Lindow (Birks 1965, 313). Anthropogenic activity which influenced the local landscape was also validated by more recent research undertaken by Branch and Scaife (1995); they examined the uppermost 1.9 metres of peat on Lindow Moss located on the sand lobe in the western side of the moss (SJ 8200 8060) which had a time frame of Neolithic (4000-2500 BC) to Early Bronze Age (2500-1500 BC) to early Medieval periods (AD 410-1066).

Results from the study revealed in Early Bronze Age (2500-1500 BC) Lindow was mainly wooded with areas of open agriculture, with secondary woodland regeneration occurring after clearance episodes (*ibid*). Branch and Scaife (1995, 20-30) argue increased anthropogenic activity during Iron Age (800 BC-AD 43) to Romano-British period (AD 43-410) took place and evidence to support this was demonstrated by the increase in the variety and numbers of herb pollen and cereal types which are indicators for agriculture (Branch and Scaife 1995). The results from their research corresponds with the earlier studies carried out by Birks (1965) and Oldfield *et al.* (1986) (Branch and Scaife 1995).

Further work was carried out on the findspot of Lindow II by Oldfield *et al.* (1986) paralleled both earlier palynological studies. Further localised palaeoenvironmental investigations concentrated within proximity of the body, but nevertheless, indicate the local environment. Barber (1986, 86-89) examined macrofossils which suggested that the area had become increasingly wetter before the body was deposited, surface wetness conditions indicated the bog would have been difficult to walk across without sinking knee deep in water. Hence travelling across the bog would have been challenging. It is well established that pollen analysis can reconstruct the vegetational history of the local landscape and identify changes in the local vegetation related to human activity, this information provides landscape context to deposition of the body (Birks 1965; Oldfield *et al.* 1986; Branch and Scaife 1995; Smith *et al.* 2010; Hjelle 2012; Golyeva and Andrič 2014; Smith *et al.* 2017).

Fossil beetle remains were analysed by Girling (1986, 90-91); they demonstrated species which were associated *Sphagnum* pools, pools, reeds, heather, and peat mosses and paralleled Barber's (1986) interpretation of very wet conditions of Lindow Moss landscape at the time Lindow II was deposited. Dayton's (1986) findings related to Cladocera and Chironomidae suggest evidence of the presence of shallow pools. In addition, Dipterous remains were analysed which indicated there was no necrophilous fauna which demonstrated that Lindow II was not exposed to air and did not decay (Skidmore 1986, 92). Hence, Lindow II was completely immersed in the bog which corresponds to the evidence from the Dipterous analysis (Skidmore 1986).

Despite the investigations surrounding the Lindow II's findspot no other wider environmental or wider landscape analysis has taken place to contextualise the body within its landscape so far. The next section describes the North West Wetlands Survey (NWWS) and its relevance to this piece of research. Results from both fieldwork undertaken by the author and the NWWS will be discussed in chapter 5 and chapter 7 below.

3.4.3 North West Wetlands Survey of Lindow Moss

The wetlands of Cheshire were surveyed by Leah *et al.* (1997) to document past human and archaeological activity within the lowland peats of this county, with the main aim to evaluate the lowland peat of North West England, its state of preservation and any potential threat to its survival. In addition, the aim of the survey was to establish the state of preservation of the peat bog environment and enrich the environmental archives of the county (*ibid*). Lindow Moss was amongst the many peat bogs within the survey area (Leah *et al.* 1997). A stratigraphic survey of the wetlands, palynological investigations, and archaeological survey of each bog was carried out to fully understand the environment of the county through time (*ibid*). The other remaining bogs investigated in this survey are discussed in length by Leah *et al.* (1997) and will not be repeated here.

A total of 38 boreholes were carried out on Lindow Moss with fieldwalking and a dyke survey which were a part of the English Heritage NWWS by Leah *et al.* (1997). The survey assessed surrounding fields for earthworks and established the extent of peat (Leah *et al.* 1997, 53). This proved to be difficult on the southern and eastern section of Lindow Moss where modern housing bordered the peatland edge (Leah *et al.* 1997, 53). However, it was observed that the peat boundary was visible by a prominent scarp across the moss (*ibid*).

The NWWS survey results will be discussed in the chapter 5 in more detail and will be evaluated as a separate piece of legacy data and then integrated into the new data from this thesis to form a larger 3D model of bog topography in GIS.

3.4.4 Scientific Investigations of Lindow II

This next section highlights the forensic and medical examinations that were undertaken on Lindow II. It also explains some of the research that has also taken place on Lindow I and Lindow III. As with the previous research carried out on most of north-western bog bodies, the emphasis has been on investigating the human remains. Detailed investigations of Lindow II have been carried out since his discovery in 1984 and are widely known. They have been reported in two edited publications by Stead, Bourke and Brothwell (1986), and Turner and Scaife (1995). The forensic examinations provide an interesting part of the biography of Lindow II which may have the potential to elucidate what happened before he finally came to be deposited in Lindow Moss. A brief outline of the forensic examinations have already been described in chapter 2. However, taking a wider contextual landscape approach has potential to go one step further with interpretation. By extending research to include the broader landscape, cultural archaeology and the bog landscape immense value in relation to how the corpse was connected to its surrounding landscape is gained. Furthermore, new data can be attained to add to current interpretations of the bog body debate that perhaps has not been considered before.

The forensic examinations revealed that Lindow II received two blows to the head (West 1986, 77). The first, when examined closely, demonstrated swellings on the wound edges which were consistent with an injury received prior to death (West 1986, 77). The second head wound was more severe (West 1986). An extremely forceful blow was used as bone fragments were found embedded into brain tissue (*ibid*). Fracture and dislocation of bones C3/C4 of the cervical vertebrae were identified (West 1986, 78-79). These injuries correspond to the twisted sinew loop being used as a garrotte to break the neck and strangle Lindow II (West 1986, 78-79). Inserting either a sturdy wood stick or piece of straight metal and twisting the sinew loop caused the neck to break (West 1986, 79).

There was an incisional wound on the front of the neck which was consistent with a sharp edge instrument (West 1986, 79). The incisional wound was deep, it penetrated the thyroid cartilage and the location of the incision has been interpreted as having the purpose to severe the jugular vein (West 1986, 79). A rib fracture was also present, and evidence suggests this occurred just before death (*ibid*). Also, a stab wound to the upper chest was detected (West 1986, 80).

Analysis of stomach contents showed that Lindow II's last meal was a combination of emmer, spelt, wheats and barley and it was suggested it was in the form of unleavened bread (Holden 1995, 82). Pollen analysis of stomach and gut contents established there was a small amount of mistletoe pollen (*Viscum album*) which may have used as a narcotic substance in the past (Scaife 1986, 131). However, there was a lack of ergot (*Claviceps purpurea*) *to* parallel findings with Grauballe man and Tollund Man (Hillman 1986, 103). The presence of ergot has been linked to the possibility that it was used intentionally as a hallucinogenic prior to being sacrificed (Hillman 1986, 103).

Samples from the small intestine of Lindow II were analysed (Jones 1986, 138-139). Human whip worm and the maw worm infestation were detected (Jones 1986, 138-139). Computerised tomography (C T scan) was used to evaluate the body of Lindow II

(Raznek *et al.* 1986). It showed good detail of spinal structure and identified Schmorl's nodes (Raznek *et al.* 1986). It was anticipated that internal organs would be seen but this was not entirely successful, it did however show the dura mater which is the membrane which encases the brain and the preserved human brain within this structure (Raznek *et al.* 1986).

Close examination of Lindow II's nails seem to suggest that he did not participate in manual labour of any form (Brothwell and Dobney 1986). Other body parts have undergone analysis; finger bones have revealed most interestingly; in that there is evidence of polydactyly in Lindow I and Lindow III (Brothwell and Bourke 1995, 56). This congenital condition is simply the presence of an extra digit (Brothwell and Bourke 1995, 56). Additionally, Pyatt *et al.* (1995) analysed skin and bone and have suggested that Lindow II and III were decorated by pigment rich body paints.

In the above section scientific analysis has revealed information on Lindow II and Lindow I and III. Medical evidence demonstrated factors leading to Lindow II's death and his infestation with two types of worms, and the contents of his stomach were able to show the type of foods he ingested prior to death. All the above form a narrow focus on the body which is very useful and informative perspective in bog body research. It is apparent that an even wider archaeological investigation has the potential to provide a more integrated interpretation of Lindow II and Lindow III within their broader cultural landscape. The following section provides background to the comparative case study of Tollund Man found deposited in Bjældskovdal bog, Denmark.

3.5 Bjældskovdal Bog

Bjældskovdal bog is located in the valley of Bjældskovdal part of the Bølling Lake system (Fischer 2012, 57). Bjældskovdal bog is centred on Eastings: 524373, Northings: 6224485 approximately 10km west of Silkeborg, Central Jutland, Denmark. Figure 3.2 shows a map of Denmark with the location of the study site inset.

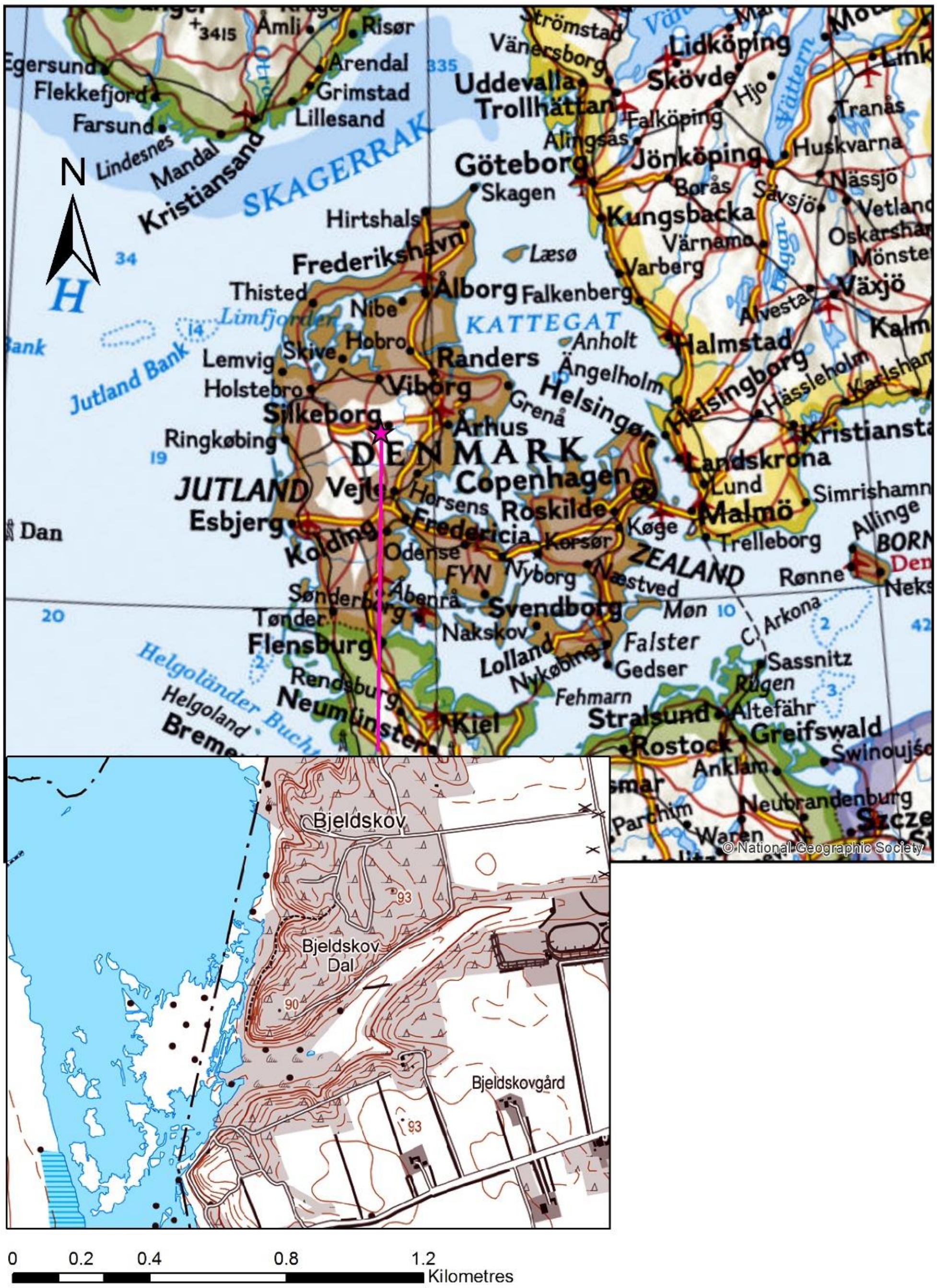

Figure 3.2 Map of Denmark with Inset Map of Study Site

3.5.1 Background of Archaeological Finds from Bjældskovdal Bog

The following section explains the local archaeological finds from Bjældskovdal bog. Two well preserved bog bodies have been recovered from Bjældskovdal bog and are well known; Tollund Man and Elling Woman (Glob 1969; van der Sanden 1996; Fischer 2012; Nielsen *et al.* 2018). A third bog body has been identified *in situ,* but recovery was not possible as a peat baulk collapsed on the body's site making it unsafe to excavate and so remains in the bog (Fischer 2012).

Tollund Man was discovered in 1950 on Bjældskovdal bog by a local family cutting peat (Fischer 1999, Fischer, 2012, van der Sanden 1996, Glob 1998). The body lay approximately 2.5 metres from the surface of the peat (*ibid*). Tollund Man lay on a layer of *Sphagnum* peat which was 2-5cm thick followed by a sequence of dark sand (Fischer 2012, 39). This suggested that Tollund Man was intentionally placed in a peat cutting which was exposed to the elements for some time before the body was deposited within it (*ibid*). As above the sandy layer under the body, *Sphagnum* peat had established, in a peat baulk 10-15m away two old peat cuttings were identified which had contained a later layer of *Sphagnum* within them (Fischer 2012, 60).

On Tollund Man's head, was a leather cap with two leather straps which tied to keep the cap firmly on the head; it was constructed with sheep hide formed of eight pieces sewn together (Fischer 2012, 43). The style of the leather cap parallels those found on bog bodies from Søgards Mose and Rønbjerg, near Skive (Fischer 2012, 43). Around his waist Tollund Man wore a leather belt, 1.9-2.4cm width and 77.5cm circumference; 14cm of the belt hung down from the side of the waist (Fischer 2012, 44). A leather rope was wound tight around his neck like a noose (*ibid*). Scientific investigations of Tollund Man follows below.

The second bog body to be discovered on Bjældskovdal was Elling Woman (figure 3.3) found in 1938 approximately 80-90 metres from the findspot of Tollund Man although the precise location is not given (Fischer 2012, 81; Nielsen, 2016, 161). Visible depositional evidence clearly suggests that Elling Woman lay in a peat cutting as the wall of the pit was seen to the west where the body lay (Fischer 2012, 81; Nielsen, 2016, 161). The skull of Elling Woman was measured lying 1.55 metres below the bog surface and the base of the bog was 1.90 metres below the surface (van der Sanden 1996; Fischer 2012, 84 van). Approximately 25 metres from Elling bog body a T-shaped peat spade was recovered in addition to another wooden instrument (*ibid*). Recent radiocarbon dating of the body produced a date of approximately 355-205 cal BC, early Iron Age period (GrA-15637, GrA-14315) (van der Plicht *et al.* 2004, 482). A leather halter was found, Elling Woman was wearing a cape of hide, and another cape of ox hide was wrapped around her legs, and she also wore a wool belt (Fischer 2012, 86-92). The evidence strongly suggests that Elling Woman died of hanging (van der Sanden 1996;

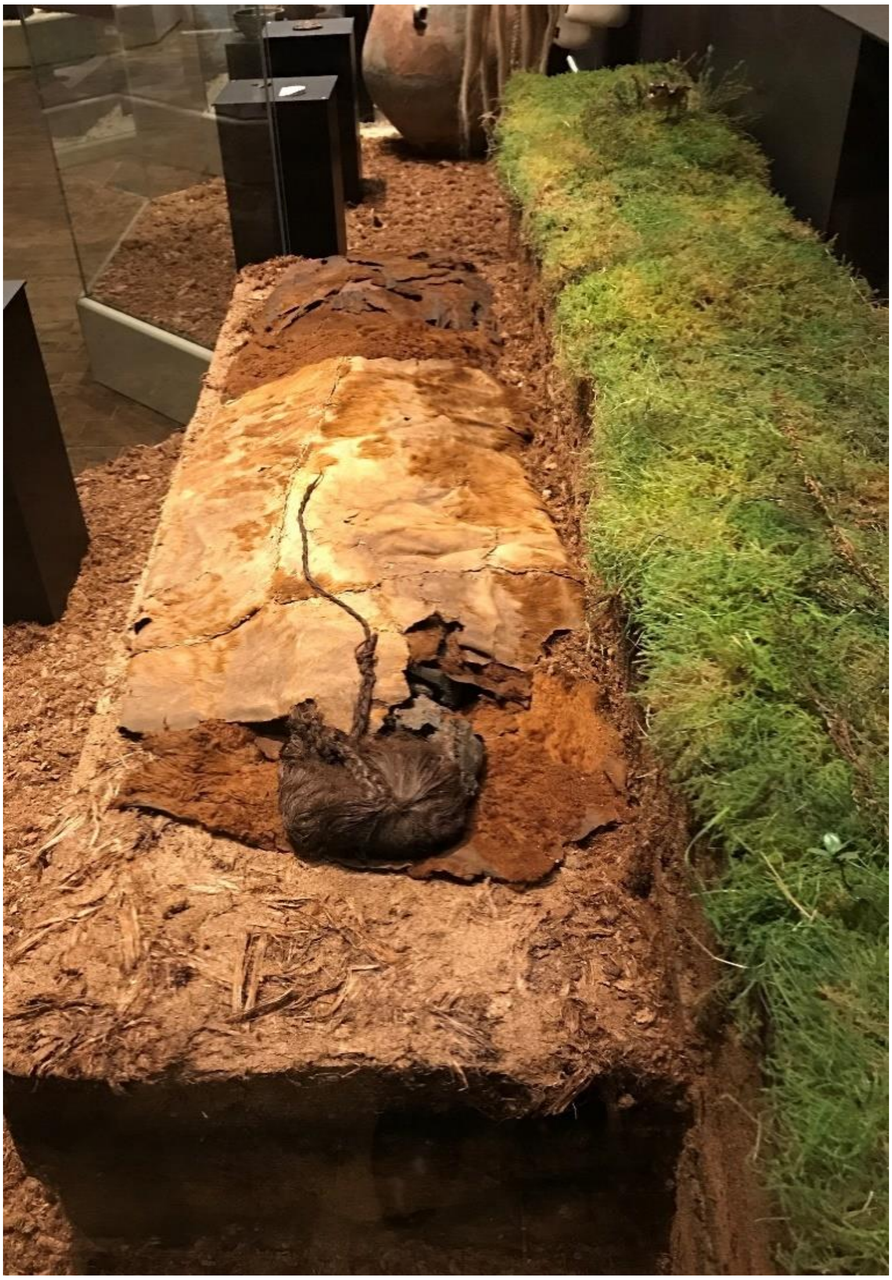
Figure 3.3 Elling Woman on display in Silkeborg museum (photo taken by author)

Asingh and Lynnerup 2007; Fischer 2012). A deep narrow indentation in the neck and throat indicated the noose embedded in the tissue typical of hanging (van der Sanden 1996; Asingh and Lynnerup 2007; Fischer 2012).

A third bog body found on Bjældskovdal bog was discovered in 1927 by a peat cutter Tobias Lassen (Fischer 2012, 94). Christian Fischer was fortunate to meet with him and was able to gain further information about finds on Bjældskovdal bog that he had discovered (Fischer 2012, 94). On extracting the last of the peat remaining in a very deep pit, human remains were identified; skin and ribs were seen (Fischer 2012, 92-95). As the peat cutter was digging further to reveal more of the body parts the sides of the pit collapsed and water rapidly filled the pit, so Lassen had to get out very quickly (Fischer 2012, 92-95). However, the following spring Lassen went back to the pit and was able to recover a piece of rectangular skin measuring 80x60cm with hair on one side and smooth on the other, with evidence of sewing stiches on the skin (*ibid*). Lassen also found two wooden paddles which he kept and later were given to the National Museum (Fischer 2012, 95). The exact location of where the paddles were found was not given in relation to the third or subsequent bog bodies (*ibid*). Unfortunately, the precise location of the third body was not recorded by Lassen for future recovery of the body (*ibid*).

Lassen also discovered the remains of part of a wooden trackway whilst cutting peat (Fischer 2012). The posts were erect in rows and their foundations were deeply embedded into the bog spaced approximately one metre apart across the width of Bjældskovdal where a pathway terminated (Fischer 2012, 95). The wooden trackway continued across the bog ended and connected to the pathway on the other side of the bog (Fischer 2012, 95). One of the wooden posts found was kept for 50 years by Lassen and subsequently was radiocarbon dated by to around 780-520 cal BC (GrN-22994, GrN-23165) (van der Plicht *et al.* 2004, 483).

At approximately 3-4 metres away from Tollund Man's findspot two wooden peat paddles/spades shaped like a T, were also discovered at a depth near to the base of the peat bog which have now been misplaced (Fischer 2012, 36). Similarly, a wooden paddle (most probably it was a peat spade) was also found with Elling Woman (Fischer 2012, 37). These wooden peat spades were used to cut pieces of peat in a block, a little like a big butter knife (*ibid*). The wooden paddles/peat spades were radiocarbon dated to the early Iron Age period (Fischer 2012, 38).

The Bølling lake area which is adjacent to Bjældskovdal bog has in the distant past been a focus of historical activity (Glob 1998,22-25; Fischer 2012, 59). Archaeological objects such as carved amber animals, a cart shaft which was dated to the Neolithic period, wooden spades, stepping-stones traversing the bog have been found in this vicinity of Tollund Man and Elling Woman deposited in nearby Bjældskovdal bog (Glob 1998,22-25; Fischer 2012, 59).

The above demonstrates archaeological finds from Bjældskovdal bog of both bog bodies and objects from a period ranging from the Neolithic to the Iron Age.

3.5.2 Environment of Bjældskovdal Bog

Bjældskovdal bog forms a part of the Bølling Lake system which extends to approximately 350ha, at either end of the lake two rivers the Funder Å and Skygge Å flow into it (Glob 1998; Fischer 2012, 57). Since the ice receded approximately 13,000 years ago, the lake formed in a depression in this large area, the surrounding landscape was a mixture of lowland bogs with meadows and raised peat bog, and open water with associated plant habitats (*ibid*). Bjældskovdal peat bog measures approximately 150 metres in width. Bjældskovdal bog has been extensively cut for peat and significant amounts of peat stratigraphy has been removed. However, in a couple of areas relict peat baulks have been identified that have the potential to reveal more in-depth peat stratigraphy and sampling for palaeoenvironmental analysis. The highest peat baulk was located nearest to the Bølling Lake end of Bjældskovdal.

Pollen sampling was undertaken by Brorson Christiensen when Tollund Man was excavated (Fischer 2012, 58-59; pers. com. N. H. Nielsen 2018). Two samples of peat were taken from under the body and surrounding it (*ibid*). The pollen samples obtained from Tollund Man's body were analysed and compared with pollen samples from the findspot area (Fischer 2012, 59). Brorson Christensen's pollen results did not have the intention of dating the body it was to provide the pollen zone that it was associated with (Fischer 2012, 59). Results of the pollen analysis revealed the body was deposited after the Neolithic period (Fischer 2012, 58-59; pers. com. N. H. Nielsen 2018).

In 1952 Troels Smith carried out an initial examination of peat stratigraphy and obtained a pollen sample from a peat baulk a number of metres away from the findspot of Tollund Man (Fischer 2012, 58-59; pers. com. N. H. Nielsen 2018). Troels Smith's original notes are held in the National Museum of Denmark. Troels Smith wanted to conduct further pollen analysis to establish the approximate dates of the peat cutting that Tollund Man was found in (Fischer 2012, 58-59; pers. com. N. H. Nielsen 2018). This did not take place because he was not granted funding by the National Museum and new methods of radiocarbon dating showed more potential at that time (pers. com. N.H. Nielsen 2018).

The limited examination of peat stratigraphy carried out by Troels Smith in 1952 was unpublished.

A full and extensive palaeoenvironmental analysis and stratigraphic survey of Bjældskovdal bog and Tollund Man's findspot has not been carried out to date (pers. com. N.H. Nielsen 2018). In comparison with Lindow Moss and Lindow II's place of deposition which has been investigated and yielded important data which has been described above (Birks 1965; Stead *et al.* 1986; Turner and Scaife 1995; Leah *et al.* 1997).

The above section explains the available evidence of the environment and investigations which have taken place on Bjældskovdal bog to date. The lack of palaeoenvironmental analysis and further landscape investigations such as borehole surveys highlight how the focus of research is solely on the human remains found within this bog and not contextualising the bog body within its wider landscape by having a more integrated landscape approach to research.

3.5.3 Scientific Investigations of Tollund Man

The following section summarises the forensic and medical examinations which have been undertaken on Tollund Man bog body. It is interesting to observe how in the past some bog bodies were treated, as with Tollund Man he was found in situ with his body intact on Bjældskovdal bog. At some point during the conservation process at the National Museum, Denmark his head was detached and preserved then presented to the Silkeborg Museum for display whilst the body was stored unpreserved (Fischer 2012. 101). His feet which were in two jars with inadequate level of fluid, so deterioration had taken place, although the thumb and toe were well preserved, but the toe went missing! (Fischer 2012, 101). The rest of the body was scraped clean of flesh before being donated to the Normal-Anatomical Institute as skeletal bones (Fischer 101-102). All body parts of Tollund Man were recovered, but more about the missing toe below. Currently Tollund Man is displayed at the Silkeborg Museum with a replica body and the preserved head. The most recent investigations which were carried out by Aarhus AMS Centre, Denmark have narrowed Tollund Man's time of death to a new date of 405-380 cal BC at 95.4% accuracy (GrA-14179, AAR-26386.1, AAR-26387.1) (Nielsen *et al.* 2018). In addition to a new date, strontium analysis of Tollund Man's femur bone indicated that this individual lived 40+ km away from Bjældskovdal bog within the last 10 years of his life (Nielsen *et al.* 2018, 1535). Further strontium analysis of Tollund Man's hair indicated that the last 4 months of his life was spent very near to Bjældskovdal bog (*ibid*).

In 1950 X-rays were taken of the upper body and head, which revealed that the brain tissue was well preserved, bones decalcified and neck vertebrae not clearly identifiable to indicate fracture or sharp instrument damage (Glob 1969, 28-30; Fischer 2012, 46). It was concluded that the cord wrapped around Tollund Man's neck was used for hanging despite no apparent neck vertebrae fractures (Fischer 2012, 46, Asingh and Lynnerup 2007 294, van der Sanden 1996, 155-6; Glob 1969, 28-30). More recently in 2002 the head of Tollund Man was taken to Aarhus University hospital for a C T scan, which revealed more detailed information on the physiology and pathology of the head. (Fischer 2012, 108-109). It revealed that the tongue was enlarged which correlates to a person who has been hung (ibid). Also, an endoscope was inserted into the brain via the spinal canal and this was able to determine the preservation of brain tissue (Fischer 2012, 111). The scan also demonstrated the presence of all teeth intact and one of Tollund Man's fingers had evidence of a healed bone fracture (Fischer 2012, 112). Tollund Man's missing toe was returned to the Silkeborg Museum by Thorvildsen's daughter after his death and she reported that her father would remove it from his pocket unwrap it from his handkerchief to check its state of preservation (Pers. Com. O. Nielsen 2017).

The skin of this individual was examined under infra-red light for signs of tattooing, but this was not seen, so it remains slightly inconclusive as presence of dyes used during this period may not be evidenced using this investigative technique (*ibid*). A thorough medical examination demonstrated that Tollund Man's internal organs were able to be identified although due to the pressure of peat on top of the body, were considerably flattened and had lost some volume so were reduced in size compared to when this individual was alive (Fischer 2012, 49). The contents of his small and large intestines were investigated by Helbæk (1951), and his last meal eaten approximately 24 hours prior to hanging was established. It consisted of a porridge type meal containing barley, oats and linseed, with ground weed seeds (Helbæk 1951, van der Sanden 1996, Fischer 2012, 49). The intestines of Tollund Man were found to contain whipworm eggs suggesting he was infested with parasites which parallels with Lindow II (Helbæk 1951, Raznek *et al.* 1986, van der Sanden 1996, 141).

Facial stubble indicated that he was not clean shaven at death, his well-preserved right foot had no toe-nails attached and two scars on the sole of Tollund's foot was visualised

(Fischer 2012). Tollund Man's penis and scrotum were very well preserved (Glob 1969, 28).

3.6 Summary of Chapter 3

Chapter 3 above outlines the background to both study sites and explains research carried out so far. The following summarises the case studies chapter and distinguishes differences in terms of the research done at both sites.

Both study sites produced multiple bog bodies and a limited number of artefacts. It became apparent that there was a significant difference between the two bogs. Specifically, on Lindow Moss a borehole survey was undertaken in some areas of the bog to outline the bog landscape and peat stratigraphy (Leah *et al.* 1997). Whilst palaeoenvironmental investigations of the areas close to Lindow II and Lindow III were done and these studies were published and have provided vital information about the local environment (Oldfield *et al.* 1986; Barber 1986; Branch and Scaife 1995; Scaife 1995; Buckland 1995; Barber 1995). The types of investigations carried out concentrated on their immediate place of deposition, i.e. local landscape environment. Lindow II findspot was extensively researched.

Palaeoenvironmental investigations have enabled the local landscape conditions at the time of deposition of the body to be established (Oldfield *et al.* 1986; Dayton 1986; Barber 1986; Girling 1986; Branch and Scaife 1995; Leah *et al.*1997). The potential impact of anthropogenic activity on Lindow Moss's vegetational history has been identified (Birks 1965). These investigations were centred on samples close to the body of Lindow II to determine surface wetness, vegetation and local conditions as well as paralleling wider palynological research on Lindow (Dayton 1986; Barber 1986; Skidmore 1986; Girling 1986).

In contrast, on Bjældskovdal bog palaeoenvironmental investigations of the findspot area have been restricted to very limited pollen analysis. The pollen study was not published. A comprehensive stratigraphic survey of Bjældskovdal bog to examine peat stratigraphy has been limited to a few cores taken near the findspot of Tollund Man. The findings from the cores taken on Bjældskovdal bog were unpublished. Legacy datasets to assess the wider landscape of Bjældskovdal bog and the local environmental conditions at the time of Tollund Man's deposition are severely lacking.

Medical investigations have been more detailed on Lindow II which has provided detailed valuable information of the cause of death, last meals, state of preservation and diseases (Bourke 1986; Connolly, 1986; West 1986; Reznek *et al.* 1986; Connolly *et al.* 1986). However, Tollund Man's initial investigations were limited as, desiccation of most of his body occurred (Glob 1969; Fischer 2012). Scientific research is still ongoing and yields even more insightful data such as, strontium analysis and a new radiocarbon date for the body (Nielsen *et al.* 2018).

It was unfortunate that initial palynological investigations on Bjældskovdal in 1952 did not take place due to lack of funding as it would have provided environmental information, and Troels Smith's notes of the pollen samples and peat stratigraphy taken in 1952 are in his original field notebook at the National Museum, Copenhagen. The author has translated Troels Smith's notes to gain additional data to analyse. These will be included in the results chapter 5.

A research framework to follow as a guide for the landscape investigation of bog bodies has recently been developed of which this research has contributed to (Chapman *et al.* 2019). A specific framework would enable research to target a group of investigations based on the framework outline which relates to different scales of landscape analyses.

Other research on wetlands has determined climate, peat stratigraphy from two study sites were analysed to investigate long term climate change in relation to changes of species of vegetation that form peat (Manquoy *et al.* 2002). Research on the Humber Wetlands has been carried out and helped improve the ways we approach wetland studies and bog body research (van de Noort 2004; van der Noort and O'Sullivan 2006). For example, Casparie (2005) modelled the mire evolution of Tumbeagh bog, Co Offaly. An integrated interpretation of archaeological and landscape data provided the conditions of the bog landscape at time of the body's placement in Tumbeagh bog (Casparie 2005). The data analysed by Casparie (2005) indicated the bog was extremely treacherous and Tumbeagh bog body perished in a dangerous area of the bog. The research on Tumbeagh bog is the only study so far that has investigated the broader bog landscape (Bermingham and Delaney 2005). The results have shown how Tumbeagh bog body became trapped and died in the bog, the peat survey showed the area the surrounding the body was very wet and unstable throughout the year (Bermingham and Delaney 2005). A large bog lake dominated the area centuries prior to the deposition of Tumbeagh bog body (Casparie 2005). Two significant phases of the bog lake have been identified, in addition, a discharge corridor emptied into the Lemanaghan Bog, the body lay at the junction of the discharge corridor (Casparie 2005). This area was saturated with water which enabled rapid accumulation of *Sphagnum* peat, the surface of the bog was very soft with pools (Casparie 2005). The conditions of the bog demonstrated that walking across this area the individual would have sunk with each step, the body probably sank below the surface of the bog within a few hours as the left leg was deeper and better preserved than the right leg (Casparie 2005). There was no evidence of carrion insects which indicates the body was not exposed and decaying (Casparie 2005). New information about the palaeoenvironmental conditions and reconstruction of the formation of the bog landscape have enabled an interpretation of Tumbeagh bog body in relation to its bog scale landscape, the lack of archaeological sites within the area surrounding Tumbeagh bog suggests the inaccessibility of the area (Bermingham and Delaney 2005).

Investigating the broader landscape of Lindow II and Tollund Man has the potential to obtain new information to contribute to the analysis of their deposition. By examining the surrounding cultural archaeology of Lindow Moss and Bjældskovdal bog it enables contextualisation of Lindow II and Tollund Man within their cultural landscape. Evaluation of the contemporary cultural archaeology surrounding both bogs enables the geographical relationship between the bodies and archaeology to be examined.

The majority of research has centred on the forensic analysis of the body (Gregersen 1980; Langfeldt and Raahede 1980; Stead *et al.* 1986; Turner and Scaife 1995; Garland 1995; Asingh and Lynnerup 2007; Fischer 2012). Bog bodies have been re-examined for radiocarbon dating, forensic analysis, stable isotope work and DNA (van der Plicht *et al.* 2004; Gill Robinson 2005). New bog body finds in Ireland have mainly been investigated for the violent injuries and cause of death and very little data related to the bog landscape has been researched (Mulhall 2010), apart from the multiproxy palaeoenvironmental study of Oldcroghan Man (Plunkett *et al.* 2009), and research on Tumbeagh bog (Bermingham and Delaney 2005). Kinnegad bog Co. Meath was re-surveyed after Moydrum Man was excavated, with the aim of identifying archaeological features and artefacts (Bermingham 2016). Although, the landscape of Kinnegad bog was re-evaluated, the bog scale landscape was not investigated for pollen, testate amoebae, coleopteran and plant macrofossils to reconstruct the formation of the bog landscape and establish surface wetness for additional data (Bermingham 2016).

Research carried out on stomach contents have provided data related to crops grown in the wider area indicating the approximate season they may have died and provided an indication of the landscape (Brandt 1951; Holden 1986; Holden 1995; van der Sanden 1996; Harild *et al.* 2007, 176-181; Mulhall 2010). Additionally, scientific analysis of fragments of textiles have suggested the geographical origin of raw materials sourced locally and from areas such as, Norway and Sweden, raw materials grown within the area contribute to a wider landscape context and the types of vegetation grown and used as resources (Frei *et al.* 2009, 1971; Frei *et al.* 2009).

Understanding the larger bog scale bog formation of Lindow Moss and Bjældskovdal bog shows the development of the hydrosere and vegetational history from the inception of peat. Furthermore, the bog landscape can demonstrate spatial differences and similarities of environmental conditions of the bog in general. It demonstrates at particular times how difficult the bog may have been to access in particular areas. For example, research on Tumbeagh bog showed unstable and perilous conditions may have contributed to the eventual demise of Tumbeagh bog body (Bermingham and Delaney 2005). The peat survey on Tumbeagh bog demonstrated there were shallow pools and the body's legs were within a pool (Casparie 2005). Whilst palaeoenvironmental reconstruction of Tumbeagh bog established some areas of the bog were extremely inaccessible (Bermingham and Delaney 2005). Palaeoenvironmental information determined conditions of the local landscape surrounding the findspot of Oldcroghan Man but, did not include the broader bog landscape (Plunkett *et al.* 2009). Obtaining data on the broader landscape has the potential to provide new information to analyse in relation to the bog body within it.

Very little research has focused on the positions of bog bodies within their bog landscape. Locating Lindow II and Tollund Man in their bog landscape enables analysis of the positions of the bodies in relation to their contemporary peatland edge. The locations of Lindow II and Tollund Man within their contemporary extent of peatland provides new data to analyse and contextualise their placement. Primarily, spatially exploring the positions of Lindow II and Tollund Man from their contemporaneous peatland extent can show how far the bodies are placed in relation to the edges of peatland at that time. Whether the bodies have been deposited on the edge or in the middle of the peatland and how they were positioned may impact on the overall interpretation by considering things such as accessibility across the bog in relation to the bog landscape at that time.

The different types of research undertaken to date provides more context to the bog body phenomena. However, previous studies described in chapter 1 and chapter 2 have illustrated a gap in research; a lack of broader landscape investigation of bog bodies.

To address the gaps in previous research explained in chapters 1 and 2 and here the design of the methodology includes assessing the cultural archaeology surrounding both bogs. The intention is to establish the broader landscape development of Lindow Moss and Bjældskovdal bog and to locate Lindow II and Tollund Man's position in their contemporaneous bog landscape, examining how far away from the peatland edges they were placed. The intention is also to reconstruct the shape of the bog basin to identify the morphology of the basin in relation to formation of the bog landscape.

Integrating cultural archaeology surrounding Lindow II and Tollund Man, plus reconstructing the wider bog scale landscape formation and analysing the positions of the corpses in their contemporaneous peatland extent attains new data to explore that moves beyond the body and findspot. This approach shows broader landscape development and how this affects bog access and the placement of bog bodies. The next chapter follows below and outlining the methodologies employed.

CHAPTER 4 METHODOLOGY

4.1 Introduction

This chapter outlines the methods of data collection used to achieve the aim and objectives stated in chapter 1 by investigating the cultural and physical landscape of bog bodies associated to Lindow Moss and Bjældskovdal bog. This research has moved away from the narrow focus of the body and findspot. The intention is to use borehole data to demonstrate the bog landscape, shape of the bog and the bog bodies positions within their hypothetical contemporaneous peatland as this has not been done before in bog body research.

To recap, in chapter 1 the aim of the thesis was to understand the broader landscape potential of bog bodies and by assessing the wider cultural archaeological evidence and trying to understand their placement in relation to their cultural landscape. It is also to see if this is a valuable approach and what else can be understood from the landscape surrounding Lindow II and Tollund Man. The aim of the research has been realised by employing four objectives:

1. To determine the pre-peat landscape;
2. To understand the development of the bog landscape;

3. To reconstruct the shape of the bog basin and identify the positions of the bodies within it;
4. To Interpret the relationships between the human remains within the bog and wider cultural activities as revealed from previous archaeological study;

Chapter 4 starts with section 4.2 which sets out the disciplinary limitations of this research. Then 4.3 outlines the methodology and techniques used to establish the pre-peat landscape for Lindow Moss and Bjældskovdal bog. Then section 4.4 explains in detail the techniques employed to analyse fieldwork data for Lindow Moss and Bjældskovdal bog.

Section 4.5 outlines the methods used to understand the development of the bog landscape on Lindow Moss and Bjældskovdal bog and the techniques needed to address this are described.

Section 4.6 outlines the methods employed to achieve the shape of the bog basin and positions of the bodies within it and the techniques used to reconstruct these. This is followed by section 4.7 which is the methodology applied to understand the relationship between the bog bodies and broader cultural archaeology from previous research and the techniques to address this. Section 4.8 is the summary of chapter 4.

4.2 Disciplinary Limitations of Research

Unlike the comprehensive study of Tumbeagh bog by Bermingham and Delaney (2006) which has set the gold standard for investigating the landscape context of bog bodies, the research for this thesis was restricted by very limited funding, inadequate levels of manpower to carry out extensive fieldwork and time constraints of both supervisors due to teaching and personal research commitments. Therefore, a full suite of palaeoenvironmental and extensive landscape analyses to complement the peat stratigraphy survey carried out for this research has not been possible to parallel the extent and detail of the investigations carried out on Tumbeagh bog. This research has not been able to radiocarbon date samples of peat from the bottom of the bog basin for potential dates of peat inception, or analyse samples of peat for pollen, beetles, plant macrofossils and testate amoebae due to the restricted time frame and small team of individuals. It is anticipated that post-doctoral research will enable further landscape analyses on Lindow Moss to build on the foundations of this research.

4.3 Methodology to Determine the Pre-Peat Landscape for Lindow Moss and Bjældskovdal Bog

The first research objective to determine the pre-peat landscape has been established and the techniques needed to address this. These were to carry out a peat stratigraphic survey of Lindow Moss and Bjældskovdal bog. The peat stratigraphic survey provided the data to establish the pre-peat landscape for both case study sites. The raw data obtained from the peat surveys formed the basis to input into ARCGiS software to analyse and achieve objective 1 by generating DEM’s of the morphology of the bog basins. The borehole transects were excavated at precise locations across Lindow Moss and Bjældskovdal bog to obtain peat stratigraphic data and basal elevations. Before starting fieldwork, archival sources were explored in order to understand the extent and results of previous fieldwork at Lindow Moss and Bjældskovdal bog. These techniques are now described in detail. Borehole surveys at each bog are explained and problems that were encountered are outlined.

4.3.1 Lindow Moss

A 20mm gouge auger was used for coring. The positions of each core was recorded using a handheld Global Positioning System (GPS). The positions of cores were then levelled using a dumpy level and these were related to existing OS benchmarks to establish the relative surface of core locations. The locations, quantities and distance between each core of the borehole surveys was determined by the landscape conditions on each respective study site. For example, transect 7 was intersected by a modern trackway and drainage ditch so the distances between cores were irregularly spaced to accommodate this.

The first phase of fieldwork commenced in 2015; a borehole survey examining the peat stratigraphy and recording depths began in the first section of peat bog still currently commercially cut for peat. At that present time, work had ceased whilst locals were contesting potential building issues within the wetland area.

Cores were taken starting in an east to west direction every 50 metres from transect 1 in the north east area of Lindow Moss. Peat stratigraphy was examined and recorded by measuring its depth of peat layer. The auger was extended by 1 metre at a time and the peat types were examined and measured. This process was repeated until the auger hit basal sands and gravels. When finished at each core a red peg was inserted into the ground to mark its location. A GPS coordinate was obtained of each core using a handheld GPS station. Near to the location of Lindow Man findspot, distances between cores ranged from 19-50 metres. This was because the section of peat closest to his place of deposition was narrow in width before it was terminated by a hardcore pathway.

One of the fundamental issues with borehole method arose when parts of the peat captured in the auger chamber was lost as it was extracted out of the core to be examined. When this happened, the auger chamber was cleaned and retaken. On occasion the core hole flooded with water and the peat deposit collected was lost. A further core was taken if this was unsuccessful and it was documented as a lost deposit. If the deposit in the auger chamber was not visualised, it was retaken. Each core was recorded in detail for Lindow Moss and Bjældskovdal bog, their locations, the depths of stratigraphic layers that were identified, types of peats and their description.

4.3.2 Bjældskovdal Bog

A 20mm gouge auger was used for the borehole survey at Bjældskovdal bog. A laser level was used to obtain surface levels of each core location. There was no vertical control, so elevations were taken from secure points observed on LiDAR data. The bog was 150 metres wide. Cores were taken every 10 metres but determined by the local conditions and landscape on the bog such as, deep pools, hummocks, and modern pathways. Bjældskovdal bog had also been commercially cut for peat to the point where in some places there was little remaining, but in other areas there were relict peat baulks of considerable depth especially closest to the Bølling lake. The area had returned to its natural habitat and was now a conservation area, so was very wet and saturated with water. Often the modern peat surface was under water and therefore the water depth needed to be measured too. If peat was lost from the auger chamber the core was retaken. In the centre of the bog the water was very deep; it was knee high and a little treacherous to negotiate safely. However, as you got further into the middle the ground became firmer. Despite this tricky element, cores were taken and recorded across the width of Bjældskovdal bog.

4.4 Techniques for Analysis of Fieldwork Data on Lindow Moss and Bjældskovdal Bog

The raw data gathered from the borehole surveys on Lindow Moss and Bjældskovdal bog were used to model the pre-peat landscape. In order to create 3D images of the pre-peat landscape, Geographic Information System software (GIS) was employed. Digital maps obtained from Digimap and Historic England databases were also manipulated in GIS to evaluate the areas of both bogs to achieve objective 1. The techniques applied to analyse information from the peat stratigraphy survey to realise objective 1 are explained below.

4.4.1 Geographic Information System (GIS)

The x, y, z, co-ordinates, top of cores and depths of the basal peat layers of each core were transcribed into GIS software. GIS software was used to create 3D models and visualise digital map information to determine and explore the landscape. Digital

Elevation Models (DEM) were created using the recorded information in GIS to visualise the pre-peat landscape of both study sites.

The fieldwork data was set out in an excel table containing X, Y and Z coordinates of cores, base of organics. The excel table was then saved and converted into a comma delimited file (csv). The csv file was checked by opening it in notepad to ensure there were no spaces and the cursor was at the end of the last line of text. Errors at this point would fail to generate a spline. The method of interpolation was applied to create a Digital Elevation Model (DEM) by first creating a polygon shapefile to constrain the analysis. This enabled a model to be made by creating a spline. The spline appears in the GIS software and is the DEM. The spline visualises the pre-peat landscape, the base of bog topography.

Any discrepancy in the initial stage will have a significant impact on analysis later. In addition, 3D models were based on raw data also the methods and techniques used can have an impact on the validity of the model too (Burrough 1986, 152). The quality and accuracy of DEM's used to analyse archaeological landscapes has been investigated and discussed in depth by Chapman (2000). In summary, GIS has shown to be a valuable tool to understand and explore conceptual surfaces. Chapman's (2000) study demonstrated for landscape archaeology, point data was more useful than contour data because there were a larger suite of tools in GIS for creating surfaces using point data.

The next section explains interpolation and spline techniques that were used to create DEM's to visualise the pre-peat landscape.

4.4.2 Digital Elevation Models (DEM's)

This section explains Digital elevation models and the technique and types used to approach this research. A DEM is a digital representation of landform slopes, elevations, surfaces and topologies in raster format. It is made up of a variety of elevations taken at spaced intervals of multiple ground locations (Burrough and McDonnell, 1998, 121-2; Kennedy 2009, 137). A DEM was used to store and display digital topographic maps available from national databases. Aerial photographs are displayed, and both types of digital maps can be displayed as layers of the same topographic area and analysis of the landscape can be carried out (*ibid*). Most relevant for the analysis of fieldwork data in this study, DEM's provide visualisation of the peat stratigraphy in 3D model form of the pre-peat landscape and peat stratigraphy of Lindow Moss and Bjældskovdal bog. The above methods have described how a DEM was created for this purpose. Archaeological objects and human remains were input into a digital map as attributes demonstrating location and type, which then was displayed as a DEM that provides a visual tool to analyse the cultural landscape surrounding the bogs during the Iron Age at both study sites. A DEM was used to create, display, and analyse the bog basin of both Lindow Moss and Bjældskovdal bog and the bog bodies within them as a 3D model.

4.4.3 Interpolation

Interpolation is a technique applied to spatial point data gathered from a specific zone in the landscape to map features as a continuous surface (Burrough & McDonnell 1998; Burrough 1986, 147-166). It transforms point data into continuous fields, which then enables a DEM model to be generated of the continuous surface (Burrough & McDonnell

1998; Burrough 1986, 147-166). There are three main types of interpolation methods that can be used to create DEM's in GIS, *linear interpolation;* a straight line through points, *statistical interpolation*, and *Cubic spline* which draws a curved line through points (Gillings and Wise 1999, 35-6). The appropriate method of interpolation is selected accordingly (*ibid*). Each method has an outcome related to the aim of processing the point data (*ibid*).

4.4.4 Spline

The technique used for this study was exact spline interpolation, which creates a smooth surface from point data in two ways (Burrough 1986; Burrough & McDonnell 1998). First, the surface passes through all data points for detailed accuracy; second, minimum curve is displayed for a smooth continuous surface (Burrough 1986; Burrough & McDonnell 1998). In ArcGIS when creating spline interpolation, a choice of two types offered; in this case a tension spline was used. Creating a spline was used to show the variations of the surface of the pre-peat landscape smoothly using the raw data obtained from the borehole survey (*ibid*). Splines mathematically join the data points from cores in a continuous curve (Burrough 1986, 151). The resulting spline shows a continuous surface (*ibid*).

Digital Elevation Models (DEM) of the pre-peat landscapes of Lindow Moss and Bjældskovdal bog were created using the raw data obtained from fieldwork and showed the base of bog topography in 3D DEM. The DEM's of the pre-peat landscapes of Lindow Moss and Bjældskovdal bog are shown in chapters 5 and 6. The methods and techniques to attain objective 2 are described below.

4.5 Methodology to Understand the Development of the Bog Landscape on Lindow Moss and Bjældskovdal Bog

The second research objective to understand the bog landscape on Lindow Moss and Bjældskovdal bog has been determined and the techniques needed to achieve this are to carry out a peat stratigraphic survey and examine and interpret the core sediments. The borehole survey helps to understand the development of the bog landscape. It elucidates the nature of how the bog landscape changed over time. The peat stratigraphy survey of Lindow Moss and Bjældskovdal bog have provided the information needed to evaluate the bog scale landscape. Recording each core and its stratigraphy has been explained above. The techniques applied to interpret the different layers of materials in each core comprised of accurate recording and then transcribing peat stratigraphy data into Strater software.

4.5.1 Strater 5 Software

Strater 5 is a geology software which displays lithology, well construction, and function logs which can be shown in cross section. For the multiple boreholes taken on Lindow Moss and Bjældskovdal bog, raw data was input into the software which enabled construction of bar graphs to display multiple core stratigraphy. The first stage was to create an excel table with 'core collars'. The core collars included information about each core geographic location and the elevations of the top and base of cores. The second stage was to produce excel tables for each core. The information in these excel tables included the location of core, from and to depths of sediments with a brief description of each layer.

The descriptions, positions and depths of peat stratigraphy were integrated from each core and recorded in the Strater database. The information was used to visualise the stratigraphy of individual cores and produce transect sections through the area of the bog that was surveyed on Lindow Moss and Bjældskovdal bog. The stratigraphic diagrams were used to interpret the development of the bog landscape. Layers of sediments seen traversing consistently across a transect of cores were labelled.

The development of bog landscape identified from the peat stratigraphy of each transect on Lindow Moss was compared to the nearest North West Wetlands Survey (NWWS) cores. Additionally, on Bjældskovdal bog the peat stratigraphy identified in the transects were compared to Troels Smith's unpublished cores.

Legacy data for Lindow Moss was available from the North West Wetlands Survey (NWWS) by Leah *et al.* (1997); these data was used alone and integrated with the new borehole survey data for analysis. The NWWS was validated through the new survey to check the elevations were correct. The peat stratigraphy from the new survey was compared with the NWWS. The archive data for Bjældskovdal bog was the unpublished notes of Troels Smith 1952 who examined the peat profile in the area of Tollund Man and obtained samples for pollen analysis. His notes were interpreted and compared with the stratigraphy of the borehole survey carried out on the Bjældskovdal bog.

Palaeoenvironmental analyses of the area around Lindow II and Lindow III have been evaluated and discussed in relation to the borehole survey carried out on Lindow Moss. On Bjældskovdal bog samples of peat were obtained from three cores for radiocarbon dating. The three cores were selected at the time of the borehole survey, two samples were collected based on the quality of basal sediments seen in the cores. The third sample was taken from a core excavated from a relic peat baulk located nearest to the Bølling lake system. The results for radiocarbon dating of the peat samples are shown and discussed in chapter 6 and 7. The methods and techniques needed to achieve objective 3 follow.

4.6 Methodology to Reconstruct the Shape of the Bog Basin and the Positions of the Bodies within it

The third research objectives have been ascertained to reconstruct the shape of the bog basin and locate the positions of the bog bodies within it on Lindow Moss and Bjældskovdal bog. The techniques to address this are to establish the pre-peat landscape from the peat stratigraphy surveys of both bogs (described above). A DEM of Lindow Moss and Bjældskovdal bog pre-peat landscape was created (see above). The DEM's of both bogs demonstrated the shapes of the base of the bogs in the areas that were surveyed.

The spatial positions of Lindow II and Lindow III findspots were obtained from Historic England Records Cheshire East. The geographic location of Tollund Man was gained from the Silkeborg Museum Denmark. The spatial positions of the bog bodies were recorded into GIS software. The positions of the bodies were then integrated with DEM of the shape of the bogs and spatially analysed. Additionally, the geographic locations of the bodies on Lindow Moss and Bjældskovdal bog were transcribed onto digital map data.

A model of the hypothetical contemporaneous peatlands on Lindow Moss and Bjældskovdal bog was achieved by using data from the borehole survey and archive data. These were combined with the approximate elevations of the bodies at the time of their deposition in the bog and correlated to the appropriate sediments at those elevations. From this information a DEM was created specifically to model the peatland extent around the time of Lindow II and Tollund Man's placement in their bog. Elevations of the bodies were extrapolated from legacy data and a DEM was created to model a hypothetical bog edge. There have been no published OD heights of Lindow II (Stead *et al.* 1986 Turner and Scaife 1995). An approximate elevation of Lindow II was depth scaled from a diagram in Connolly (1985) and West (1986) and is discussed in chapter 5. Whereas, the probable elevation for Tollund Man was deduced from notes made by Troels Smith in 1952 (Chapman *et al.* 2019).

The approximate elevations of Lindow II and Tollund Man were calculated from legacy data. The elevations of the bodies were related to the layer properties of the DEM of the pre-peat landscape of the bogs. The elevations of the peat associated with the heights of the bodies demonstrated the contemporary extent of peatlands on the DEM's of Lindow Moss and Bjældskovdal bog. The methods and techniques employed to achieve objective 4 are below.

4.7 Methodology to Understand the Wider Cultural Activities Related to Lindow II and Tollund Man

The fourth research objective was to understand the relationship between the human remains within their bog and wider cultural activities from previous archaeological studies has been established. The techniques needed to attain this objective were to carry out a desk-based evaluation of archival literature and sources related to Lindow Moss and Bjældskovdal bog. These link to the objective in this way to illuminate cultural archaeology that provided a broader context to Lindow II and Tollund Man.

4.7.1 Archive Data

The following techniques were used to acquire data via a desk-based research to achieve objective 4. The archival sources consulted were as follows:

- A desk based analysis of archival literature related to the study areas and surrounding 5km based on previous archaeological studies.
- Archaeological sites and finds were collated from the appropriate Historic Environment Records department (HER) and Portable Antiquities Scheme (PAS) (Lindow Moss) and data from Silkeborg Museum for Bjældskovdal bog.
- The sites and finds were evaluated spatially in ArcGIS software, mapped and interpreted in relation to the bog bodies.
- Digital map data and LiDAR was obtained from the environment agency and Digimap for Lindow Moss, for Bjældskovdal bog this data was gained from Kortforsyningens.

The combined information from archival literature and online resources were evaluated and interpreted in relation to the broader landscape context of Lindow II and Tollund Man.

4.8 Summary of Chapter 4

Chapter 4 has presented the methodology and techniques applied to address the objectives outlined in chapter 1. The techniques have been described individually and issues experienced whilst collecting and analysing data for the thesis have been mitigated and highlighted. The key issues arose from conducting practical fieldwork and developing a robust approach to problems as they were encountered. Software anomalies were addressed by going back to raw data checking the format and recreating DEM's.

The following chapter 5 presents the results from Lindow Moss. Chapter 6 then presents the results from Bjældskovdal bog.

CHAPTER 5 RESULTS LINDOW MOSS

5.1 Introduction

The aim of this thesis was to investigate the wider landscape context of bog bodies using the objectives outlined in chapter 1 and methodologies in chapter 4. The results of Lindow Moss, Cheshire are presented below.

Chapter 5 is structured in the following way. In section 5.2 the general peat types of Lindow Moss were examined using archetype cores which represent examples of sediments found across Lindow Moss and in section 5.3 the bog landscape was established using the peat types identified in the archetype cores.

In section 5.4 the transect profiles were interpreted by examination of the peat stratigraphy of each transect taken across Lindow Moss. The general development of the bog landscape across each transect was described. After this, section 5.5 outlined the differences in the stratigraphy between transects 1 – 7. The differences in stratigraphy of transects in the north east area were evaluated and then the differences in stratigraphy of transects in the west area were assessed.

In section 5.6 the reconstruction of the bog basin and the positions of Lindow II was located spatially within bog basin with Lindow I, Lindow III and Lindow IV. Digital Elevation Models represented the shape of the bog and diagrams show this with the bodies.

Cultural archaeology and artefacts within 5km of Lindow Moss were shown and described in section 5.7 to further contextualise Lindow II in his landscape. Section 5.8 demonstrated the hypothetical edge of the bog contemporary to Lindow bog bodies and their positions within it. Finally, section 5.9 the conclusion of chapter 5 evaluated the new data that has been gained from the results reported for Lindow Moss. The study site is shown in the diagram below figure 5.1.

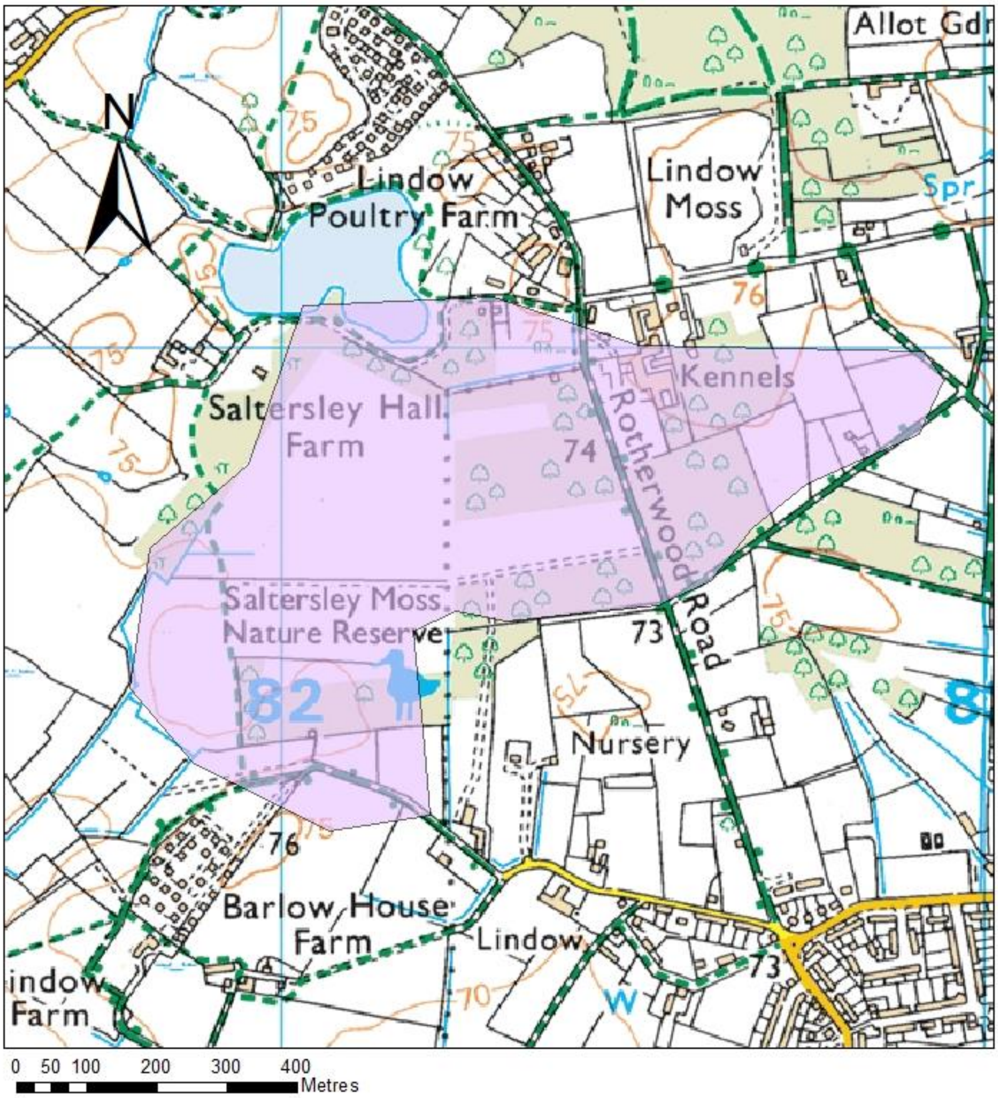

Figure 5.1 Lindow Moss Study Site

5.2 General Peat Types on Lindow Moss

The intention of this section is to outline the general peats present and identify the general development of the bog landscape. To fully represent all peat types across Lindow Moss, seven archetype cores were used to demonstrate the variations and facilitate the description of the complex mire ontogeny. Archetype cores represent samples of peat profiles from Lindow Moss which demonstrate the stratigraphy across the bog. Seven archetype cores were selected to show the varying peat stratigraphy across the site. The archetype cores are: T1c2, T1c3, T2c3, T3c1, T3c7, T4c1, T4c7, and the map below shows their location (figure 5.2). The diagram below (figure 5.3) shows the materials present in T1c2 from transect 1.

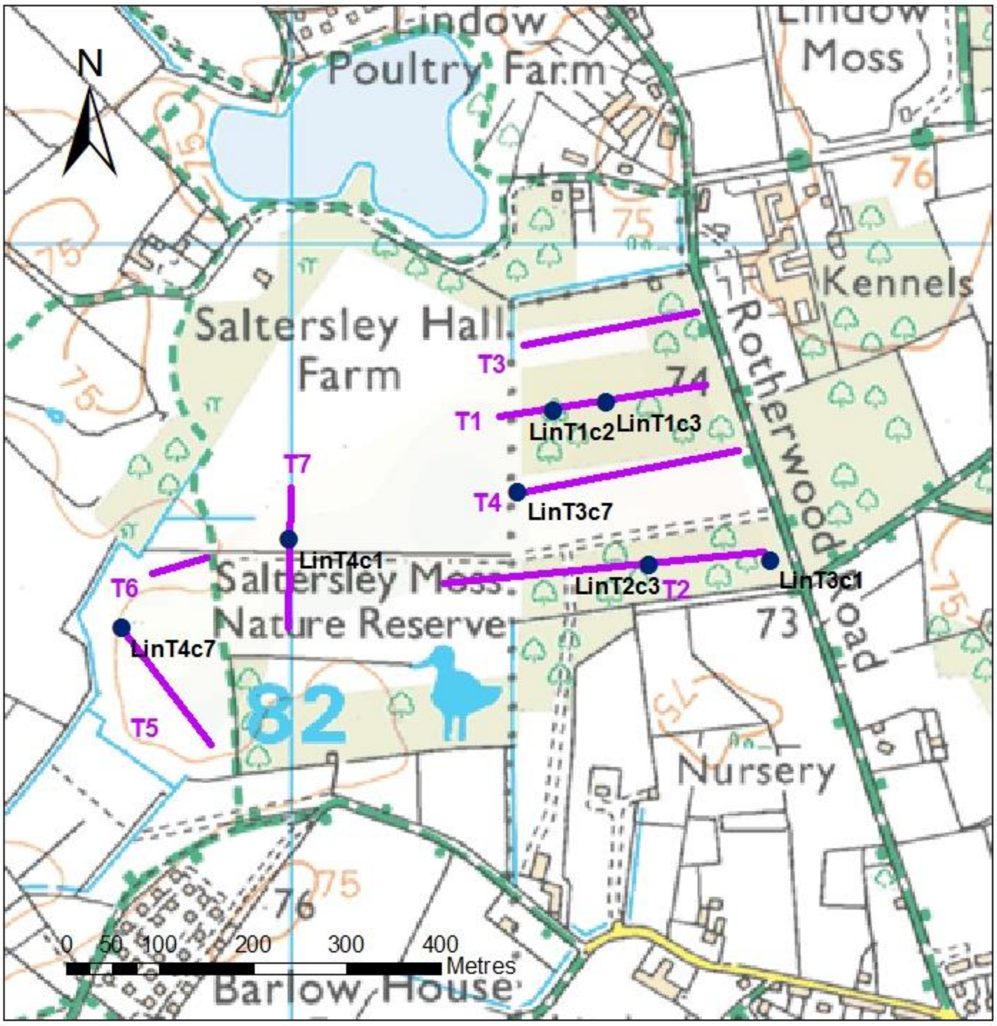

Figure 5.2 Locations of Archetype cores on Lindow Moss

5.2.1 Stratigraphy of Core T1 C2

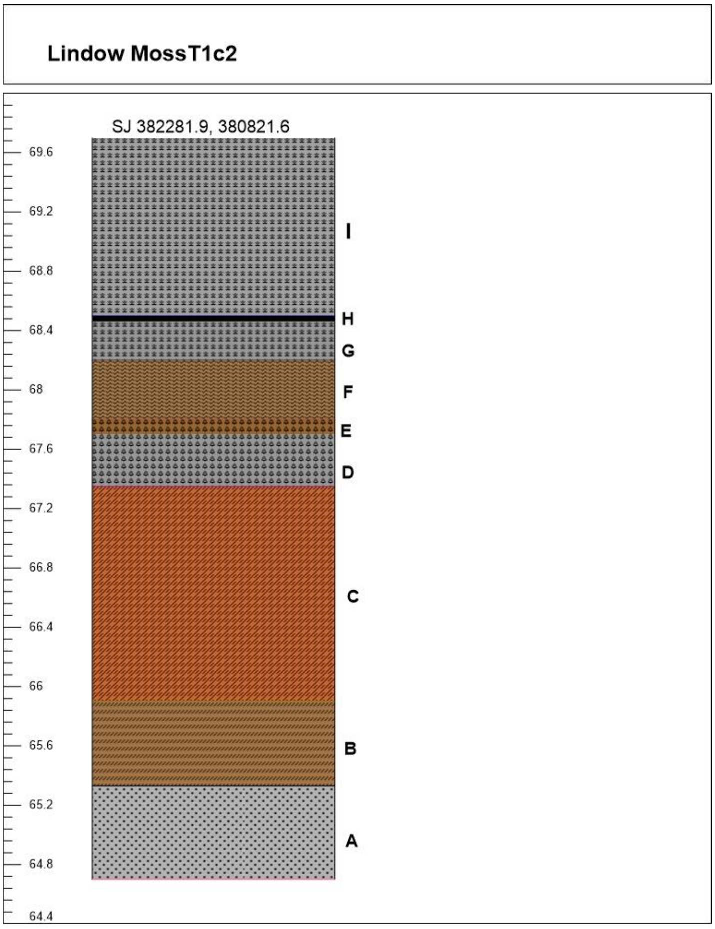

Figure 5.3 Core T1 c2 showing stratigraphy

Core 2 stratigraphy is described below in units A - I starting at the bottom of the core and progressing upwards to the top. The depths of peat units are stated in metres OD preceding the unit and its description.

- 66.33 – 65.70m OD Unit A loose grey silty sand.
- 65.90 – 66.33m OD Unit B comprised of *Phragmites* peat *Phragmites australis*

- 67.35 – 65.90m OD Unit C was a *Phragmites* peat *Phragmites australis* in wood peat rich matrix with moderate wood inclusions at the top of unit C continuing through to the base of the *Phragmites* peat.
- 67.70 – 67.35m OD Unit D consisted of wood peat with sedge peat matrix
- 67.80 – 67.70m OD Unit E contained a chunk of wood.
- 68.20 – 67.80m OD Unit F was a *Sphagnum* moss rich peat.
- 68.46 – 68.20m OD Unit G comprised of reed peat *Phragmites australis* and sedge peats in a loose silt matrix.
- 68.50 – 68.46m OD Unit H a thin lens of charcoal in a wood peat matrix.
- 69.70 – 68.50m OD Unit I consisted of sedge peats with the remains of sedge monocot.

The unit description of core T1c2 basal deposits (above) showed the general development of Lindow Moss landscape in this area. Peats were underlain by grey silty sand and the bog landscape began as *Phragmites australis* known as common reed, with patches of open pools of freshwater marsh (Stace 2010, 1057). This was followed by the development of fen carr wood peats at 67.35-65.90m OD in the north west area of Lindow Moss. Succeeded by the acidic raised bog peat of *Sphagnum* at the top showing that the landscape conditions were oligotrophic with open water and shallow pools.

Marshy silty reeds and sedge interleaved with charcoal in wood peat at 68.50-68.46m OD indicated a potential episode of burning within the surrounding area of the bog and a phase of open freshwater fen indicating minerotrophic landscape conditions. The unit terminated at the top with further layers of sedge demonstrating freshwater marsh with open water, shallow pools. The diagram below (figure 5.4) presents the second archetype core T1c3 to classify some of the variations of peat stratigraphy identified on Lindow Moss.

5.2.2 Stratigraphy of Core T1 C3

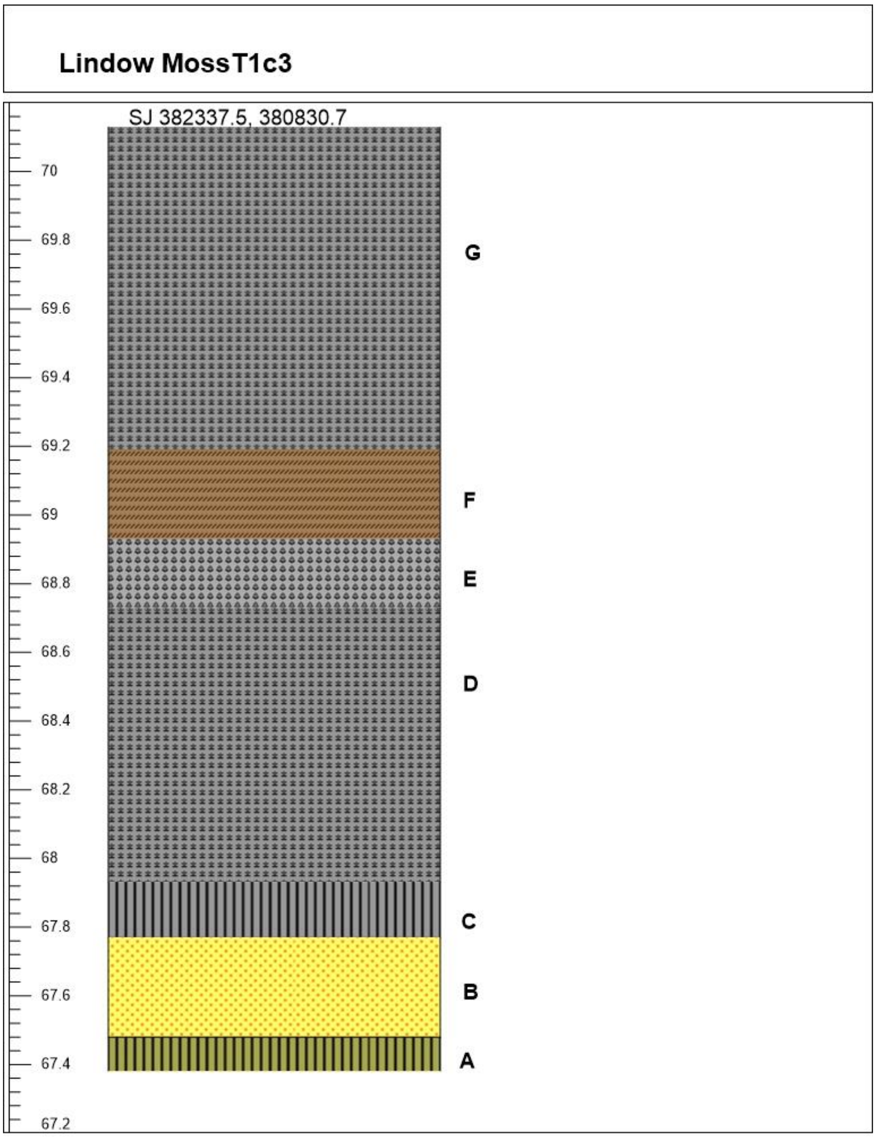

Figure 5.4 T1c3 showing stratigraphic units

The stratigraphy of core T1c3 from transect 1 is described in units A – G. The units of peat types are measured in metres OD preceding the unit description.

- 67.48 – 67.38m OD Unit A comprised of clay.
- 67.77 – 67.48m OD Unit B was medium coarse sand.
- 67.93 – 67.77m OD Unit C consisted of grey clay.
- 68.73 – 67.93m OD Unit D was sedge peat in a loose silty matrix.
- 68.93 – 68.73m OD Unit E comprised of wood peat with chunks of wood within the peat matrix and a lens of charcoal at the top of the unit.
- 69.19 – 68.93m OD Unit F consisted of *Phragmites* peat dominated by fragments of leaf and roots of the common reed *Phragmites australis* with wood inclusions within the peat matrix.
- 70.13 – 69.19m OD Unit G was sedge peat with small branches and seeds of *Betula nana* L. or *Betula pubescens* (Erhrh) identified by their oval winged shape and sedge monocot.

The unit description of core T1c3 (above) showed organic sediment deposits which overlie clay and sand. The development of the landscape in this area began as a freshwater marsh of sedge with shallow pools. Fen carr wood peats developed and within the fen peat matrix was a lens of charcoal which indicated evidence of burning at 68.93-68.73m OD and a phase of a drier woodland landscape. Reed peats then followed which demonstrated wetter conditions of a freshwater marsh of reeds and wood peats. The upper sequence of landscape development indicated sedge marsh with open freshwater. The landscape conditions in this area were minerotrophic with pools and fen carr. The third core archetype to represent stratigraphy observed on Lindow Moss is shown in core T2c3. The diagram below figure 5.5 shows peat stratigraphy within the core and is described below.

5.2.3 Stratigraphy of Core T2 C3

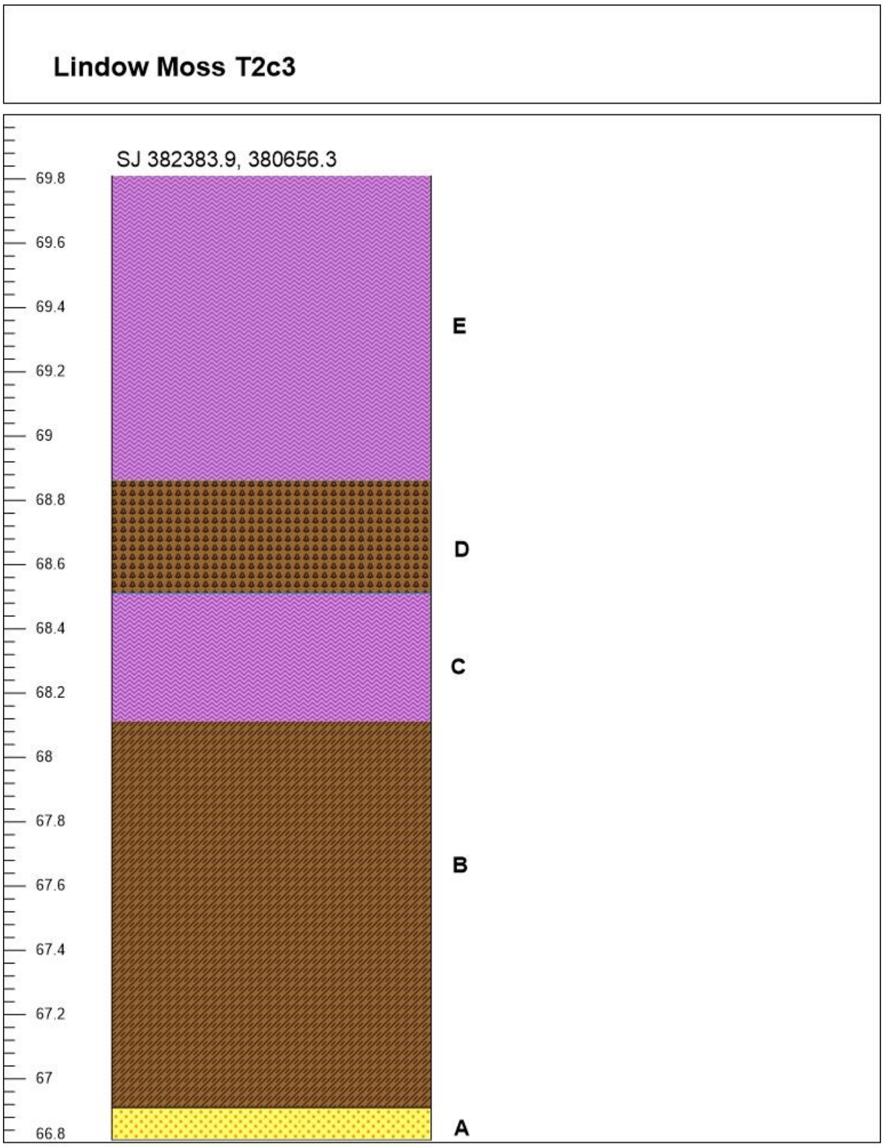

Figure 5.5 Core T2c3 showing stratigraphy units

The units of stratigraphy are explained below, unit A starts at the top of the core and the depths of the units are in metres OD which precede stratigraphy classification.

- 66.91 – 66.81m OD Unit A was medium coarse sand.
- 68.11 – 66.91m OD Unit B consisted of phragmites peat *Phragmites australis* in a wood peat rich matrix which contained small birch branches and leaves of *Betula nana* L. or *B. pubescens* (Erhrh), *Phragmites* disappears towards the end of the unit.
- 68.51 – 68.11m OD Unit C was an *Eriophorum* in a *Phragmites australis* peat matrix.
- 68.86 – 68.51m OD Unit D wood material.
- 69.81 – 68.86m OD Unit E consisted of *Eriophorum* peat with wood fragments.

The description of core T2c3 (above) peat sediments overlie sand and in general shows in this area the landscape developed as freshwater marsh of reeds and fen carr with open water, shallow pools. The environmental conditions show a transition from minerotrophic freshwater fen to oligotrophic acidic bog characterised by the establishment of *Eriophorum* and *Phragmites* mixed sediments (Godwin 1981, 81). A final phase of wood material and drier sequence was determined by *Eriophorum* indicated this area was dominated by fen carr with a fluctuating water table and acidic oligotrophic phase of landscape development (Casparie 2006, 121; Godwin 1981).

The diagram below (figure 5.6) shows the fourth archetype core T3c1 which represents variations encountered in the peat stratigraphy on Lindow Moss.

5.2.4 Stratigraphy of Core T3 C1

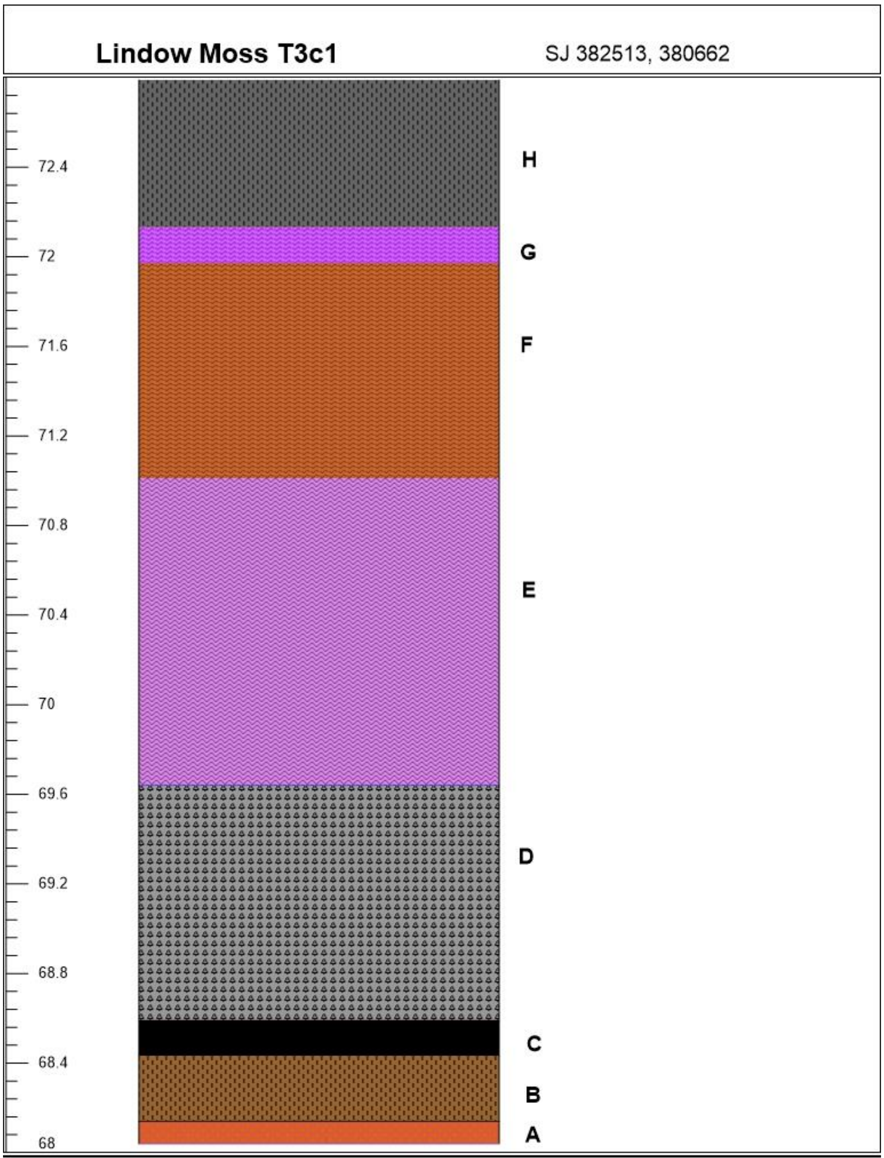

Figure 5.6 T3c1 showing stratigraphy units

T3c1 contains the following sediments in units A – H and are described.

- 68.14 – 68.04m OD Unit A consisted of medium coarse brown sand.
- 68.43 – 68.14m OD Unit B comprised of well humified dark brown peat.
- 68.59 – 68.43m OD Unit C was a thin lens of charcoal.

- 69.64 – 68.59m OD Unit D consisted of well humified wood peat with wood fragments which became more concentrated progressing down the unit.
- 71.01 – 69.64m OD Unit E was an *Eriophorum angustifolium* (commonly known as cotton grass) rich peat.
- 71.97 – 71.01m OD Unit F comprised of orange brown mossy peat.
- 72.13 – 71.97m OD Unit G consisted of orange heather peat in an organic stained sandy peat matrix.
- 72.79 – 72.13m OD Unit H was black amorphous peat.

The materials from core T3c1 profile demonstrated organic sediments overlie coarse sand in this area at 68.14 – 68.04m OD. The general landscape developed as freshwater marsh of fen carr with evidence of burning at the depth of 68.59 – 68.43m OD. A transition to an acidic phase of landscape conditions was indicated by *Eriophorum* followed by a wetter episode of open water, shallow pools and slow growing acidic bog with *Sphagnum*. Subsequently, hummocky landscape with acid conditions of heather peat developed at the top of T3c1 showing a drier landscape in this area, enabling growth of heather on peaty sandy soil.

5.2.5 Stratigraphy of Core T3 C7

The materials contained in T3c7 diagram (figure 5.7) start from the top of the core and progress downwards to the base and are referred to as unit A – O are described.

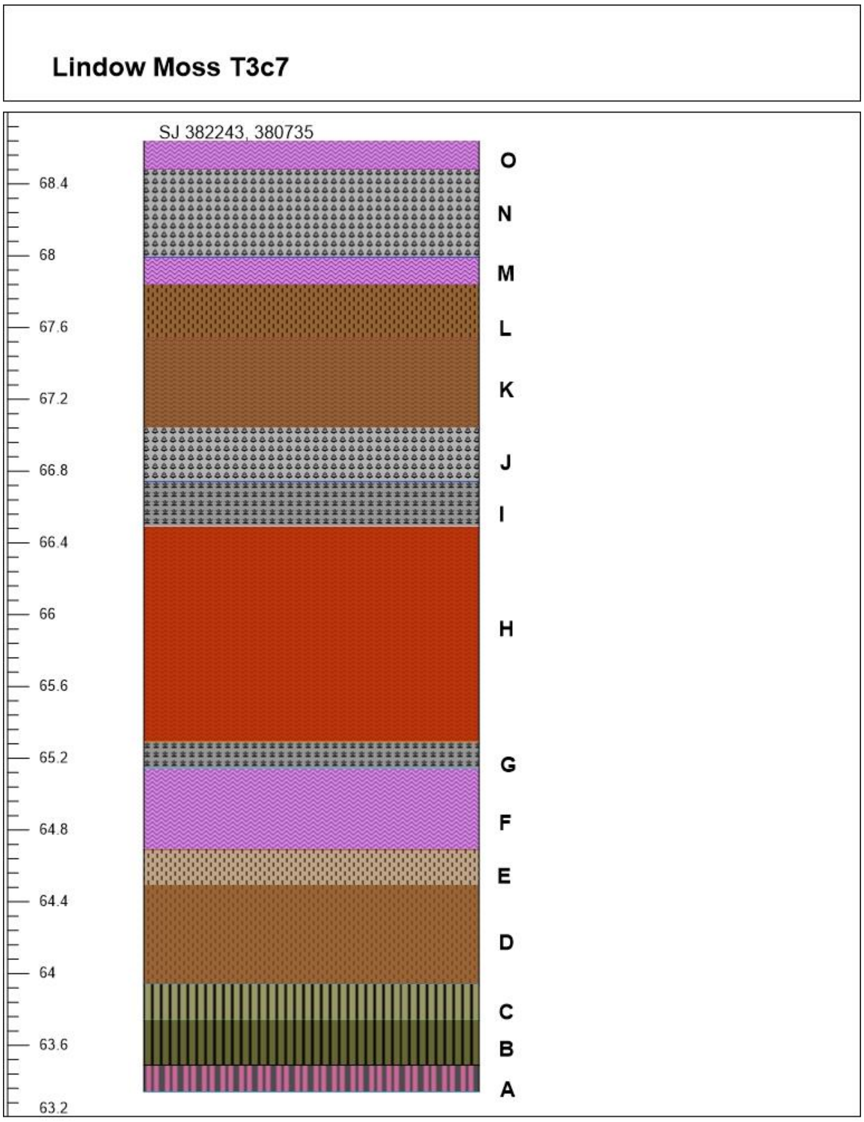

Figure 5.7 Core T3c7 showing stratigraphic units

- 63.49 - 63.34m OD Unit A pink silty clay.
- 63.74 - 63.49m OD Unit B green grey silty clay.
- 63.94 - 63.74m OD Unit C was an organic stained green brown silt.
- 64.49 - 63.94m OD Unit D was a very degraded fibrous peat.
- 64.69 - 64.49m OD Unit E humified peat with medium light brown sand.
- 65.14 - 64.69m OD Unit F degraded *Eriophorum angustifolium* rich peat.
- 65.29 - 65.14m OD Unit G a reedy peat containing *Phragmites australis L.*

- 66.49 - 65.29m OD Unit H was *Sphagnum* moss peat in a wood rich matrix with frequent wood inclusions which became less frequent in the last 50cm.
- 66.74 - 66.49m OD Unit I was a reed peat consisting of *Phragmites australis L.* remains in a moss rich matrix.
- 67.04 - 66.74m OD Unit J wood rich peat.
- 67.54 - 67.04m OD Unit K *Sphagnum* peat.
- 67.84 - 67.54m OD Unit L was a degraded muddy peat.
- 67.99 - 67.84m OD Unit M *Eriophorum angustifolium* rich peat.
- 68.48 - 67.99m OD Unit N was wood rich peat with infrequent wood inclusions.
- 68.64 - 68.48m OD Unit O was an *Eriophorum angustifolium* peat.

Core T3c7 has shown that in this area of Lindow Moss sediments overlie clays and the landscape developed as open water and shallow pools, with sequences of clays and silts at the bottom. Wet conditions of *Eriophorum*, followed by reeds indicated a landscape of fen with open water and pools. The development of *Sphagnum* showed a transition to oligotrophic conditions with open water, pools and acidic slow growing bog. In this area of the landscape freshwater marsh of reed was succeeded by fen carr wood peats. Afterwards acidic bog of *Sphagnum* developed. A sequence of muddy peat determined an increase in the water table probably due to open water or flooding. Afterwards, the upper phases of landscape development was demonstrated with *Eriophorum*, then fen carr (wood peat) which indicated a drier phase of tree development and a final layer of *Eriophorum* with a return to wetter conditions.

The peat profile of core T4c1 is presented in figure 5.2.6 and described below.

5.2.6 Stratigraphy of Core T4c1

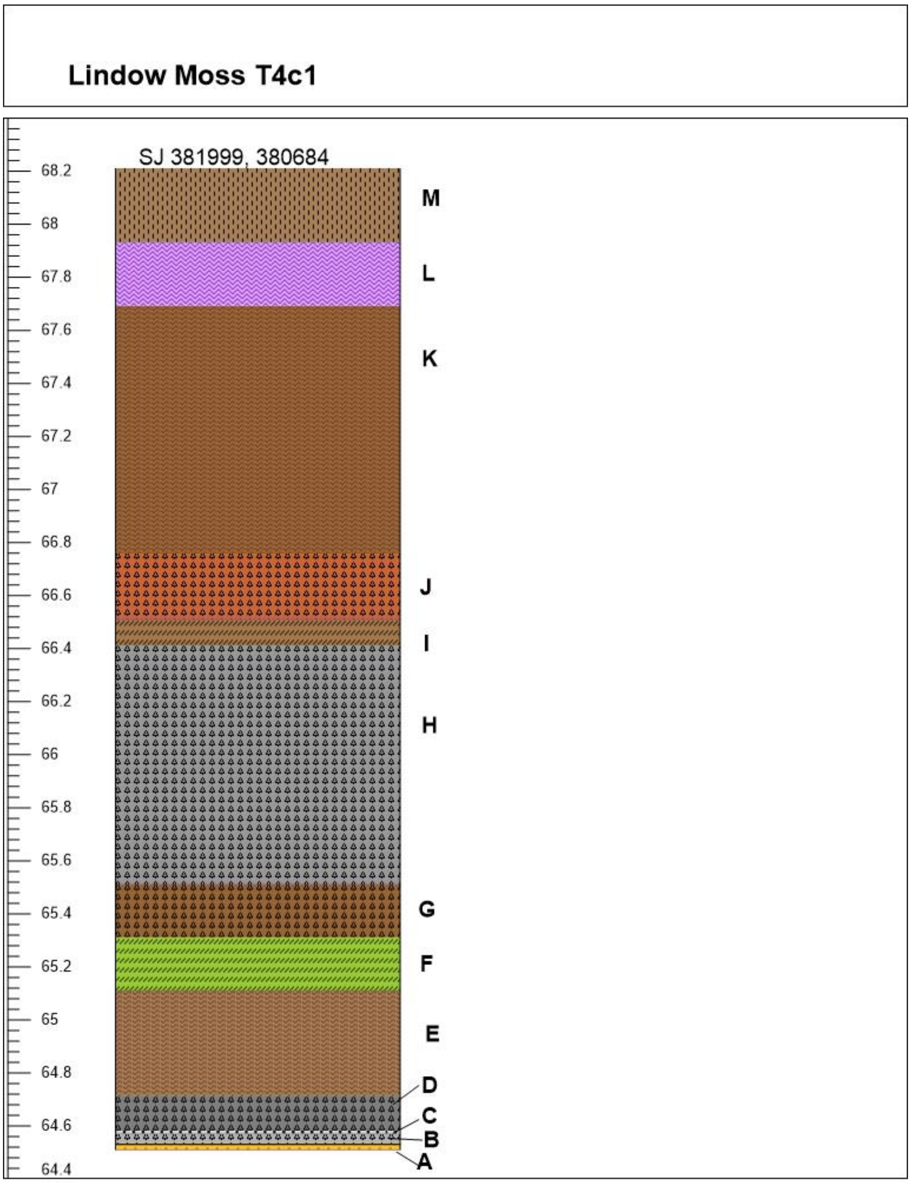

Figure 5.8 Lin T4 c1 showing stratigraphic units

- 68.21 – 67.93m OD Unit A was light grey medium coarse sand.
- 67.93 – 67.69m OD Unit B comprised of humified dark brown wood peat.

- 67.69 – 66.76m OD Unit C comprised of a thin lens of light grey loose silt which was at the base of unit
- 66.76 – 66.51m OD Unit D was a desiccated wood rich peat.
- 66.51 – 66.41m OD Unit E consisted of excellent preserved orange *Sphagnum* peat.
- 66.41 – 65.51m OD Unit F comprised of excellent preserved *Sphagnum* peat contained in a *Phragmites australis* rich matrix with bog bean remains and seeds of *Menyanthes trifolata* L.
- 65.51 – 65.31m OD Unit G was wood material.
- 65.31 – 65.11m OD Unit H consisted of *Sphagnum* peat contained in a wood peat rich matrix.
- 65.11 – 64.71m OD Unit I was a phragmites peat dominated by fragments of leaves of the common reed *Phragmites australis L*.
- 64.71 – 64.58m OD Unit J comprised of wood peat contained in a *Sphagnum* rich matrix with wood inclusions of *Betula nana* L. or *Betula pubescens* (Erhrh).
- 64. 58 – 64.57m OD Unit K was a *Sphagnum* peat with inclusions of small branches and stems of Birch *Betula nana* L. or *Betula pubescens* (Erhrh)
- 64.57 – 64.53m OD Unit L consisted of an *Eriophorum* L. rich peat matrix.
- 64.53 – 64.51m OD Unit M was amorphous black brown peat.

The materials contained in T4c1 have shown in this area organic sediments overlie sand. The general wetland landscape developed as a freshwater fen of fen carr wood peats intersected by silt which showed an episode of water inundation or open water and minerotrophic conditions. This was succeeded by a change to acidic conditions of *Sphagnum* moss peats with upper sequences mixed with fen carr wood peats that indicated a return to fresh water. Afterwards *Phragmites* marsh with bog bean demonstrated very wet open water and shallow pools. A sequence of fen carr wood peats mixed with *Sphagnum* suggested a shift back to acidic water with an oligotrophic environment and a landscape of wet fen carr woodland with open water, shallow pools and acidic raised bog. An upper layer of *Eriophorum* peat indicated fluctuating water levels in this area.

The nature of the bog and the extent to which it is freshwater or acidic is very variable both in time and space across Lindow Moss.

To further demonstrate the local variations of the landscape at Lindow Moss core T4c7 is shown in diagram 5.9 below, and the units of peat are described.

5.2.7 Stratigraphy of Core T4c7

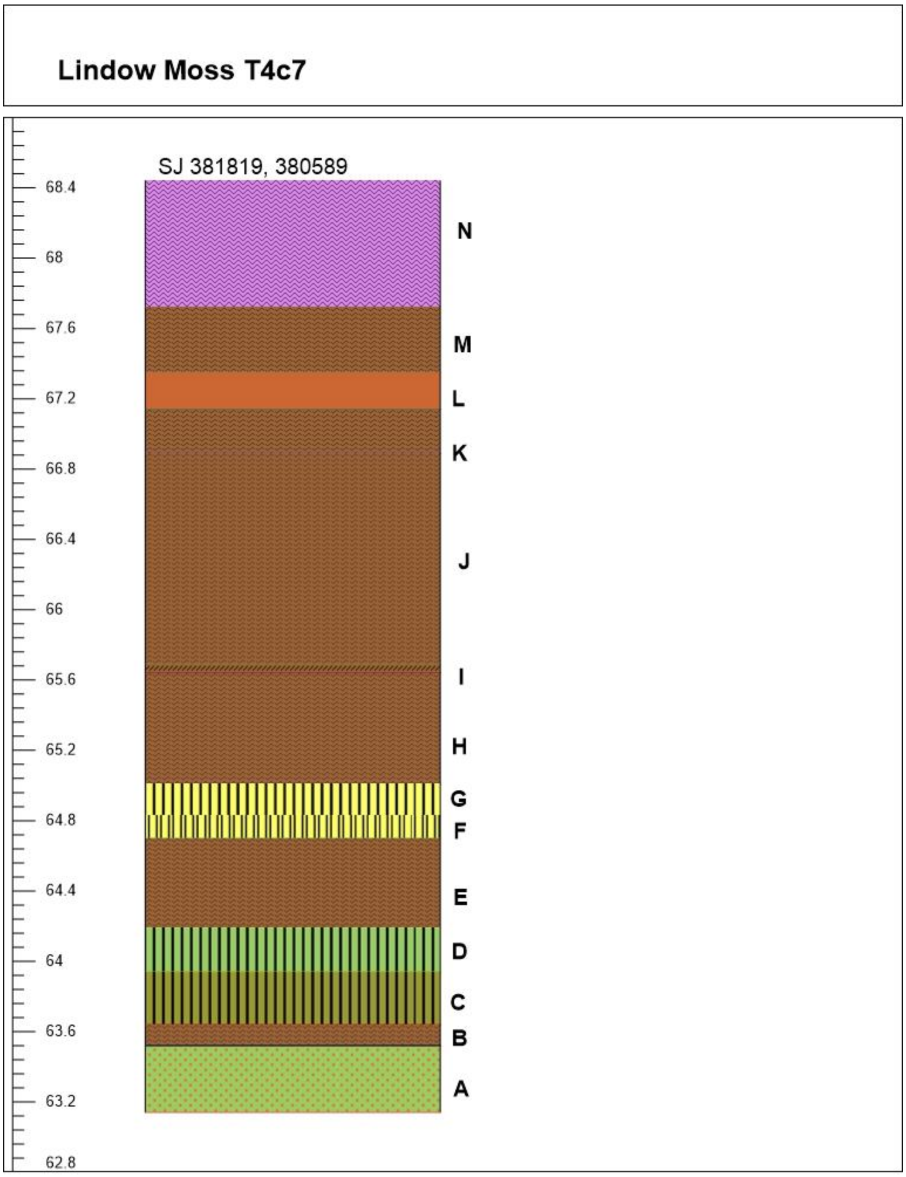

Figure 5.9 T4c7 showing stratigraphic units

- 63.52 – 63.14m OD Unit A was medium coarse light olive grey sand, the upper 5cm consisted of an organic stained clay rich matrix.
- 63.64 – 63.52m OD Unit B comprised of *Sphagnum* peat.
- 63.94 – 63.64m OD Unit C consisted of olive grey silty clay.
- 64.19 – 63.94m OD Unit D was light olive grey loose silt.

- 64.70 – 64.19m OD Unit E comprised of degraded *Sphagnum* rich peat matrix with bog bean remains of *Menyanthes trifoliata* L.
- 64.83 – 64.70m OD Unit F was light yellow fine grain loose silty marl with fragments of leaf and root base of the common reed *Phragmites australis*.
- 65.01 – 64.83m OD Unit G was a light yellow fine loose silty marl.
- 65.64 – 65.01m OD Unit H consisted of a *Sphagnum* rich peat.
- 65.69 – 65.64m OD Unit I was *Phragmites* peat with fragments of leaf and root base of the common reed *Phragmites australis* and bog bean seeds of *Menyanthes trifolata* L.
- 66.89 – 65.69m OD Unit J comprised of a large chunk of wood in a *Sphagnum* peat matrix.
- 67.14 – 66.89m OD Unit K was *Sphagnum* rich peat.
- 67.35 – 67.14m OD Unit L comprised of very fine grain organic mud.
- 67.72 – 67.35m OD Unit M consisted of woody *Sphagnum* peat.
- 68.44 – 67.72m OD Unit N was *Eriophorum* peat dominated by *Eriophorum angustifolium* with occasional twigs within the peat matrix.

The profile of core T4c7 deposits of peats overlie sand. This area of Lindow Moss T4c7 has shown the landscape developed initially as acidic *Sphagnum* bog with open water, shallow pools and an oligotrophic environment. A rise in the water table was shown with silts and clay (units C and D) which suggested open water. This was followed by very wet acidic bog with open water, shallow pools indicated by *Sphagnum* and bog bean (*Menyanthes trifoliata* L.). Afterwards landscape conditions showed an episode of flooding or rise in the water table which suggested deep pools in this area was identified by marls and reed peats (units F and G). Subsequently, *Sphagnum*, *Phragmites* and bog bean dominated the upper units which demonstrated very wet bog of open water, shallow pools and evidence of some fen carr. Unit L was fine organic mud and suggests open pools or flooding occurred in this area, which intersected two sequences of acidic S*phagnum* moss peat. A drier phase of landscape was indicated by *Eriophorum* at the top of the core. The sequence of units in core T4c7 have shown that the landscape in this section was subject to two episodes of water inundation and characterised by open pools.

5.3 Bog Landscape

The core archetypes above have shown in those areas on Lindow Moss, in general the development of the bog landscape was variable across the bog. In the north east area, the hydrosere began as a freshwater fen of sedges, reeds, and fen carr with open water and pools (T1c2, T1c3, T2c3, T3c1). Environment conditions were at this stage minerotrophic. Whereas, the areas around cores T3c7 (north east) and T4c7 (west) started development as a landscape with oligotrophic environmental conditions and acidic bog with *Eriophorum* and *Sphagnum* with open water and shallow pools. The hydrosere development around core T1c3 began as freshwater marsh of reeds and sedge with fen carr and showed no transition to acidic bog. A transition to oligotrophic conditions of acidic bog followed with a phase of landscape development with the growth of *Sphagnum* and *Eriophorum* in upper layers (T1c2, T4c1, T3c1, T2c3, T3c7, T4c7). This seems to be the general pattern though with local variation.

The archetype profiles have shown localised variations of hydrosere succession. For example, core T4c7 showed in this area there was very little fen carr wood peats. Core T4c7 also demonstrated two episodes of inundation and open pools before very wet acidic raised bog sequences of a landscape of *Sphagnum* and reed marsh.

Variations of sediments can be determined in all archetype cores. At core T3c1 the development of Lindow Moss in that area was a freshwater marsh of fen carr with evidence of potential burning. This was followed by a phase of *Eriophorum* landscape development and then slow growing acidic wet bog with open water, shallow pools.

The materials in core T1c3 contained sedges, reeds and wood peats which showed a freshwater fen with minerotrophic conditions dominated this area of Lindow Moss. These layers were distinct because there seemed to be no transition to acidic and oligotrophic conditions with *Sphagnum* and *Eriophorum*. There were localised variations in the development of the hydrosere across Lindow Moss through time. The sediments identified have indicated bog development was probably controlled by minor variations in ground water supply and rainfall and topography (Walker 1970). The archetype cores have new information about the bog landscape in specific areas of the hydrosere on Lindow Moss.

5.4 Transect Profiles

The aim of this section is to outline the description of the transects and the nature of the deposits recorded and the process of bog development in those areas of Lindow Moss. Coherent units of sediments which are of the same peat type and approximately are stratigraphically at a similar elevation and which run between the cores, will be identified. The distance between each core is identified on the diagrams. All transects are shown in figure 5.10, and there are seven transects in total carried out on the study site.

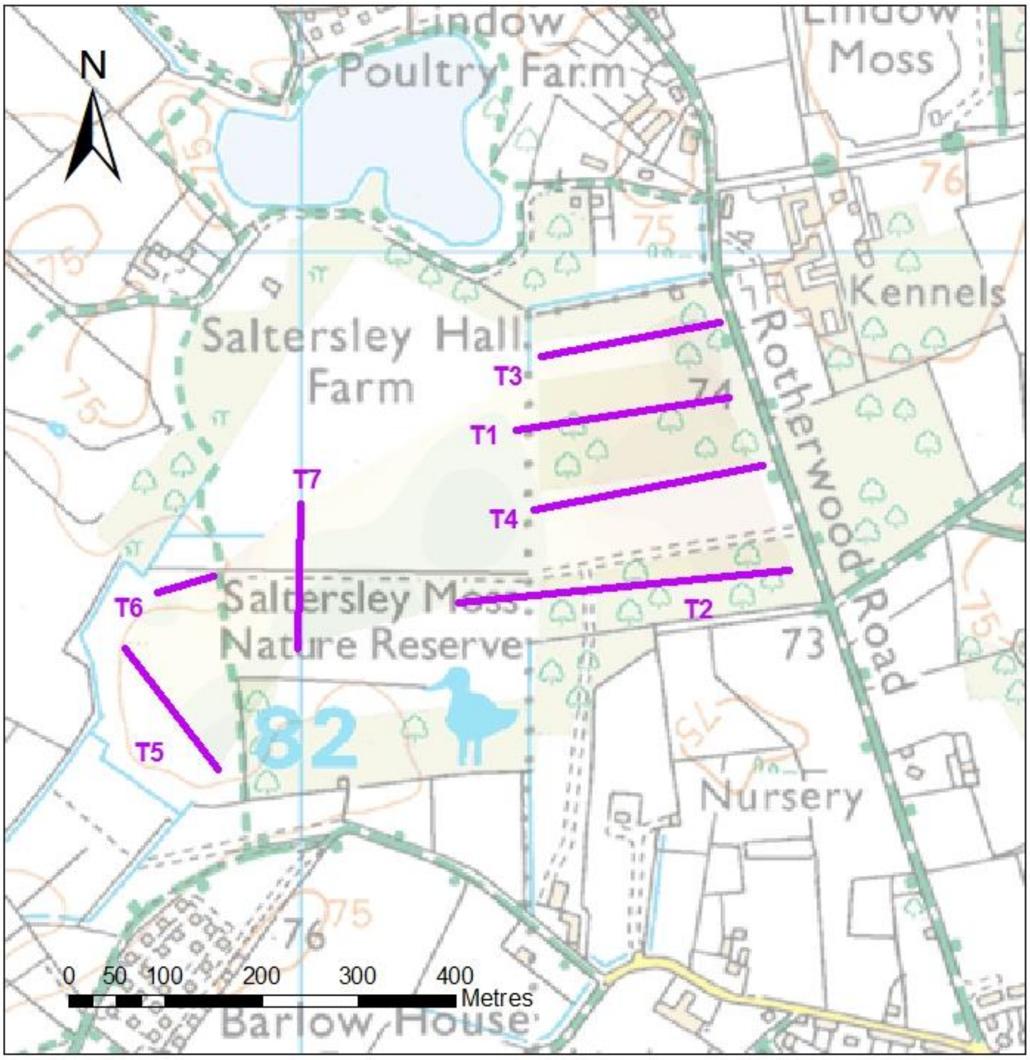

Figure 5.10 Locations of Transects

5.4.1 Transect 1

There are five cores in transect 1 shown in figure 5.11 which is presented and described.

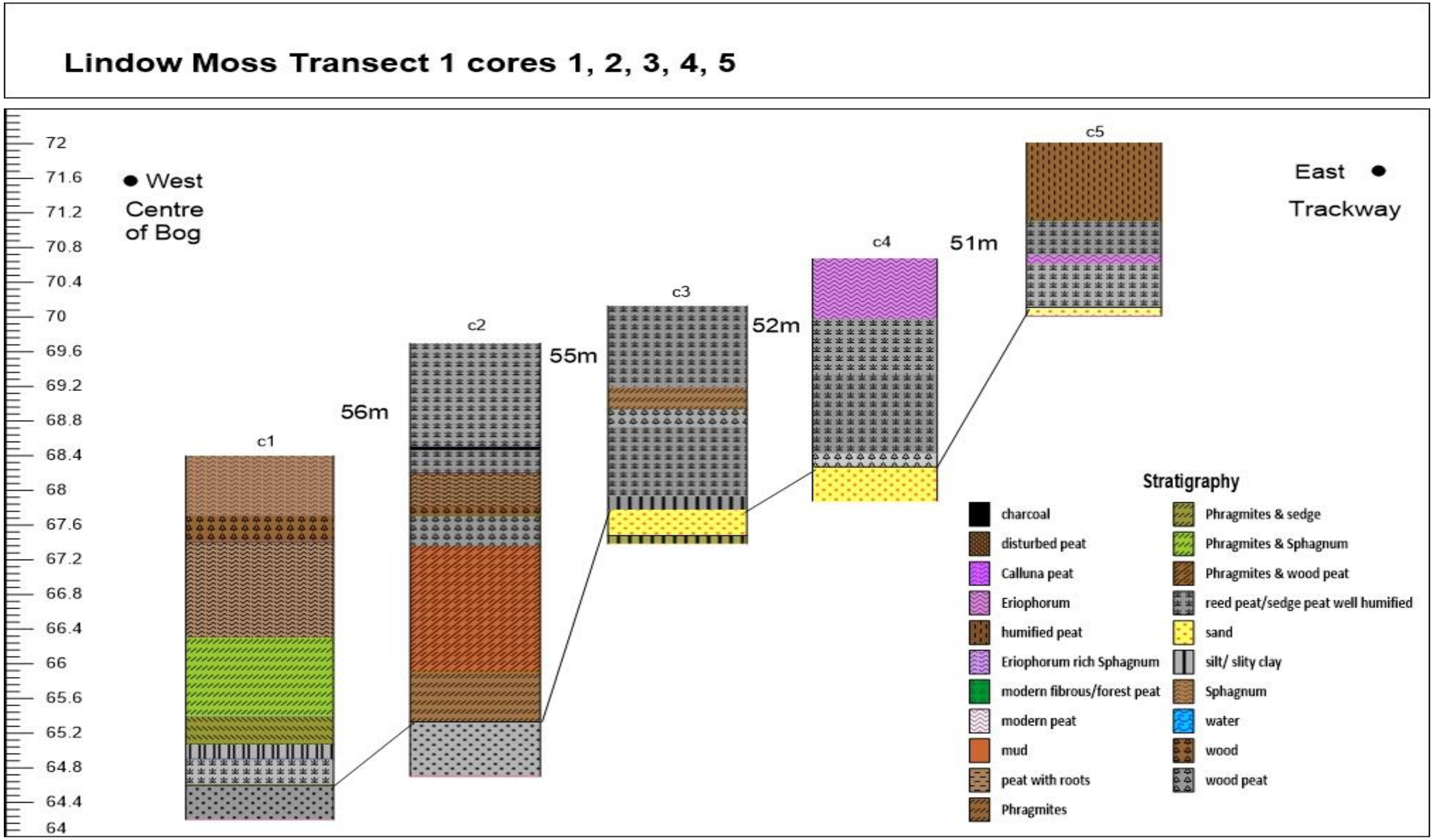

Figure 5.11 Transect 1 Core Stratigraphy

There are five cores in transect 1. Transect 1 comprised of six discrete sedimentary units. These units did not occur in each core or run consistently across the transect of cores.

1. This was sand that underlies the basin and occurs in all cores except the base of core T1c4 which has clay.
2. *Phragmites* was present in cores T1c1 (0.9m), T1c2 (0.57m) and T1c3 (0.26m). Core T1c1 (0.33m) also contained a second layer of *Phragmites* and sedge peat. The location of core T1c1 was in the central part of Lindow bog. Deposits of *Phragmites* were mainly in the western area of transect 1 in varying depths and combinations.
3. Wood peat was identified in cores T1c2 (0.8m), T1c3 (0.20m) which contained a thin lens of charcoal, and T1c4 (0.5m). The peat profile of core T1c2 comprised of wood peat in a mixed matrix of sedge (*Carex*) and *Phragmites*. Wood material was present in T1c1 (0.30m) and T1c2 (0.10m). Wood peats were more predominate towards the edge of the bog.
4. *Sphagnum* identified across cores T1c1 (0.70m) and T1c2 (0.40m). Deposits of *Sphagnum* were generally on the lower part of the slope becoming more concentrated in depth in the west of transect 1.
5. Sedge (*Carex* L.) runs coherently between cores T1c2 (1.2m), T1c3 (0.94m), T1c4 (1.55m) and T1c5 (0.4m). Core T1c4 contained the largest quantity of sedge peat (1.55m) which was located on the eastern edge of transect 1. Although core T1c5 comprised of sedge peat in a mixed matrix of *Eriophorum* it probably represented a continuation of this unit of sedge peat. The deposits of sedge

peats vary in depth and combination between the cores and were particularly more concentrated in depths on the eastern edges of this area.

6. *Eriophorum* deposits were situated on the outer edge of transect 1 in the east and the largest deposit was on the lower part of the slope.

Phragmites, and sedge peats dominated transect 1 and fluctuated in depth and composition. Wood peat and wood material were identified in cores T1c1, T1c2, T1c3 and T1c4 of varying depths and arrangements. Wood peat and reed peat mixed matrix was only evident in core T1c2 measuring 0.80m in depth.

Sphagnum was evident in two cores T1c1 and T1c2 which were positioned in the centre (west) of the bog. The layers of *Sphagnum* were deepest in core T1c1. Two cores contained deposits of *Eriophorum* (T1c4 and T1c5) and these were on the edge towards the trackway (east). In core T1c1 a layer of silty clay was identified intersected by *Phragmites* peats 0.17m in depth.

The deepest peats in transect 1 were contained in core T1c2 with the base of organics at 4.37m depth. The second deepest peats were exhibited in core T1c1 with the base of organics at 3.8m depth. The shallowest peat stratigraphy was contained in core T1c5 at 1.9 metres deep. The basin of the bog topography from core T1c5 to core T1c1 declined in elevation by 5.51 metres OD east to west.

5.4.2 Summary of Transect 1

In summary, the stratigraphic units which were present in general in transect 1 core profiles on Lindow Moss were sand and clay which underlies the organic sediments, wood peats mixed with *Phragmites*, *Phragmites* mixed with *Sphagnum, Phragmites* with sedge (*Carex* L.) and *Phragmites*. These sediments were in three cores, the bog landscape began as freshwater fen with minerotrophic conditions, with growth of *Sphagnum* moss in some areas. Fen carr wood peats were clustered around the eastern edge near the modern trackway. In two cores *Sphagnum* followed fen carr peats and were mainly in the west of transect 1 towards the central area of the Lindow Moss, demonstrating wetter conditions of open water and pools of *Sphagnum* moss. Sedge peats dominated the stratigraphy of four cores in varying depths and composition from the eastern edge to the centre. The landscape was freshwater fen with minerotrophic conditions and open water and pools. This was generally followed by *Eriophorum* peat two cores in the east on the outer edge of Lindow Moss indicating the water levels fluctuated in this area and were acidic with oligotrophic conditions.

A sequence of landscape development which facilitated growth of *Eriophorum* peat (T1c4 and T1c5) demonstrated that at the outer edges the water table may have been lower or fluctuating at this location. Additionally, cores T1c2 to T1c4 indicated that fen carr was located near to the outer edge of the bog (core T1c4) and continued to inhabit the centre where the basin of the bog was deeper and wet. Subsequently, in cores T1c1 and T1c2 a sequence of *Sphagnum* growth indicated open water, shallow pools with acidic slow-growing raised bog characteristics. Below the layer of *Sphagnum* cores T1c4 and T1c5 (unit B) identified *Phragmites* which suggested the stratigraphy showed a very wet fen of reeds with open water and shallow pools. The distinct dominance of sedges *Carex* and reed *Phragmites australis*. indicated the landscape in the north east quadrant was freshwater fen with open water, shallow pools, of reeds and sedges with fen carr in the deepest area of transect 1. Consequently, the results reported have identified that the bog basin elevated steeply east to west by 5.51m OD.

The new information obtained from the peat profiles in transect 1 on Lindow Moss provided a general outline of landscape development for the north east quadrant of fen carr, reeds, and sedge on the edge of the bog. A transition to acidic bog of *Sphagnum and Eriophorum* was evident in upper core sediments. *Sphagnum* was mainly in cores in the central area of the bog (west). The peat stratigraphy of transect 1 has shown the character of the bog and the degree to which it is fresh water with minerotrophic conditions or acidic with an oligotrophic environment was variable across this area of the bog through time. Additionally, the pre-peat bog basin profile of the area around transect 1 has been established.

5.4.3 Transect 2

There are eight cores in transect 2 in figure 5.12. Transect 2 consists of five distinct sediments. Not all sediments occur in each unit or run coherently across the transect.

1. shows sands which underlies the basin in all cores apart from T2c5 which contained grey silt which was also partially encountered in core T2c4 where it overlaid the lower sand.
2. *Phragmites* peats and fen carr wood peats in varying compositions dominated the stratigraphy in transect 2 and were present in the majority of cores T3c1 to T2c7. The *Phragmites* peats and fen carr wood peats varies in thickness as the

peat shallows towards the eastern edge of the basin. In core T3c5 there seemed to be no wood peat fragments present as seen in other cores in transect 2, but it probably does represent a continuation of this unit based on depth and similarity.

3. *Phragmites* was encountered across cores T2c1 (0.31m) and T2c2 (0.64m). This unit lacked wood peat fragments and was not a consistent across all cores, it is probably the same unit as number 2 and 6 which were composed of *Phragmites* peats and fen carr wood peats.

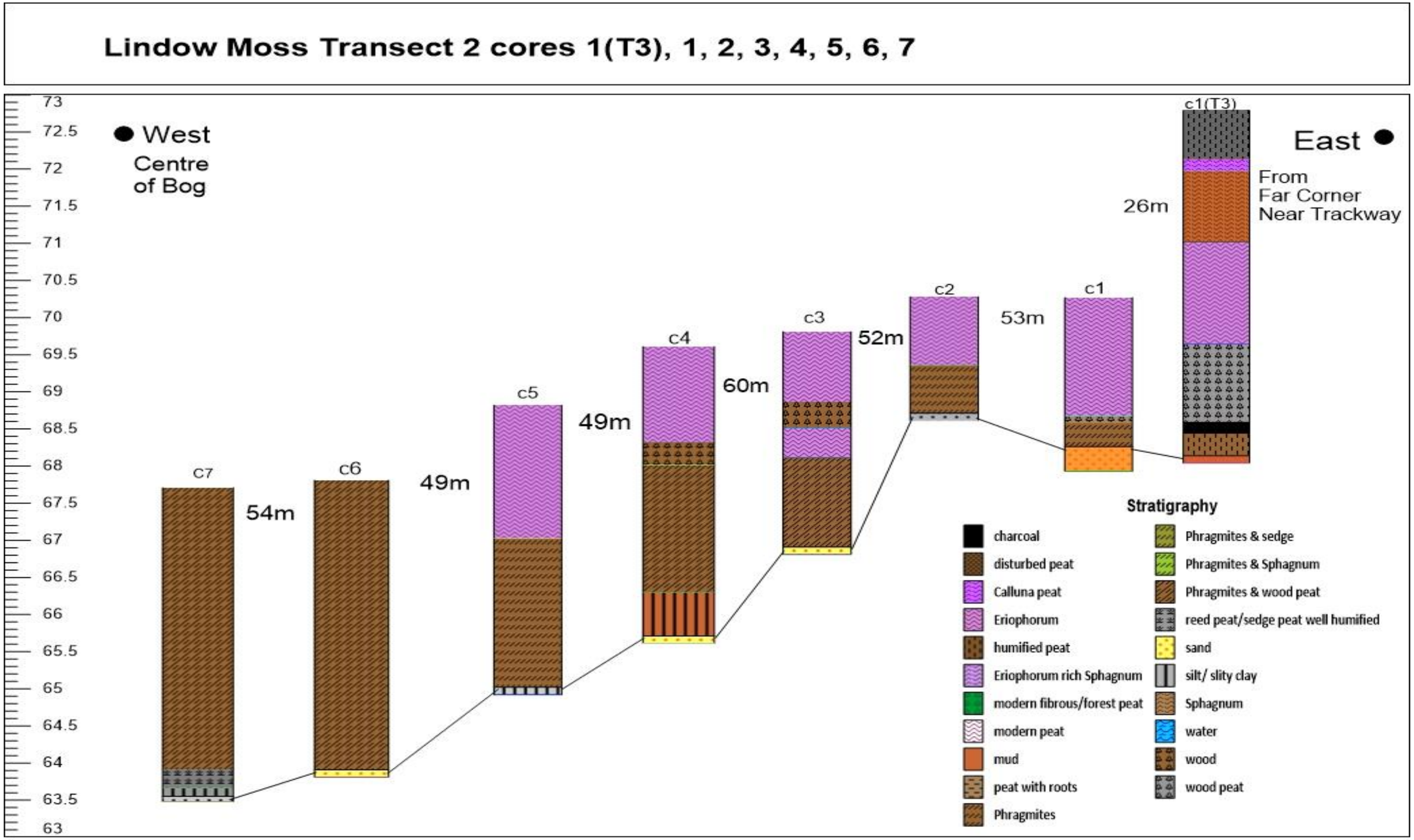

Figure 5.12 Transect 2 Core Stratigraphy

4. *Eriophorum* root mat. This ranged in depth from 1.8m to 0.93m in five cores starting at the edge of the bog near the trackway (east) and progressing to the centre of the bog. This showed that the landscape was wet, acidic with hummocks of *Eriophorum*.
5. Wood material within a wood peat matrix in core T2c3 and T3c4 which was on the outer edge east in transect 2.
6. Wood peat and *Phragmites* mixed peats in cores T2c3 (1.72m) and T2c4 (3.9m) depth which is encountered on the eastern edge of this area and probably represents a continuation of unit 5.
7. Wood peats running across cores T3c1 (1.05m), and T2c1 (0.1m) as a lower basal deposit located on the periphery of this area on the far eastern edge of the transect near the modern trackway.
8. A mix of *Eriophorum* in a wood peat matrix 1.6m depth. Afterwards a deposit of *Sphagnum* then *Calluna* (heather peat) was encountered on the far edge in the east of this transect. *Sphagnum* and heather peat were not present in cores T2c1-T2c7.

The deepest peats in transect 2 were 4.65m at core T3c1 followed by, T2c7 which contained deposits 4.05m deep. The shallowest peats recorded was identified at T2c2 at 1.57m. The base of the bog profile from the T2c7 to core T3c1 inclines by 4.48m.

5.4.4 Summary of Transect 2

In summary, the peat profiles units of transect 2 have shown on Lindow Moss the basin of the bog was overlain by sand and grey silt. The hydrosere developed as wood peats and *Phragmites* peat which in varying compositions and depths dominated the cores in transect 2. Above the lower wood peats and *Phragmites* peat unit generally was *Eriophorum* which fluctuated in variations of arrangement and depths across the transect. An upper unit of heather peat was encountered in T3c1 on the outer eastern edge of transect 2 which comprised of an underlying deposit of *Sphagnum*. Although *Sphagnum* was not evident in other cores in transect 2 this was probably because much of the upper peat deposits in the south east quadrant have been commercially cut for peat and therefore lost.

A shift from freshwater fen with minerotrophic conditions of *Phragmites* and wood peats to oligotrophic conditions and acidic bog was demonstrated in upper sediments of *Sphagnum* and *Eriophorum* on the edge of the bog progressing towards the centre (west). The lowest elevated area of the basin contained deeper deposits of *Phragmites* mixed wood peats indicating a landscape of fen woodland with open water and reeds. The peat profiles of transect 2 have demonstrated the variability of the development of the bog landscape. Furthermore, localised differences identified in transect 2 which indicated minor variations in hydrosere development were probably influenced by ground water, rain and topography.

Transect 3 is presented in figure 5.13 and the sediments described below.

5.4.5 Transect 3

There are five cores in transect 3 shown in diagram 5.13. Transect 3 consists of four discrete sedimentary units. Not all of these units were in each core or run coherently across transect 3.

1. Sand which underlies the basin across all cores apart from core T2c10 which contained grey silty clay.

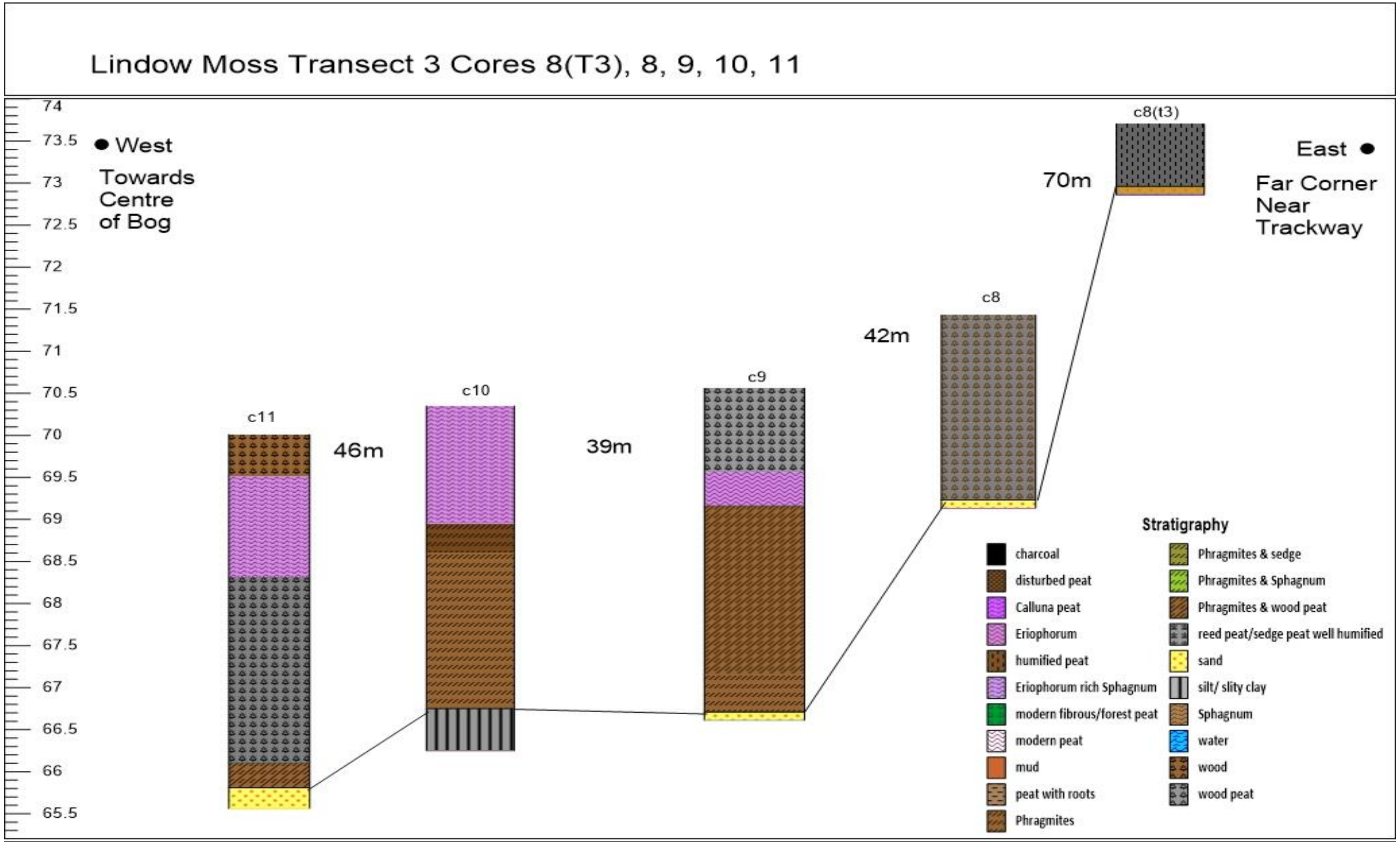

Figure 5.13 Lindow Moss Transect 3 Cores

2. *Phragmites* peat was in cores T2c9, T2c10 and T2c1 ranging from 0.3m (T2c11) to 2.2m (T2c10). In T2c11 above the deposit of *Phragmites* was a deposit of wood peat in a *Phragmites* matrix. It was probably the same sediment indicating interleaved *Phragmites* and fen carr. *Phragmites* is mainly situated on the eastern edge and towards the centre of transect 3 in varying composition and depths.
3. *Calluna* (heather peat) was present in cores T2c10 (1.4m) and T2c11 (1.2m). The heather peat was an upper deposit and was located in the west.
4. Wood peat runs coherently across cores T2c8 (2.2m) and T2c9 (1m) in different combinations and depths which were situated on the outer eastern edge of transect 3.

The two upper sequences of wood peat in cores T2c9 and T2c11 did not form coherent units across the cores, T2c11 was in the central area (west) and T2c9 was situated 85m distance away from T2c11 towards the outer edge of the bog (east). It is probable that the two upper units of fen carr wood peats were the same unit; it seems likely that peat cutting in this area of Lindow Moss has removed the peat record which could demonstrate this.

The deepest peats were identified in core T2c11 situated in the centre (west) at 4.2m. The shallowest peats were classified in core T3c8 at 0.74m and was located on the outer edge of Lindow Moss near to the trackway in the far east corner. The base of the bog basin from T2c11 to T3c8 elevated steeply by 7.15m.

5.4.6 Summary of Transect 3

The underlying bog basin was overlain by sand and clay. The general development of the bog landscape in this area was dominated by lower wood peats and *Phragmites* peats in varying arrangement and depths. This was followed by heather peat towards the centre (west) in cores T2c10 and T2c11. Whilst core T2c9 comprised of an upper deposit of *Eriophorum* on the eastern edge of transect 3 which suggested fluctuating water levels and a shift to acidic conditions.

The peat units in this area demonstrated landscape development on Lindow Moss was a freshwater reed marsh with fen carr, open water, shallow pools, with mainly fen carr at the edge with a minerotrophic environment. The wet landscape characteristics were generally followed by sequence of bog development of *Calluna* and *Eriophorum* in the western area of transect 3 which indicated a change from freshwater fen to acidic bog with oligotrophic conditions and areas that were slightly drier. The peat stratigraphy of transect 3 has demonstrated the nature of Lindow Moss and that the extent to which it was freshwater and acidic is variable across the bog through time.

The new data gained from the peat profiles in transect 3 provide a general outline of the development of Lindow Moss in the north east quadrant of Lindow Moss and established a pre-peat bog profile. The new information provides better understanding about the development of Lindow Moss in an area not previously surveyed.

The results of the investigation of sediments contained in transect 3 provides new data about the overall development of the hydrosere and the shape of the bog.

5.4.7 Transect 4

There are five cores in transect 4 which are shown in the diagram figure 5.14. Transect 4 contained six distinct sedimentary units. These sedimentary units did not occur in all cores or run consistently across transect 4.

1. Sand which underlies the basin and was present in all cores except the base of core T3c7 which consisted of clays.
2. Fen carr wood peats were present in cores T3c3 (0.60m), T3c4 (0.22m), T3c5 (0.19m). In core T3c6 two deposits of fen carr wood peats were present (0.28m basal, 0.21m upper). Also, core T3c7 consisted of two deposits fen carr wood peats (0.30m basal, 0.49 upper) which coherently run across transect 4. This unit occurred across the cores in transect 4.

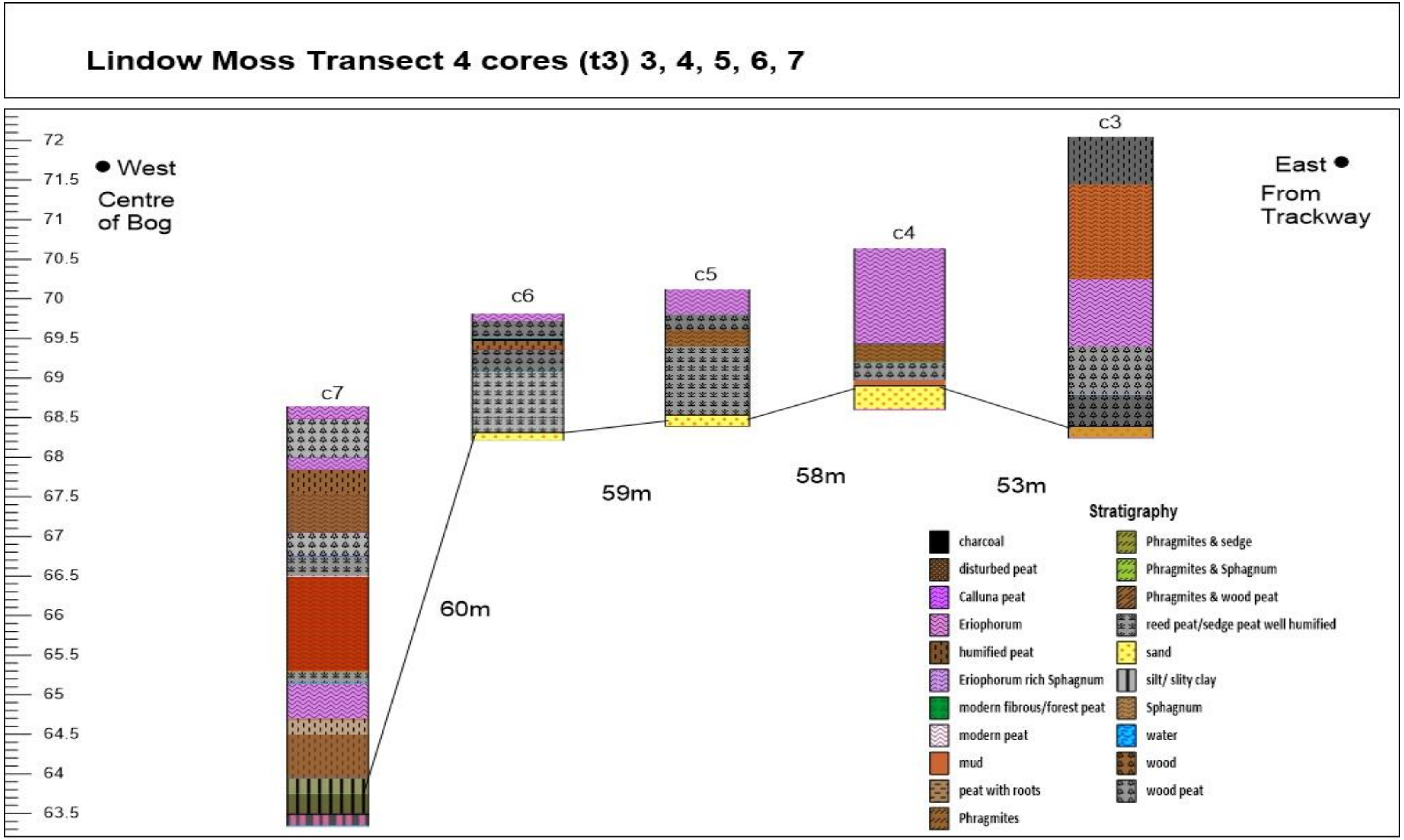

Figure 5.14 Lindow Moss Transect 4 Cores

3. *Phragmites* peat runs consistently across three cores in different compositions and depths, T3c5 (0.86m), T3c6 (0.77m), and T3c7 (0.15m). In core T3c5 (0.86m) was mixed peat containing *Sphagnum, Phragmites* and wood peats. Core T3c7 consisted of 0.15m of a lower deposit of reed peat, and an upper layer of reed peat of 0.25m. *Phragmites* peat was concentrated from the eastern edge where the peat shallows on the scarp across to the western area of the centre of Lindow Moss where peat deepens.
4. Fen carr wood peat which was identified in cores T3c6 (0.28m) and at core T3c7 (0.30m) in depth.
5. *Sphagnum* peat which traversed across cores T3c3 (2.2m), T3c4 (0.24m), and T3c5 (0.21m). Core T3c7 was in western central area of the Lindow Moss and contained a deposit of S*phagnum* 0.50m depth which did not run across core to T3c6. S*phagnum* peat was mainly seen on the eastern edges of transect 4 on the scarp and in the western central area of Lindow Moss. Core T3c6 did not contain deposits of S*phagnum* peat in its stratigraphy probably because upper deposits have been removed during peat cutting of the area and the peat record has been lost as a result.
6. *Eriophorum* was deposited in all five cores in varying depths and arrangements. The deepest layer of *Eriophorum* was identified in core T3c4 (1.2m), and T3c3 (0.85m). These two cores were located at the start of the transect 4 close to the trackway (east). Cores T3c5 (0.36m), T3c6 (0.10m) and T3c7 (0.16m) contained

an upper deposit of *Eriophorum*. Whereas, core T3c7 stratigraphy contained three phases of *Eriophorum*, the lowest layer was 0.45m, and the second layer was 0.15m depth. The third uppermost deposit in core T3c7 traversed across cores T3c6, T3c5, T3c4, and T3c3.

In transect 4 three cores comprised of finely degraded mud. In core T3c3 there was an upper layer 0.4m of degraded mud in a matrix of wood peat. In core T3c4 a lower thin lens of lake mud 0.07m in depth above sand. Core T3c7 comprised of an upper deposit of muddy peat 0.3m depth.

Cores T3c3 and T3c4 were on the eastern edge of the scarp and T3c7 was in the central western area of transect 4. A thin lens of charcoal was evident in T3c6 of 0.04m depth which was underlying fen carr wood peats situated on the very edge of the scarp.

The deposits that were present in the profiles of transect 4 in general were wood peat (unit B) in all five cores of varying depths and arrangement ranging from 0.19m to 0.86m in depth. The deepest deposit of wood peat unit B was observed in cores T3c5 (0.86m) and T3c3 (0.6m). There were multiple deposits of wood peat in cores T3c6 and T3c7, T3c6 consisted of an upper layer of 0.21m and lower layer of wood peat 0.28m in depth. Whereas, T3c7 comprised of an upper deposit of 0.49m and lower layer of wood peat 0.3m in depth.

The deepest peats were classified in T3c7 which was situated in the middle of the bog at 4.90m. The second deepest peats in T3c3 was located at the edge of Lindow bog at 3.95m. The shallowest peats were identified at T3c6 at 1.5m. The base of the bog basin from T3c7 to core T3c3 elevated steeply by 4.65m. It was evident from T3c6 to T3c3 that the base of the bog topography increases by 0.59m. There was a very steep incline of 4.57m in the basin of the bog from T3c7 to T3c6.

5.4.8 Summary of Transect 4

The bog basin was overlain by sand and clay. It was demonstrated from the sediment profiles that from the modern trackway in the eastern corner from T3c3 to T3c6 there was a scarp. The bog landscape began on the scarp (east) as fen carr, freshwater reed marsh with open water and shallow pools with minerotrophic conditions. This was generally followed by S*phagnum* and *Eriophorum* which marked a change from freshwater fen to acidic bog on the edge of the scarp with oligotrophic conditions.

In the western area of transect 4 the bog landscape developed as *Eriophorum*, followed by freshwater reed marsh with open water and shallow pools. Then S*phagnum* moss indicated open water and pools continued with an acidic bog landscape. This was followed by a reed marsh of *Phragmites* with fen carr and a return to freshwater conditions. Afterwards, S*phagnum* and *Eriophorum* developed and demonstrated a transition back to acidic bog and an oligotrophic environment with aquatic conditions. The landscape during this phase of development was pools of S*phagnum* moss with hummocks of *Eriophorum* (cotton grass). The final phase of bog landscape in the western area of transect 4 was fen carr woodland. An episode of burning was indicated by charcoal deposits on the very edge of the scarp.

The presence of fine muds was evident in the profiles of T3c3, T3c4, and T3c7 which indicated open water, pools or a significant rise in the water table. The layer of mud deposits precedes the sequence of unit of *Eriophorum* peats.

The stratigraphy of transect 4 has provided new and additional data to understand the development of the landscape in this area of Lindow Moss. The development of the bog landscape was shown be variable across transect 4. The shape of the bog basin was attained and demonstrated that there was a scarp on the eastern edge.

5.4.9 Transect 5

Transect 5 stratigraphy comprised of three distinct sedimentary units. Not all of these units run consistently across the cores. The units vary in depth and arrangement. There are four cores in transect 5 which are shown in diagram 5.15.

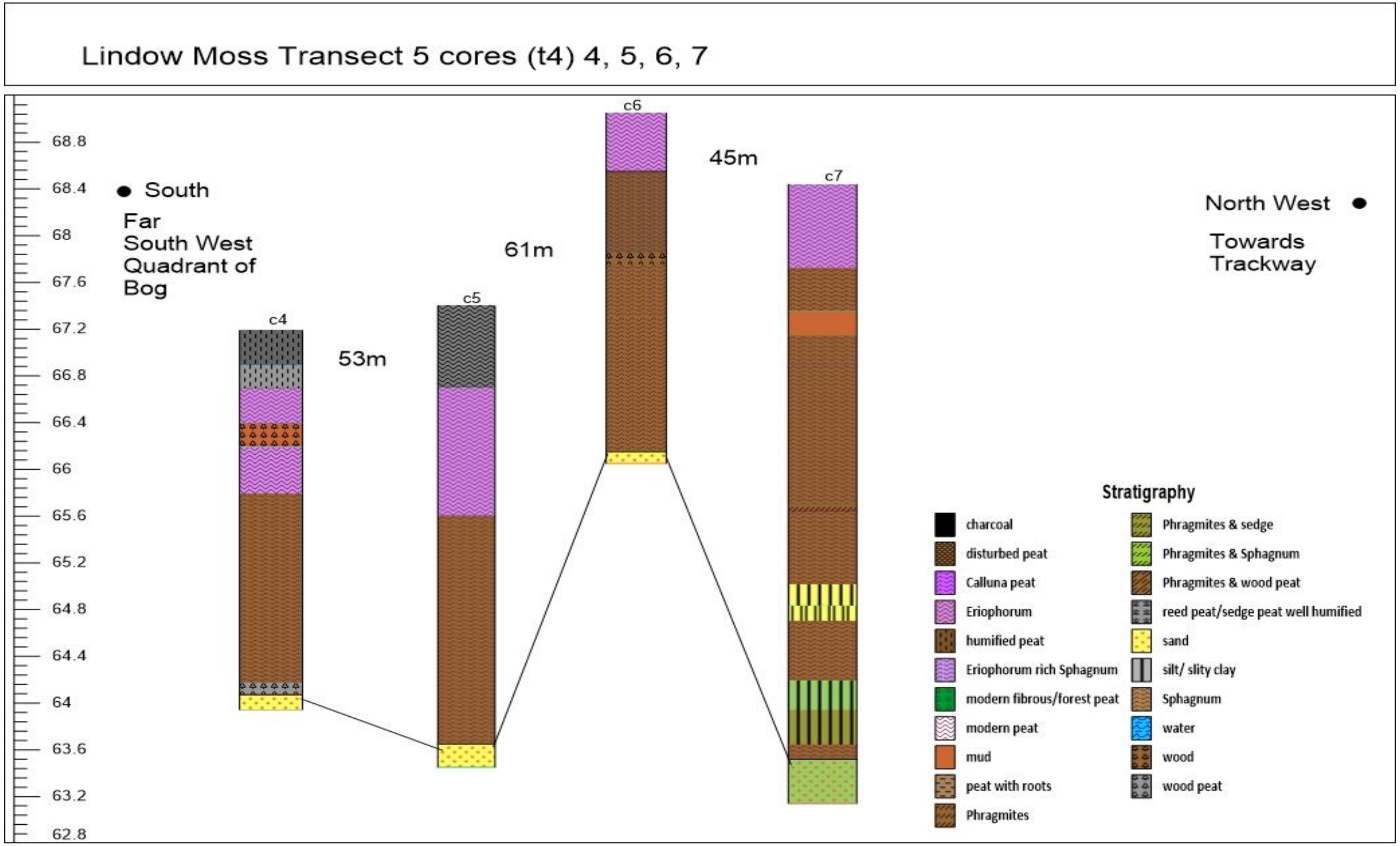

Figure 5.15 Lindow Moss Transect 5 Cores

1. Sand which underlies the basin which runs across all cores.
2. *Sphagnum* peat dominated the stratigraphy in transect 5 which formed lower deposits in three cores. Core T4c4 contained fen carr wood peat followed by *Sphagnum* peat. The depths of *Sphagnum* in transect 5 range from 0.12m to 2.4m.
3. *Eriophorum* peat was present in all cores in transect 5 in varying depths and composition. The depths of *Eriophorum* peat range from 0.20m (T4c4) to 1.80m (T4c5 located south).

The stratigraphy of core T4c7 indicated localised distinct events of water inundation in this area and the basal deposit of *Sphagnum* peat determined a wet acidic bog. This was followed by an increase in open water, pools or in wash from dryland which was indicated by layers of silt and clay above. Silts and clay in T4c7 were preceded by *Sphagnum* and bog bean *Menyanthes trifolata* L. which demonstrated open pools and acidic bog. Subsequent layer of marls, deposits of *Phragmites* and bog bean *Menyanthes trifolata* L. demonstrated further pool conditions of the hydrosere in this area. The profile of T4c7 continued to demonstrate reeds, open water, pools and acidic bog with the presence of further upper deposits of *Sphagnum*, *Phragmites* and bog bean which underlie very fine organic mud. An upper layer of *Sphagnum* followed. The very wet landscape sequences identified by sediments in core T4c7 were followed by development of *Eriophorum* which was identified traversing across all cores in transect 5.

The deepest peats were identified in core T4c7 at 4.92m depth. The shallowest peats were classified in core T4c6 at 2.90m. The stratigraphy of transect 5 established that the base of the bog basin profile from T4c4 to T4c5 the basin declined by 0.42m and from T4c5 to T4c6 the bog basin rises by 2.5m. Additionally, the bog basin profile from T4c6 to T4c7 declined by 2.63m. The stratigraphy of transect 5 has demonstrated the base of the bog in the south west quadrant undulates up and down by a maximum of 2.63m.

5.4.10 Summary of Transect 5

In summary, the stratigraphic units which were present in transect 5 in general are sand overlies the basin, lower *Sphagnum* peat then formed and dominated this area in varying depths and combinations. The bog landscape in this area started as an acidic bog with oligotrophic conditions of open water and shallow pools indicated by lower layers of *Sphagnum*. *Eriophorum* peat generally follows this unit across all cores though fluctuates in depths and composition. The upper deposits of *Eriophorum* indicated this area was predominately acidic bog with perhaps subtle transitions to open freshwater demonstrated by interleaved layers of *Phragmites* and bog bean *Menyanthes trifolata* L. below it in core T4c7. Although, it was possible acidic conditions were still present despite the presence of reeds.

Sequences of marls, clays and pool mud have been identified in the stratigraphy of core T4c7 which demonstrated in this area there was episodes of water inundation and pools. The morphology of the bog basin showed a channel feature or a low depression in the bog basin in the area of core T4c7.

The data obtained from the stratigraphy of transect 5 provides new information about the formation of bog landscape on Lindow Moss in the south west area and has established the shape of the bog basin.

5.4.11 Transect 6

Transect 6 comprised of five discrete stratigraphic units. Not all of these units were present in the cores and not all occur coherently across the transect. The peat stratigraphy of transect 6 is reported and presented below in diagram figure 5.16.

1. Sand which underlies the basin in all cores in transect 6.
2. *Sphagnum* peat which dominated the stratigraphy of transect 6 in varying depths and composition across all cores. Core T4c8 consisted of 2.03m depth of *Sphagnum* with wood inclusions; core T4c9 (0.95m) contained *Sphagnum*, bog bean *Menyanthes trifoliata* L. and wood material. *Sphagnum* peat in core T4c10 (2.55m) consisted of *Sphagnum* well humified, bog bean and wood inclusions. The deepest unit of *Sphagnum* peat was identified in core T4c10 (2.55m) which was situated on the south west edge of transect 6. The unit of *Sphagnum* peat in cores T4c9 and T4c10 overlie wood material in the south west of the transect area.
3. Wood material which varied in depth. Core T4c10 wood was 0.95m in depth and T4c9 contained 0.19m of wood material as lower deposits.

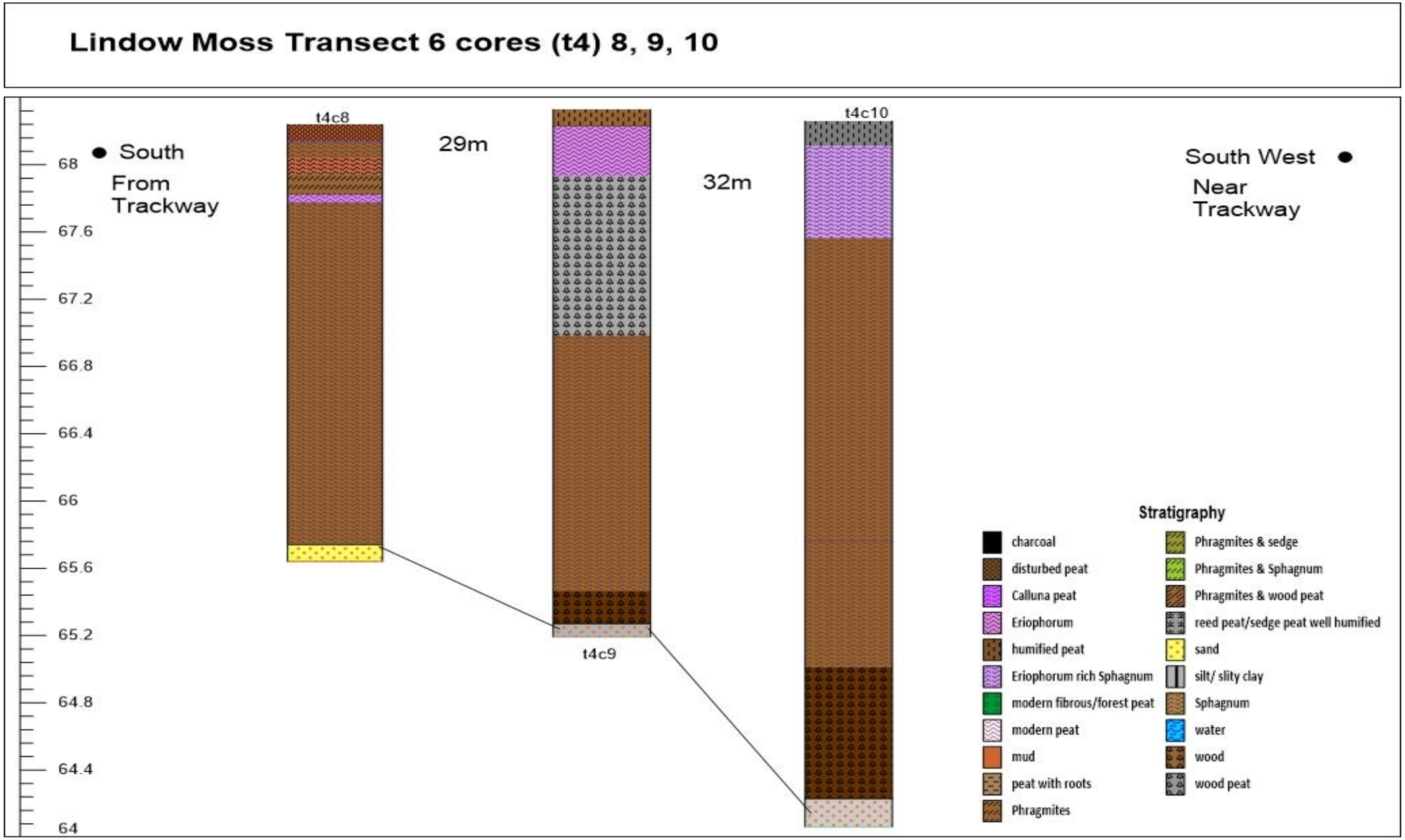

Figure 5.16 Lindow Moss Transect 6

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4. Wood rich *Sphagnum* peat which formed coherent units in cores T4c8 (0.10m) and T4c9 (0.95m) were located in the southern edge of transect 6.
5. *Eriophorum* peat which runs across all cores coherently in transect 6 in different depths and composition. The depths of *Eriophorum* range from 0.05m (T4c8) to 0.55m (T4c10). Core T4c10 comprised of *Eriophorum* rich *Sphagnum* peat.

The deepest peats were identified in T4c10 of 4.03m depth. The shallowest core was T4c8 with 2.5m depth. The base of the bog basin profile from T4c8 to T4c10 declined by 1.51m. The base of the bog declines by 1.51m in the south west section of Lindow Moss.

5.4.12 Summary of Transect 6

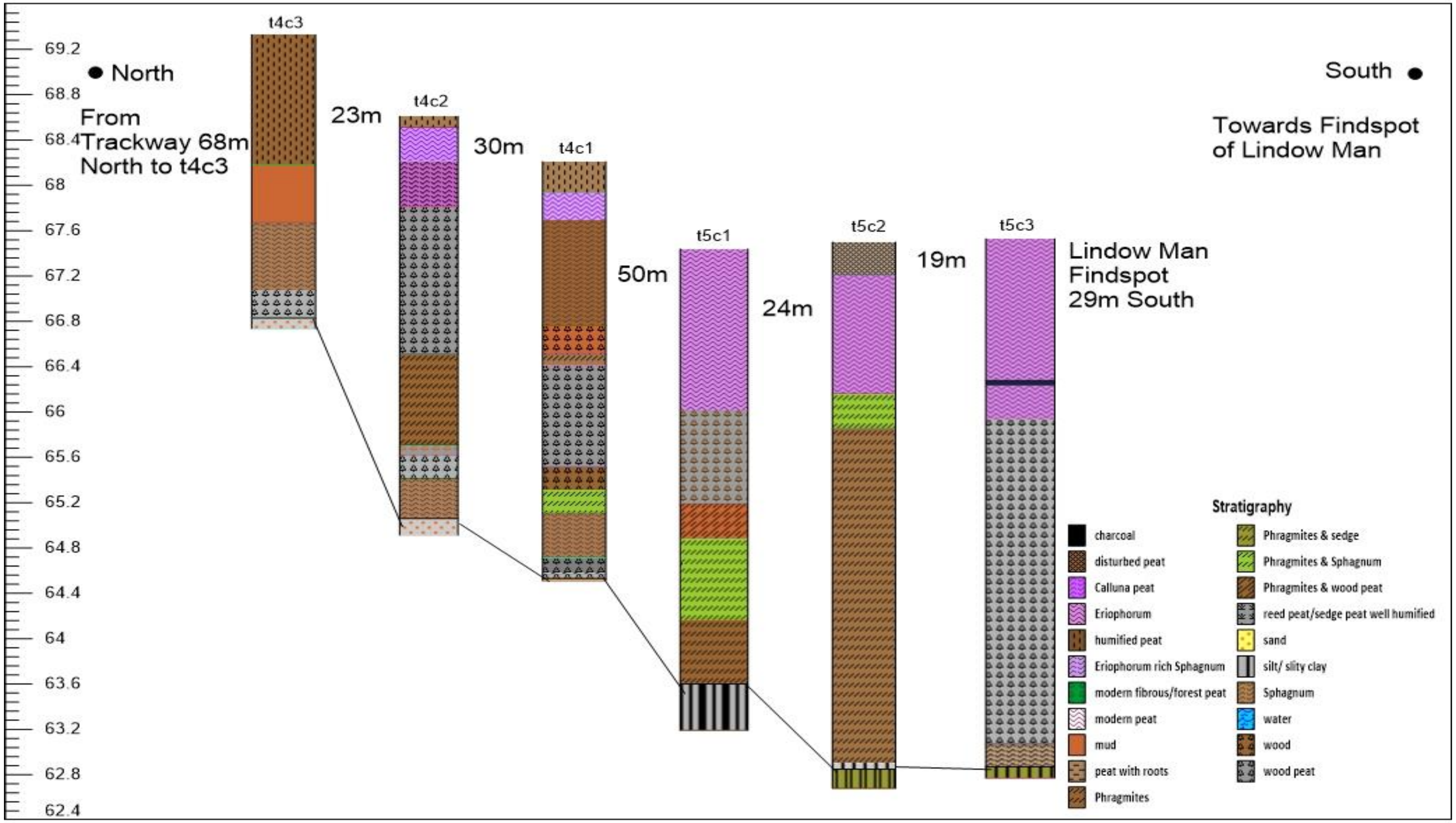
In summary, the stratigraphic units that were present in transect 6 overlie sand, are lower *Sphagnum* peat which in different compositions and depths dominated transect 6. Although, lower deposits of wood material were in cores T4c9 and T4c10 it was probably the same unit as *Sphagnum* peat as this was above the wood and dominated transect 6. The bog landscape began as acidic bog with open water and shallow pools of *Sphagnum* moss with fen carr woodland in the south west indicating an oligotrophic environment. Generally, this was followed by *Eriophorum* peat which occurs above this unit across all cores showing the water levels fluctuated and the landscape was wet with hummocks of cotton grass. In the southern area of transect 6 following the landscape of *Eriophorum* was reeds and *Sphagnum* which showed wetter conditions returned and oligotrophic environment continued. During this phase of development, the bog landscape was open water and shallow pools with *Sphagnum* moss and reeds.

The general development of the landscape of transect 6 was identified from the peat stratigraphy. This showed the variations of bog landscape across Lindow Moss. The shape of the bog basin has been identified in this area of Lindow Moss. New information about the hydrosere the south west area of Lindow Moss has been gained to further understand the study site.

5.4.13 Transect 7

Transect 7 consists of eight discrete sedimentary units. Not all of these units occur coherently across the transect or in each core. There are six cores in transect 7 shown in diagram figure 5.17.

Lindow Moss Transect 7 Cores (T4) 3, 2, 1, (T5) 1, 2, 3



1. This was the sand and clay that underlies the basin in all cores. Cores T4c3, T4c2, and T4c1 contained sand and cores T5c1, T5c2, and T5c3 comprised of clay.
2. Lower deposit of fen carr wood peat of varying depths and arrangement. Wood peat was classified running across T4c3 (0.24m), T4c2 (0.20m), T4c1 (0.04m) and T5c1 (0.31m). The depth of wood peat decreased from core T4c3 to core T5c1 and these were located running north to south from the edge near the modern trackway to the lower area of the bog topography.
3. *Sphagnum* peat which runs consistently across T4c1 (0.40m), T4c2 (0.35m) and T4c3 (0.60m) in different depths and composition. *Sphagnum* peat was clustered from the northern edge of transect 7 progressing down towards the lower topographic area south.
4. *Phragmites* and *Sphagnum* mixed matrix peat which traversed across T4c1 (0.20m), T5c1 (0.72m) and T5c2 (0.31m), the largest layer of *Phragmites* and *Sphagnum* peat was contained in T5c1 (0.72m). *Phragmites* and *Sphagnum* peat was found mainly in the southern area of transect 7.
5. Upper layer of wood peat which traverses across T4c2 (1.3m) and T4c1 (0.25m).
6. *Phragmites australis* common reed runs coherently across cores T4c2 (0.10m) and T4c1 (0.80m). *Phragmites* peat was contained in cores located on the northern edge of transect 7.
7. Lower layer of *Phragmites* peat which was present in T5c1 (0.95m) and T5c2 (2.95m). The deposit of *Phragmites* in core T5c2 consisted of *Phragmites* with bog bean *Menyanthes trifoliata* L. with a thin lens of *Sphagnum* at the base and

was the largest layer. Lower layers of *Phragmites* peat was found in cores situated in the southern area of transect 7.

8. *Eriophorum* peat runs across all cores consistently in varying depths and arrangement. The depths of *Eriophorum* peat range from 0.24m to 1.43m in depth, cores T5c3 (1.25m) and T5c2 (1.04m) comprised of *Eriophorum* peat mixed with Calluna (heather peat). The deposit of *Eriophorum* peat in core T5c1 consisted of a mixed matrix peat of *Sphagnum* and *Eriophorum* peats. A mix of *Sphagnum* and *Eriophorum* with *Phragmites* peat was classified in T4c2 (0.30m) which overlies a lower deposit of Calluna (heather peat) of 0.4m in depth. *Eriophorum* peat though mixed with other peats was probably the same unit of sediment. Core T5c3 contained deposits of charcoal at 66.28-66.23m OD. *Eriophorum* peat dominated the upper sequences of five cores apart from core T4c3 which was located on the northern edge of transect 7, probably this core's deposit of *Eriophorum* peat was removed by peat cutting in this area as it was on the higher area of the northern edge.

The stratigraphy of core T4c3 comprised of organic degraded mud with occasional *Phragmites* was identified 0.4m in depth. A thin lens of charcoal 0.05m in depth was identified in core T5c3 which intersected a lower deposit of *Eriophorum* and wood peat and an upper layer of *Eriophorum* and Calluna (heather peat) which suggested burning within this area of Lindow Moss.

The deepest peats were classified at T5c3 at 4.66m; the shallowest peats were contained in T4c1 of 2.5m in depth. The stratigraphy of transect 7 determined that the base of the bog basin from T4c1 to T5c3 declined by 3.96m in the west quadrant of Lindow Moss.

5.4.14 Summary of Transect 7

In summary, the stratigraphic sedimentary units overlie sand and clays, clays were located in the lower elevated areas of the basin. In general, in transect 7 there were lower fen carr woodland, *Sphagnum* and *Phragmites* peats which were in different compositions and depths and dominated transect 7 stratigraphy. On the northern edge of transect 7 landscape development began as fen carr woodland and acidic bog of *Sphagnum* with open water and shallow pools with an oligotrophic environment. Towards the southern area the bog landscape started as freshwater reed marsh with open water with minerotrophic conditions in this area. Furthest south in transect 7, 29m away from the findspot of Lindow II, the bog landscape developed as acidic *Sphagnum* bog with open water and pools followed by a drier phase of fen carr woodland.

Fen carr was concentrated around the northern edge and progressed south. In general, this was usually followed predominately by *Eriophorum* which varied in arrangement of layers and depths across transect 7. This indicated slightly drier patches of landscape with fluctuating water levels, hummocks of cotton grass in an aquatic environment. Evidence of burning was identified in core T5c3 and suggests around Lindow Moss woodland was burnt either by natural causes or by anthropogenic activity.

The new information obtained from the stratigraphic sediments of transect 7 on Lindow Moss demonstrated the development of the landscape in this area. Localised differences in landscape hydrosere were identified which may have been influenced by topography, ground water levels, water inundation from streams branching from the River Bollin in the northern area feeding in to Lindow Moss and rain. The stratigraphy of transect 7 established the shape of the bog basin in the west quadrant of Lindow Moss.

The intention of this section was to outline the general formation of the bog landscape from the results of transect 7 and establish the shape of the bog basin. This has been achieved. New information about the hydrosere in the western area of Lindow Moss has been gained to further understand the study site. An outline of previous research carried out on raised bogs is included in chapter 7 below.

5.5 Bog Formation on Lindow Moss

The peat stratigraphy of cores in transects 1, 2, 3, and 4 have provided new information to determine the development of the bog landscape in the eastern area of Lindow Moss. Towards the basin edge the earliest development seems to be a wood peat with sedge and reeds. The bog landscape was fen carr woodland with areas of open water and pools of reeds and sedge with a minerotrophic environment. This persists in this area for much of the period of bog formation. Evidence of burning was identified on the eastern edge of Lindow Moss by presence of charcoal. Towards the centre of the bog basin this later developed into acidic bog with open water and pools in some places with oligotrophic conditions. This was demonstrated by *Sphagnum* peat across this area.

Generally, later formation of the bog landscape was in the form of *Eriophorum*, in most areas towards the edge and centre of the bog basin. In some places on the eastern edge of the bog basin after development of *Eriophorum* there was further formation of *Sphagnum* peat demonstrating a return to much wetter conditions in this area, followed by a further sequence of *Eriophorum*. This showed the water levels fluctuated in this area and continued to exhibit oligotrophic conditions. Whereas, in other locations on the eastern edge there was formation of sedge which followed *Eriophorum*. This demonstrated a transition from acidic bog with an oligotrophic environment to freshwater conditions and potential minerotrophic conditions. An area on the eastern edge of the basin showed that wood peats developed after *Eriophorum* demonstrating in this area it became drier with development of fen carr woodland.

Towards the centre of the bog basin below the scarp at core T3c7, development of the bog landscape was very variable. Initial bog formation was open water and pools demonstrated by silts and clays. The bog landscape developed into *Eriophorum* with acidic wet oligotrophic conditions. Reed fen followed which demonstrated a shift to open freshwater landscape in this area and minerotrophic environmental conditions. Formation of *Sphagnum* followed reed fen, which indicated a shift to oligotrophic conditions of acidic bog with pools and open water. Then the bog landscape developed into reed fen with open freshwater. Upper sediments showed bog landscape development continued with a wood peat and *Sphagnum* and *Eriophorum*. Upper sediments showed the landscape development persisted with fen carr wood peat and *Eriophorum* in this area of Lindow Moss. The centre of Lindow Moss shows variations through its bog landscape development transitioning from oligotrophic to minerotrophic back to oligotrophic environment conditions.

In the far south west quadrant of Lindow Moss around the area of transect 5, the earliest formation of the landscape in this area was acidic *Sphagnum* bog with a wood peat on the outer southern area, showing a landscape of open water and pools with *Sphagnum* and fen carr. This persisted in this area for most of its development. Followed by formation of *Eriophorum* which demonstrated that oligotrophic conditions continued in this area. There was open freshwater fen with development of reeds and bog bean towards the north west edge, indicating in this area minerotrophic conditions prevailed. Towards the north west area of transect 5, morphology of the bog basin identified a channel feature or a low depression in the morphology of the basin in this area. In this area two episodes of pool formation developed. Pool mud indicated either open water or water inundation around the area of the channel feature or depression through which water scoured out towards the north west of Lindow Moss.

In the south west area of Lindow Moss along the modern trackway, sediments in transect 6 demonstrated earliest formation of the landscape was predominately open water and pools of *Sphagnum* acidic bog and a fen carr wood peat. This continued for some time during the period of development of the bog landscape. Formation of *Eriophorum* followed *Sphagnum* indicating oligotrophic conditions throughout its development in the southern area. Whilst in the south west area heather peat developed after *Sphagnum* which demonstrated a drier phase of bog landscape development. In the south west area of transect 6, acidic bog conditions predominated.

On the northern edge of transect 7 near the modern trackway, the earliest development was a wood peat and acidic *Sphagnum* bog with open water, pools and fen carr. Whilst progressing down towards the southern edge earliest formation was of a wood peat, acidic *Sphagnum* bog and reeds. Freshwater reed fen dominated bog development in the area of T5c2 which suggests in this area the environment had minerotrophic conditions. Approximately 29m from Lindow II findspot, the bog landscape began as acidic *Sphagnum* bog with a wood peat afterwards, significantly, this area was open water and pools of *Sphagnum* with oligotrophic conditions; followed by a drier landscape development of fen carr woodland. This was generally followed by formation of *Eriophorum* in the south west section of the bog basin. Apart from on the northern edge in this area heather peat formed, which showed areas of heath and woodland with peaty or sandy soil and a slightly drier landscape phase (Stace 2010). The development of the landscape in the south west area has shown that the landscape conditions were mainly oligotrophic with slight changes to freshwater reed marsh with minerotrophic conditions which later returned to acidic bog and oligotrophic conditions. Variability of the development of the bog landscape through pre-history on Lindow Moss has been demonstrated across the bog basin.

The peat profiles of NWWS cores were compared with the stratigraphy of cores in transects 1-7 on Lindow Moss to determine if the formation of the bog landscape across Lindow Moss correlated with the NWWS and peat stratigraphy examined by Branch and Scaife (1995, 21-24).

Transect 1 - The nearest NWWS core was Lin8, located 93.5m south west of T1c1. The NWWS core Lin8 showed formation of the bog landscape began as *Scheuchzeria* L. commonly known as rannoch rush, and reed peats which were generally followed by *Eriophorum* and *Sphagnum* peat. *Scheuchzeria* L. (rannoch rush) was not identified at macro-scale examination during fieldwork on Lindow Moss for this thesis. The bog landscape in the area of Lin8 was freshwater reed marsh with open water, shallow pools, an episode of flooding was indicated by the presence of *Scheuchzeria* L. (rannoch rush). *Eriophorum* and *Sphagnum* indicated a transition to acidic bog landscape and a fluctuating water table (Leah *et al.* 1997, 53-62).

A *Sphagnum* dominated bog landscape with open woodland, areas of pools and hummocks were interpreted by research carried out around the location Lindow II was excavated (Branch and Scaife 1995, 21-24). The new information from transect 1 shows the landscape development in the north east area in general parallels aspects of previous research and provides new data on the hydrosere development.

Transect 2 - The NWWS did not carry out cores in the south east quadrant. The nearest NWWS core to core T2c1 was 103m north east NWWS Lin14, 90m north of core T2c2 was NWWS Lin13 and 38m south of core T2c7 (centre) was NWWS Lin6 (Leah *et al.* 1997). The stratigraphy in NWWS core Lin14 showed the landscape started as a fen carr landscape which developed into slow growing acidic bog with *Sphagnum* and *Eriophorum* and a drier phase of heather (Leah *et al.* 1997, 58).

Around NWWS core Lin13 the landscape development was freshwater reed fen with *Scheuchzeria* L. (rannoch rush) with open water, shallow pools and potential episode of flooding (Leah *et al.* 1997, 53-62). A shift from freshwater fen landscape to acidic bog was demonstrated by *Sphagnum* and *Eriophorum* and heather peats (Leah *et al.* 1997, 53-62). NWWS core Lin6 correlated with T2c7 in transect 2. The sediments in Lin6 suggested the centre of Lindow bog began as a wood peat (fen carr) with development of freshwater reed fen with open water, shallow pools. A return to a wood peat followed afterwards, with a later hydrosere development of acidic bog of *Eriophorum*. *Scheuchzeria* L. (rannoch rush) returned and indicated open water, shallow pools and possible flooding and a shift to freshwater conditions. This was followed by a transition back to acidic bog with *Eriophorum* and *Sphagnum* in this area (Leah *et al.* 1997, 54).

Transect 2 showed the landscape development on Lindow Moss corresponds in general with research by Leah *et al.* (1997), Branch and Scaife (1995, 21-24). However, the distances from cores in transect 2 to the NWWS cores and the findspot of Lindow Man is considerable. The distance is significant because sediments from cores represent the landscape in that area rather than characterising the whole bog (Barber *et al.* 1998; Hughes and Dumayne-Peaty 2001).

Transect 3 - The nearest NWWS core to T3c8 was Lin8 which was 168m south west. The peat profile of Lin8 indicated formation of the bog landscape in this area was freshwater reed marsh with open water, shallow pools demonstrated by deposits of *Scheuchzeria* L. (rannoch rush) and fen carr. This was generally followed by *Eriophorum* and *Sphagnum* which indicated a transition to acidic bog conditions in this area (Leah *et al.* 1997, 54). Differences were observed in core T3c11; there was no *Sphagnum* within the stratigraphy probably due to removal of upper layers of relict peat during peat cutting.

Transect 4 – NWWS core Lin13 was located 18m south from T3c3 in transect 4. Core T3c7 was positioned 72m east from NWWS Lin7. The peat profile of NWWS Lin7 corresponded with T3c3 on the eastern edge of the bog basin but did not parallel the rest of transect 4 stratigraphy. Lin7 showed the bog landscape started as a wood peat (fen carr) landscape was followed by *Eriophorum* and *Sphagnum* which demonstrated a change to acidic bog with pools and open water (Leah *et al.* 1997, 54).

In comparison, Lin13 contained sediments that indicated no wood peat (fen carr woodland) was identified in this area (Leah *et al.* 1997, 58). The bog landscape around Lin13 started as open freshwater reed fen and transitioned to an acidic bog of *Sphagnum*, *Eriophorum* and heather (Leah *et al.* 1997, 58). Whereas, the stratigraphy in NWWS Lin14 which was 92m south east of core T3c3 corresponded to sediments identified in T3c3, T3c4, and T3c5 which demonstrated the landscape in this section of Lindow Moss developed as a wood peat (fen carr) generally followed with an acidic bog of *Sphagnum* and *Eriophorum* with small amounts of heather (Leah *et al.* 1997, 58).

Transect 5 - The NWWS core Lin20 was located 150m north east of T4c7. The sediments in Lin20 determined the bog landscape developed as a fen carr landscape and was generally followed by *Sphagnum* peat (Leah *et al.* 1997, 58). After *Sphagnum* formation of the bog landscape developed into *Eriophorum* (Leah *et al.* 1997, 58). There were some similarities of the sequence of sediments in core Lin20 that corresponded to core T4c4 with localised variations through time. The stratigraphy of Lin20 did not parallel the peat profile of core T4c7. The nearest NWWS core to T4c4 was Lin29 which was located 135m south. The peat profile of Lin29 indicated the bog landscape developed as a wood peat and afterwards *Scheuchzeria* L. (rannoch rush) with freshwater reed fen of open water and shallow pools around this area (Leah *et al.* 1997, 56). The formation of the landscape indicated by Lin29 did not parallel the peat stratigraphy of transect 5 and showed virtually no similarity. Transect 5 was predominately acidic bog.

Transect 6 - The NWWS core Lin20 to T4c9 was located 35m east from core T4c9. The sediments in Lin20 were different and bog landscape started as a wood peat (Leah *et al.* 1997, 58). Whereas, the peat stratigraphy in transect 6 cores showed the bog formation was predominately acidic *Sphagnum* bog. There were distinct variations with the development of the bog landscape in transect 6 profiles that did not correspond with Lin20.

The peat stratigraphy of Lin28 was distinctly different from core T4c10 which was 220m away. Development of the bog began as freshwater reed fen then a wood peat (Leah *et al.* 1997, 56). Lin28 showed a transition from freshwater to acidic conditions with *Sphagnum*, *Eriophorum* and small amounts of heather. Whereas, around core T4c10, the bog landscape formed as an acidic bog of *Sphagnum* moss and then afterwards with *Eriophorum*.

Transect 7 - The NWWS core Lin28 was located 67m south from T5c3. The stratigraphy of Lin28 showed the landscape began as open freshwater reed fen with *Scheuchzeria* L. (rannoch rush) (Leah *et al.* 1997, 56). Whereas, around core T5c3 formation of the bog started as acidic *Sphagnum* bog of open water and pools followed by development into a wood peat. The development of the bog landscape was very varied in both Lin28 and T5c3 throughout prehistory (Leah *et al.* 1997, 56).

The positions of NWWS cores Lin19 which was 81m east and Lin20 was 80m south east from core T4c1 in transect 7. The stratigraphy of Lin19 and Lin20 were not analogous with the peat profiles in transect 7. The peat profiles of Lin19 and Lin20 classified development of the bog landscape began with a wood peat (fen carr landscape) (Leah *et al.* 1997, 56-58). Whilst on the outer northern edge of transect 7 wood peat (fen carr) developed in this area at T4c3 and at core T4c1. Afterwards the bog landscape developed as an acidic bog followed by a switch to open freshwater reed fen at core T4c1. Then a wood peat and acidic bog of *Sphagnum* developed at core T4c1.

It is evident from the peat stratigraphy of the NWWS cores located at different distances from the cores in transects 1-7 that development of the bog landscape on Lindow Moss was very varied across the bog in location and time throughout prehistory.

5.6 Reconstruction of the Underlying Bog Basin

The intention of this section is to reconstruct the underlying bog basin in which the bog landscape developed from the new data gained from the results of the investigations reported in this chapter. The shape of the bog basin is evaluated in relation to the positions of Lindow bog bodies placed within it as mentioned in chapter 1 and 3 because information that relates to their placement from contemporary peatland edges are analysed. The morphology of the bog basin is evaluated in relation to the formation of the bog landscape and how this corresponds with the location of Lindow II. Additionally, the borehole surveys have provided data to establish the general landscape development of Lindow Moss which have been reported and presented above.

Subsequently, the base of organic deposits on Lindow Moss have identified the base of the bog basin. Furthermore, the shape of the bog basin has been reconstructed and presented as a DEM below (figure 5.19). Additionally, the diagram of transects 1-7 located in the map of Lindow Moss is displayed in (figure 5.18) showing the locations of individual cores contained in transects 1-7 which give context to the description of the pre-peat landscape below. The second DEM presented and explained is the reconstruction of the bog basin which has combined legacy data from the NWWS and new data from the profiles of transects 1-7 (figure 5.21). The diagram (figure 5.20) below shows the position of transects 1-7 and cores to aide explanation of the description of the bog topography at Lindow Moss.

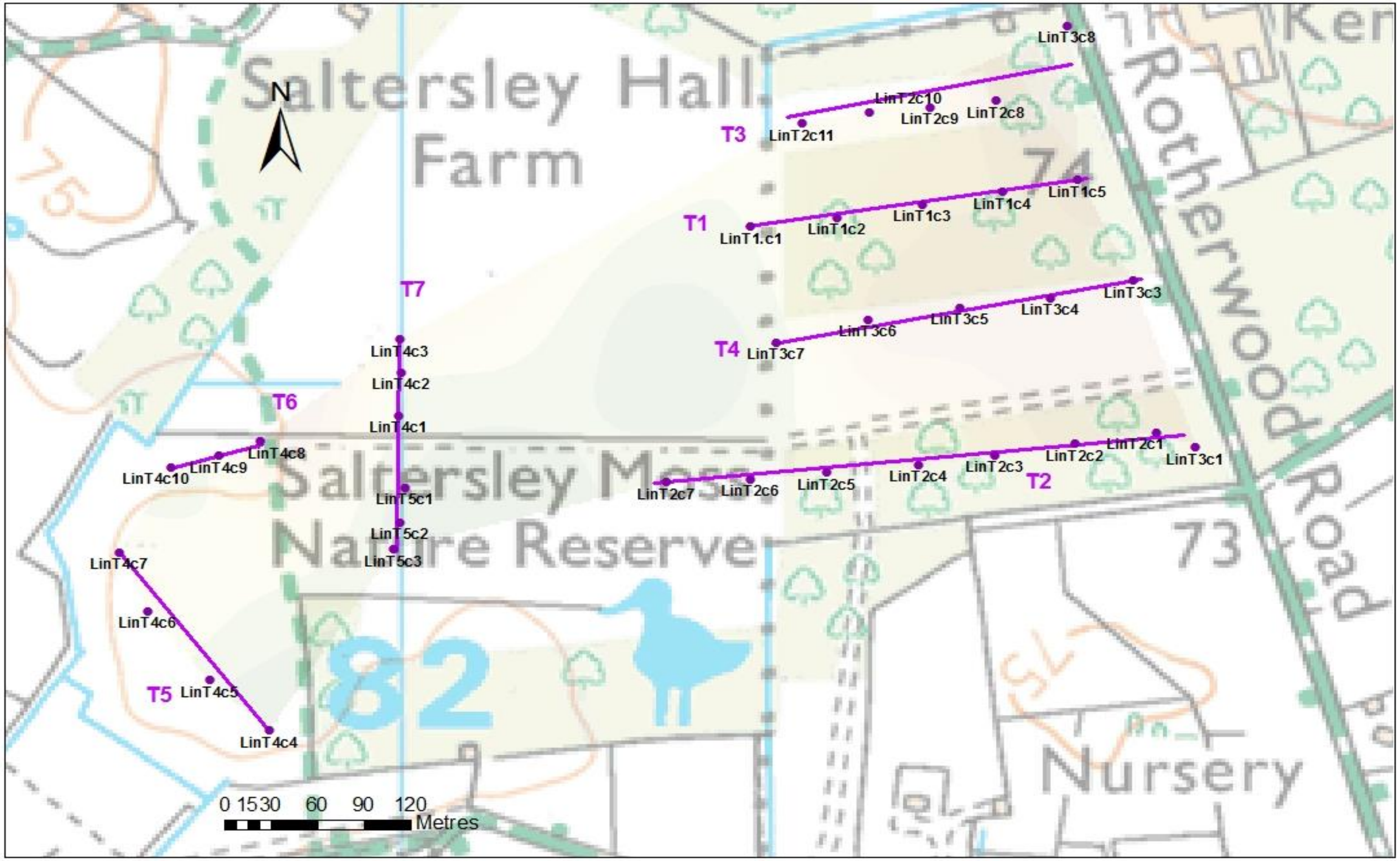


Figure 5.18 Locations of Transects and Cores on Lindow Moss

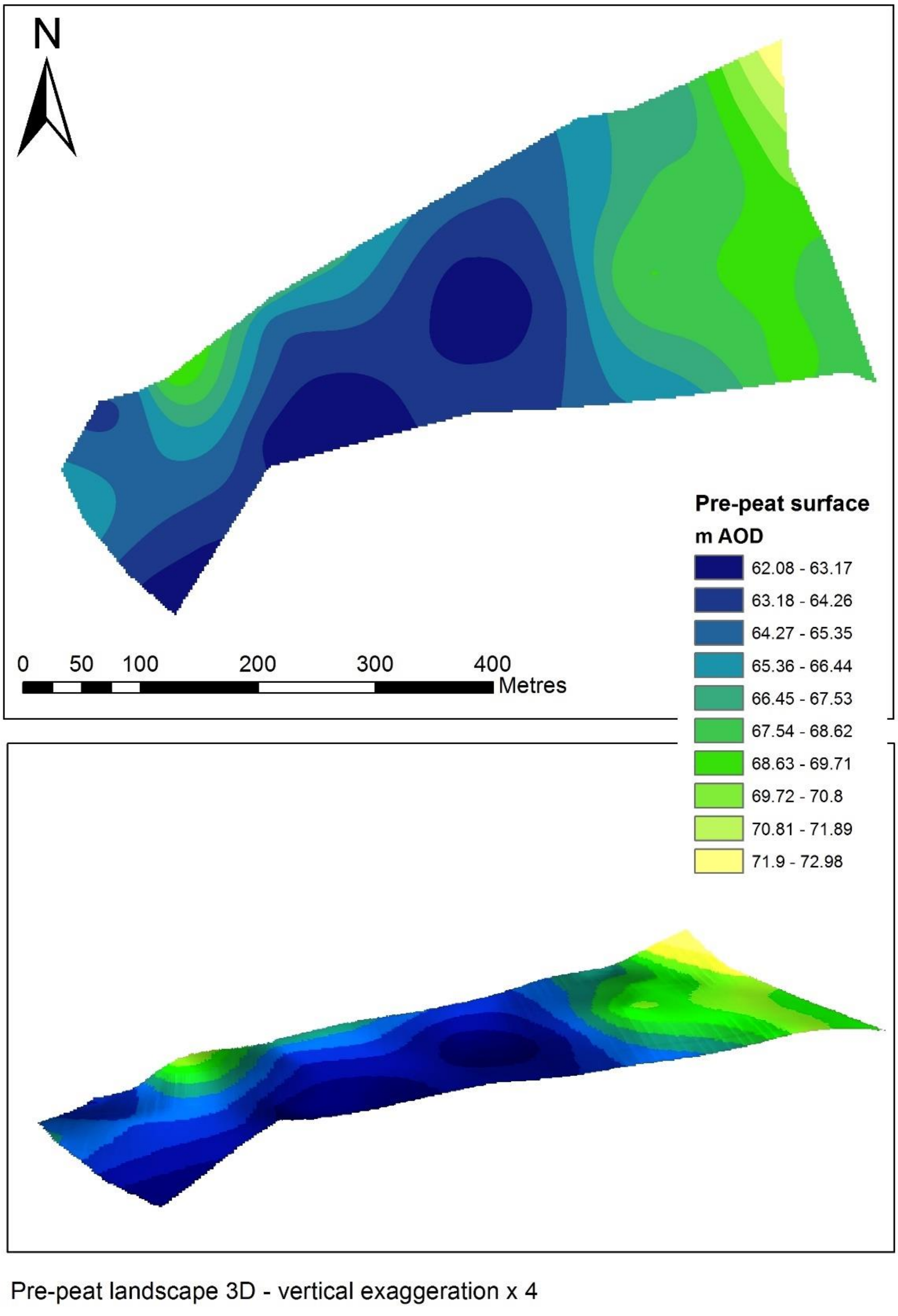
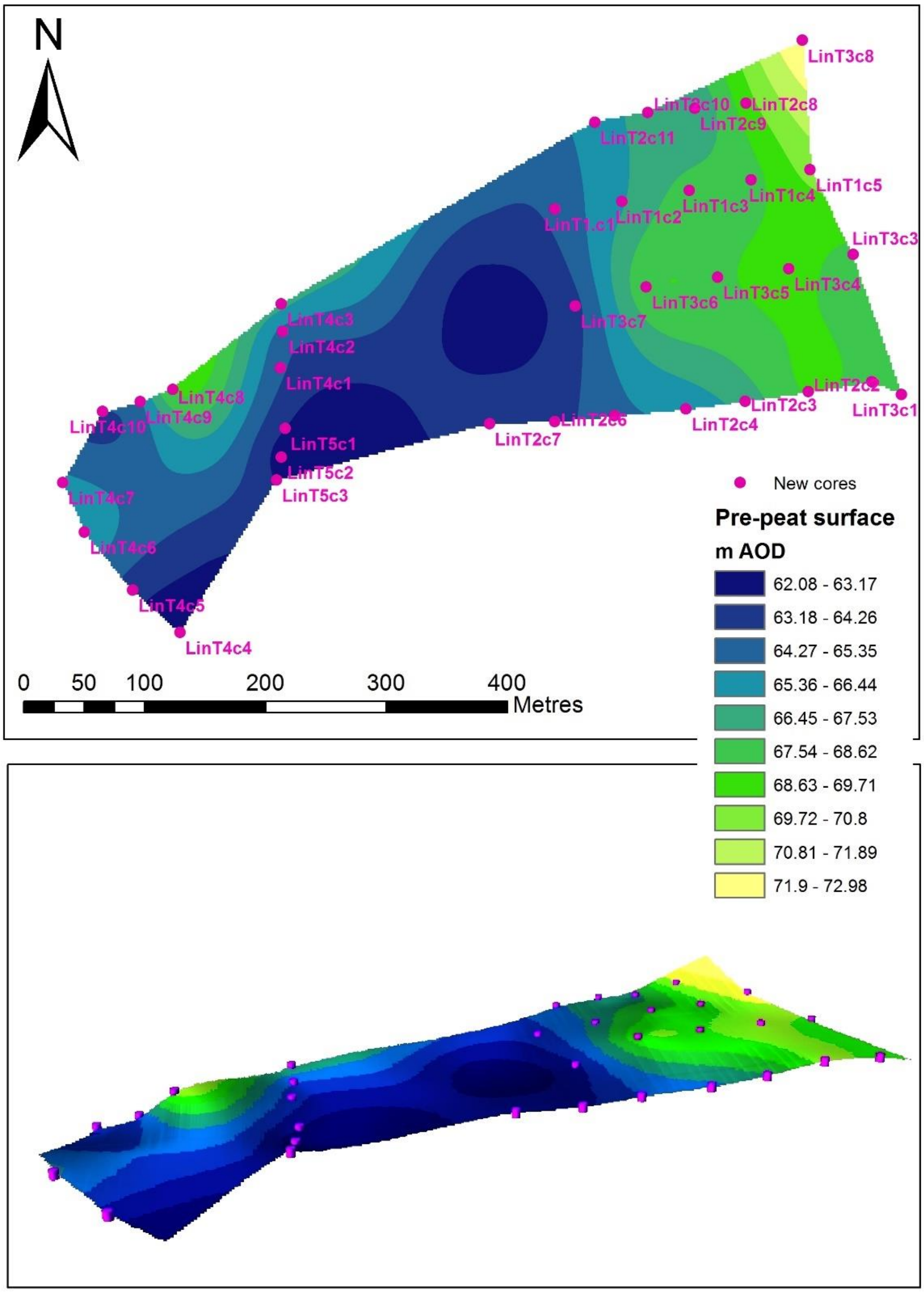


Figure 5.19 DEM of The Pre-Peat Landscape of Lindow Moss



Pre-peat landscape 3D - vertical exaggeration x 4

Figure 5.20 The Pre-Peat Landscape and Core Locations

The stratigraphy of transects 1, 2, 3 and 4 have demonstrated the underlying bog basin in the north east section of Lindow Moss. Around the area of transect 1, the bog basin declined by 5.51m from the eastern edge to the west. Whereas, the area around transect 2 demonstrated the base of the bog declined from the eastern edge to the central area in the west by 4.48m. The topography of the bog basin in the area of transect 3 declined by 7.15m east to west.

From the eastern edge of Lindow Moss the bog basin demonstrated a scarp feature which had elevations of 68.15-69.35m OD. The scarp was identified in the area of transect 4 where there was a slight decline from T3c3 to T3c6 of 0.59m. Then there was a steep drop from core T3c6 to T3c7 of 4.57m. The bog basin was distinct in this area of Lindow Moss. The scarp extended outwards from the eastern edge of the bog to the west approximately central to the bog basin where elevations were lowest at 62.08-63.3m OD.

The underlying bog basin in the north east area had a deeper drop in topography at transect 3 of 7.15m. around the areas of transects 1, 2 and 4 the bog basin declined east to west by 5.51m – 4.48m. From the eastern edge of the bog to the centre in the west elevations of the underlying bog basin were 72.98-63.31m OD.

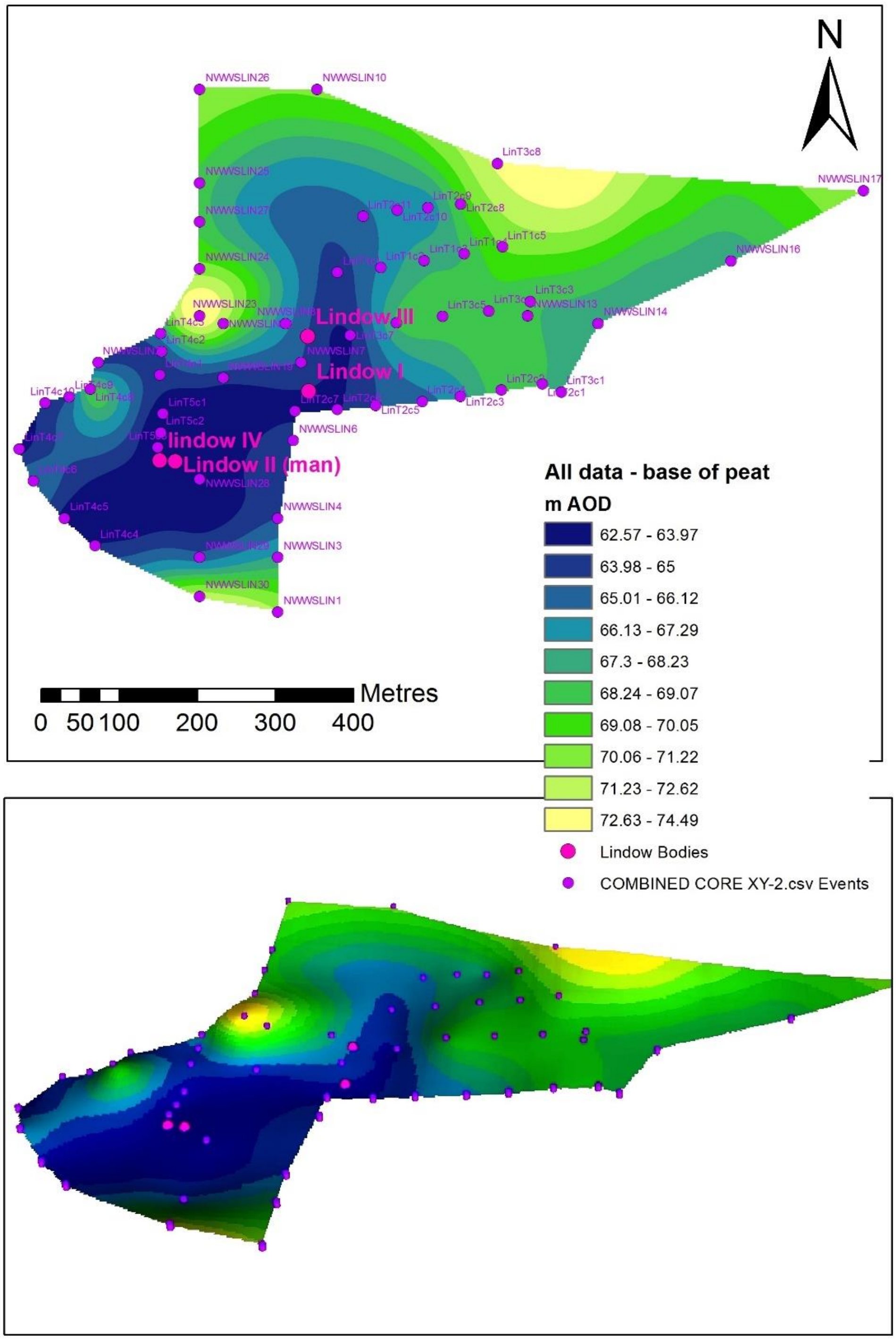
The bog basin profile in transect 5 was different to the bog profiles demonstrated in transects 1-4, 6, and 7. The underlying bog basin in the area of transect 5 has shown from T4c4 to T4c7 the basin declines by 0.42m, rises by 2.5m and declines by 2.63m outlining an undulating channel feature. The elevations around the channel feature or low depression in the morphology of the bog basin in the south west area of the bog were 66.93-62.08m OD. The undulating characteristic of the base of the bog basin has not been detected in transects 1-4, 6, and 7. Transect 6 stratigraphy showed the bog profile declined south to south west by 1.51m.

The topography of the bog basin in transect 7 identified the base of the bog decreased north to south by 3.96m. From the northern edge of the bog in the western section of Lindow Moss elevations of the bog basin ranged from 65.73-62.08m OD.

In the western section of Lindow Moss the bog basin around transect 5 showed the base of the bog decreased by 0.42m followed by a rise in topography by 2.5m and then declined in depth by 2.63m. The bog basin was deeper across north to south, declined south to south west by 1.51m. In addition, south to north west there were undulations with a maximum decline of 2.63m in this area of Lindow Moss.

The data derived from surviving peats in transects 1-7 have shown the highest elevation of the pre-peat landscape at Lindow bog was in the north east corner and was 73m OD – 70.56m OD. The scarp had elevation values of 68m OD to 69.3m OD and extended east to west. The deepest part of the bog basin at Lindow Moss was identified in the middle of the bog with elevation values of 62m OD to 63m OD.

A new DEM was created using the legacy data from the NWWS and new data from the stratigraphy of transects 1-7. The new DEM containing combined data reconstructed the base of bog topography which has provided a larger reconstruction of the pre-peat landscape at Lindow Moss which has not been established before this research. The positions of the Lindow bog bodies are shown below in figure 5.21 and figure 5.22 on Lindow Moss.



3D view looking north - vertical exaggeration x 2

Figure 5.21 The Pre-Peat Landscape Transects 1-7 and NWWS Cores

The profiles of transects 1-7 have provided new information about the development of the landscape on Lindow Moss. Combining legacy dataset from the NWWS with transect 1-7 have provided a larger detailed reconstruction of the base of the bog. The positions of Lindow bog bodies were notably deposited in the central area of Lindow bog basin where accessibility would have been more difficult than on the edges of the bog. This is an important result because it has implications on the interpretations of their deposition.

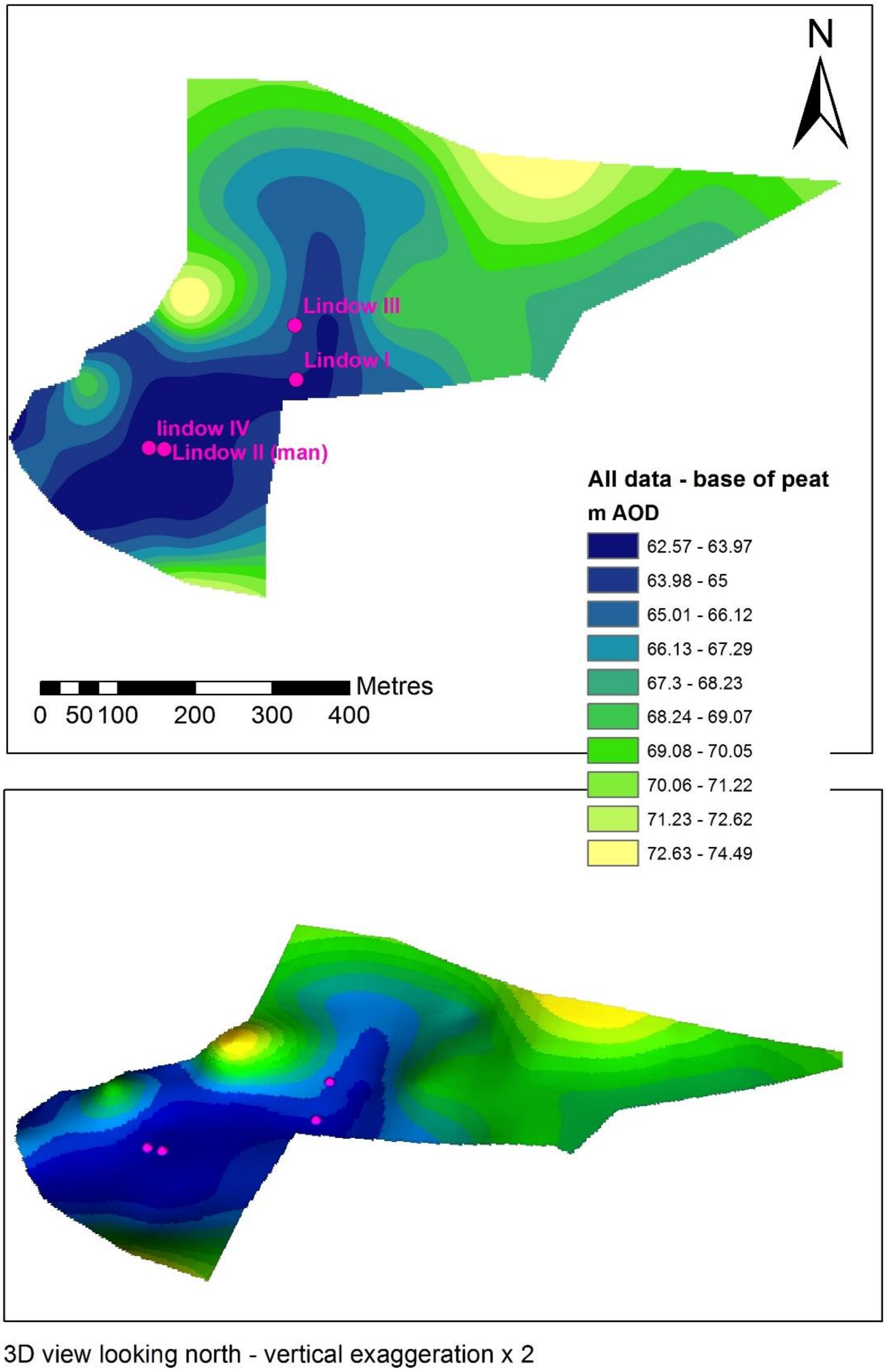


Figure 5.22 Lindow Moss Pre-Peat Landscape and Lindow Bog Bodies

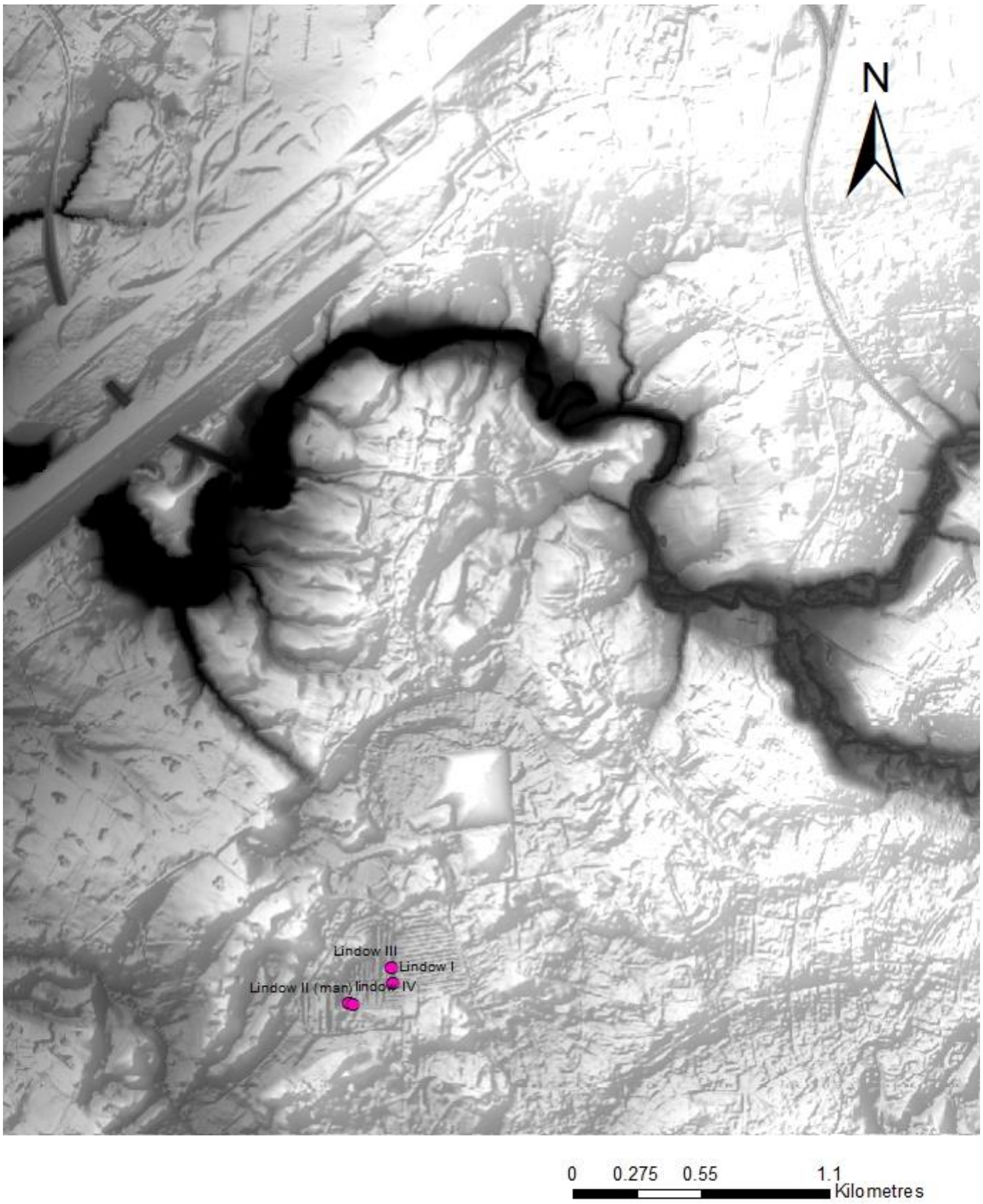


Figure 5.23 LiDAR of Lindow Moss

Lindow Moss is located under an arc of the River Bollin, palaeochannels branching from the River Bollin feed into the north of Lindow bog (figure 5.30). This has probably influenced the fluctuating water levels which drive formation of the hydrosere on Lindow Moss coupled with rainwater and the bog basin topography. It is probable the distinct events of three classifications of marls, clays, silts and finely degraded mud in the eastern area showing sequences of pools may have been influenced by water inundation from the palaeochannels scouring through and down from the scarp. The centre and deeper part of the bog basin have been prone to flooding and landscape development has been complex and varied on Lindow Moss. The map below shows the locations of a jawbone and wooden trackway on Lindow Moss in figure 5.31.

5.7 Archaeology and Artefacts found within 5km of Lindow Moss

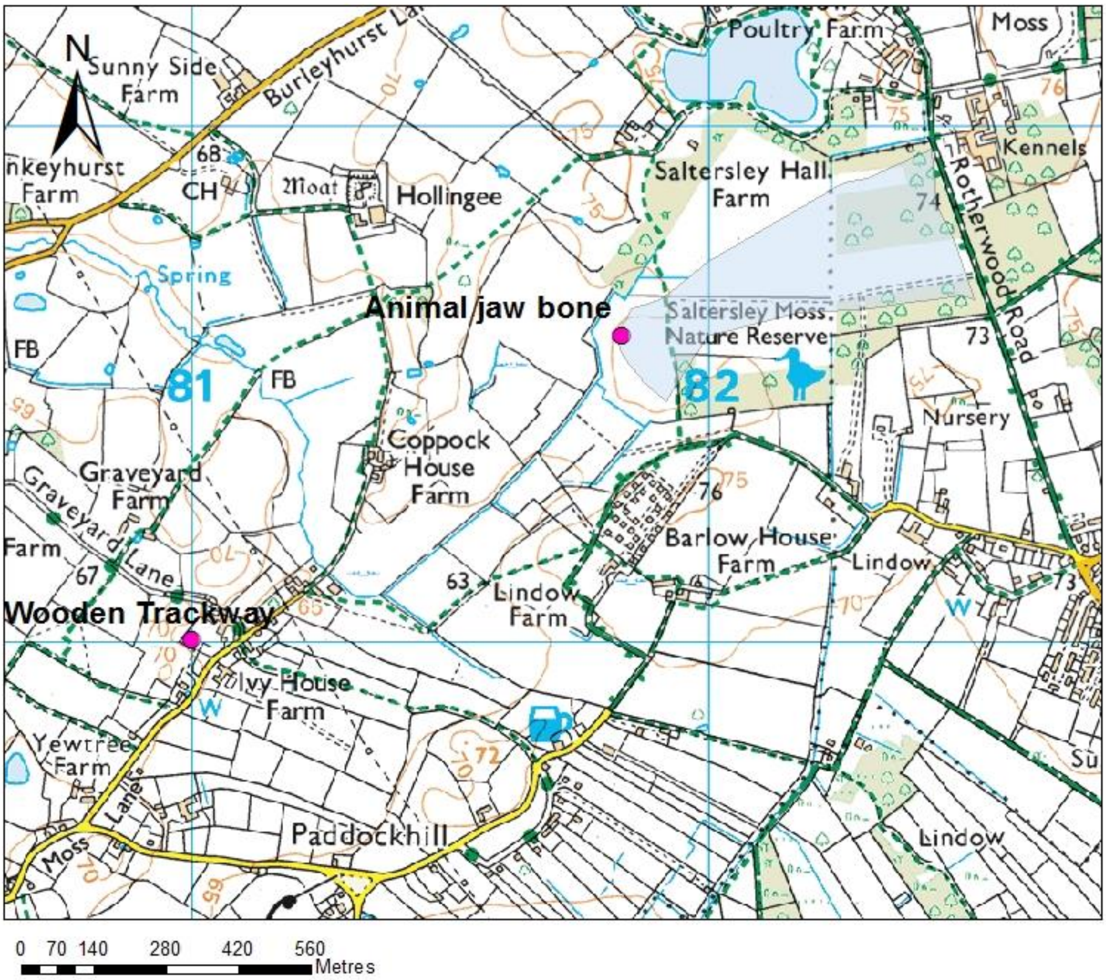


Figure 5.24 Locations of Potential Wooden Trackway and Jawbone Near Lindow Moss

The wooden trackway (SMR 1472/0/2) was reported to run across the length of Lindow Moss. It was discovered by a local man in this area and described in detail (Norbury 1884, 65). The implications of the presence of a wooden trackway suggested accessibility across Lindow Moss was difficult and thus made easier by a wooden trackway. Unfortunately, to date the trackway has not been identified to confirm this early report.

In 1991 a mandible of a *Bos taurus* (SMR 1472/0/1) was discovered at the peat depot on Lindow Moss. Examination of the mandible indicated it was approximately Iron age (500 BC-42 AD), the date was based on its stratigraphy context (Roberts 1991; Stallibrass 1993). There were no signs of butchery, although possible evidence of burning was identified on the outer back edge of the mandible (Roberts 1991).

The wooden trackway and *Bos taurus* were the only other two identified archaeology and artefacts found within a 5km radius of Lindow Moss apart from the bog bodies and iron pin (Stead *et al*. 1986; Turner and Scaife 1995). There was no archaeology surrounding Lindow II for 2km apart from the Lindow bodies and *Bos taurus*. This is an important result because it has shown that Lindow II was placed in a location that was archaeologically barren for 2km around Lindow Moss. This indicates that the location of Lindow Moss was chosen for its remote location away from cultural archaeology.

The distance surrounding Lindow Moss was extended to evaluate cultural archaeology within the wider Cheshire wetlands of nearby Mosses to explore if this wider approach would enhance Lindow II's cultural context as the surrounding archaeology within 5km was scarce. A few interesting sites were identified, Great Woolden hall was a rural Iron age-Romano British farm approximately 19km from Lindow Moss phases III and IV were broadly contemporary with Lindow II (Nevell 1998). It is possible that Lindow II was connected to Great Woolden Hall in some capacity, he may have worked or lived there.

Longley farm (SMR 1984) was another Iron age, British Romano settlement within the Cheshire wetlands that had the potential to be in use during the same period as Lindow II (Longley 1987).

Further afield Eddisbury Hillfort was approximately 28km from Lindow Moss (see chapter 4). The hillfort was still in use and refortified approximately cal AD 10-130 which is contemporary with Lindow II (Garner 2016). Two possible sites have been identified that were within 28km of Lindow Moss that were active during the same period as Lindow II; it is possible that he may have been connected to either or even both sites in some capacity.

Very little cultural archaeology has been identified near Lindow Moss. However, at Risley Moss located approximately 16km from Lindow Moss a 'Bronze cauldron' (SMR 601) was discovered and dated as Roman (Leah et al. 1997, 20; Watkin 1883, 228). The object found at Risley was not a Bronze cauldron but a bronze strainer for wines and herbal infusions (pers. com. J. Farley 2019). These strainers are well known in the north and west from late Iron age Britain and rare (pers. com. J. Farley 2019). The bronze strainer from Risley most likely dates from approximately post AD 43, but dating this object has difficulties (pers. com. J. Farley 2019), although it was possible that the object may have been contemporary with Lindow II. However, the time frame may be narrow to correlate with Lindow II. The uniqueness of the bronze strainer suggests that this perhaps was not an everyday item and even more intriguing was that it was found in Risley Moss under 3.35m of peat (Watkins 1883).

More problematic was the date of the wooden figurine found on Oakhanger Moss 22km from Lindow Moss as it no longer existed, Coles (1993), confirmed it was genuine and it corresponded to the Ballachulish and Ralaghan figures. An approximate date of 500 BC was suggested based on similar figures that had eyes, nose, and mouths which had already been dated (Coles 1993, 19). The wooden figure is not of the same period as Lindow II, but despite this it has provided a little more archaeological context to the surrounding Mosses around Lindow Moss and how they may have had cultural significance, Oakhanger Moss may have been regarded as a special place and used for ritual activities.

5.8 Modelled Pre-Peat Landscape 1st Century AD

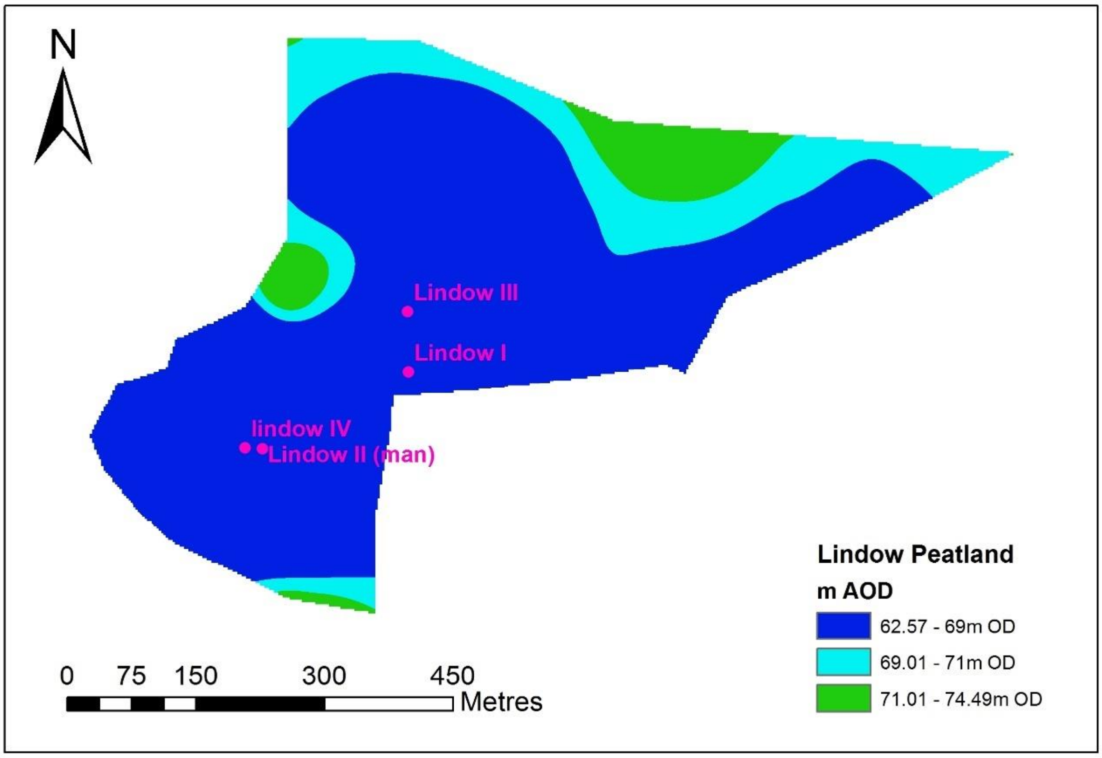
Based on elevations of Lindow II which have been calculated between 69.80m-70m OD (see methodology) and Lindow III minimum elevation was 70.21m OD a hypothetical extent of the peatland in the 1st century AD has been modelled figure 5.25 (below). The edge of the contemporary peatland was shown in the DEM at 69.80-71m OD and represents the extent of peatland at the time Lindow II and Lindow III were placed in the bog.

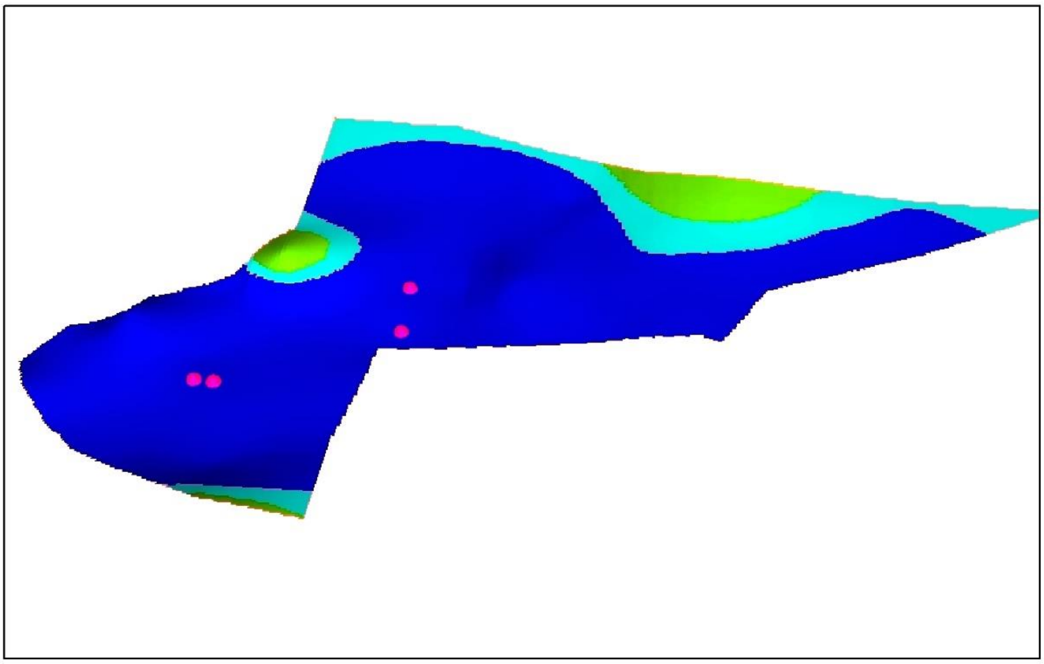
Lindow II (Man) was placed approximately 169m from the southern edge of the peatland and around 164m from the northern edge.

Lindow III was deposited approximately 348m from the northern edge, 288m from the north eastern edge and around 106m from the western edge of the peatland.

Lindow IV was placed approximately 171m from the southern edge of the peatland and around 179m from the northern edge.

Lindow I was deposited around 273m from the southern edge of the peatland, approximately 141m from the western edge and approximately 335m from the north eastern edge.





First Century Peatland 3D vertical exaggeration x 2

Figure 5.25 Peatland Landscape 1st Century AD 69.80m-70m OD Lindow Moss

5.9 Conclusion of Lindow Moss Results

The new information obtained from the results reported in this chapter has identified the development of the hydrosere of Lindow Moss and the shape of the bog basin in relation to the positions of Lindow II within it.

The results of the investigations of transects 1-7 on Lindow Moss have demonstrated the overall landscape development. The stratigraphy of transects 1-7 indicated the general spatial development of the landscape on Lindow Moss was open water marsh of reeds, sedges and fen carr with a transition to acidic bog of *Sphagnum* and *Eriophorum*. The development of the landscape on Lindow Moss was not consistent across the bog, localised differences in succession were identified. For example, the area of transect 1 compared with transects 2-7 was distinct because the peat profiles contained *Phragmites* (reed) and sedges (*Carex* L.). Showing this area developed as open freshwater fen with reeds and sedge. Wood peat (fen carr) and *Sphagnum* were absent in transect 1 and reed and sedge decreased in depth west to east and was concentrated in the deeper area of the bog basin (west) on Lindow Moss.

The stratigraphy of transect 2 showed the landscape was dominated by fen carr (wood peat) and reed (*Phragmites*) in the south east area of Lindow Moss. Wood peat was clustered on the outer eastern edge of the bog at transect 2 and was also more concentrated in the deeper western area of the bog with reeds.

The landscape development on Lindow Moss continued to exhibit fen carr and reed marsh characteristics corresponding across from transect 2, 3, and 4 in the north east section of Lindow bog. Transects 5, 6 and 7 demonstrated a very wet landscape of reed marsh, fen carr, open water, shallow pools and acidic raised bog of *Sphagnum* and *Eriophorum* in the western area of Lindow Moss.

The types of sediment identified at Lindow bog was a little complex. Seven archetype cores were assigned to identify the types of peat encountered in general on Lindow Moss, as the layers of peat were not entirely coherent across the bog. There was no clear differentiation identified between the layers across transects 1-7, variations of peat sequences determined in all the archetype cores demonstrated localised differences in the development of the bog across Lindow Moss.

The nature of the bog landscape and the extent to which it was open freshwater or acidic bog was very variable throughout prehistory. Basal samples of peat have not been radiocarbon dated for the inception of peat formation on Lindow Moss. Based on the depths of peat stratigraphy, pollen analyses of NWWS core Lin8 and pollen analyses by Birks (1965), they indicate the deepest deposits of peat date to the early Flandrian period (Leah *et al.* 1997). Also, in terms of location distinct fluctuations of development have been demonstrated. The landscape development was probably controlled by minor variations in ground water, topography and rainfall.

Transects 1-7 have shown formation of the bog landscape. Distinctive episodes of the hydrosere development across Lindow Moss have been Identified. For example, the profile of transect 5 in the area of core T4c7 contained sediments of marls, clays, silts and fine degraded mud. These indicated three sequences of open water, pools or potential flooding in the western area.

Finely degraded muds were classified in transect 4 profiles in cores T3c3, T3c4 and T3c7. The positions of cores T4c3, T4c4, T4c7 and T5c7 which also contained sediments of degraded muds running across east to west along the deepest and central area of Lindow Moss. This suggested through the centre of the bog, east to west open water, shallow pools flooded and accumulated in this area.

This kettle hole bog facilitated fluctuating water levels, episodes of flooding and open pools that influenced variations in bog landscape development on Lindow Moss have been identified. The presence of charcoal in the stratigraphy of transect 4 cores T3c1, T3c6, transect 1 cores T1c2, T1c3 and transect 7 core T5c3 have provided evidence of burning on Lindow Moss which may have been due to natural causes of fire or anthropogenic activities. Around 3970-3640 cal BC (HAR-8875) anthropogenic burning was identified on the sand island on Lindow Moss, charcoal was seen in the peat stratigraphy across Lindow Moss and it is difficult to establish if these represent anthropogenic burning on the sand island or natural fire too (Leah *et al.* 1997).

New knowledge about the shape of the bog basin has been realised and provides new data which has shown that Lindow bog bodies were deposited in the central part of the bog basin furthest away from edges of their contemporary peatland. This result is very significant. The centre of the bog landscape would have been difficult to access on Lindow Moss and poses potential implications to consider in relation to the placement of bodies. Archaeology surrounding Lindow II was very meagre indeed. The implications of the results from Lindow Moss are discussed further in chapter 7.

CHAPTER 6 RESULTS BJÆLDSKOVDAL BOG

6.1 Introduction

The aim of this chapter is to investigate the wider landscape archaeology of Tollund Man following the objectives and methodologies stated in chapters 1 and 4. Tollund Man was deposited in Bjældskovdal bog, Denmark, in the same bog Elling Woman and an unexcavated body were also deposited.

This chapter is structured in the same way as chapter 5 Lindow results. In section 6.2 the general peat types of peats across Bjældskovdal bog are described and in section 6.3 the bog landscape is identified from the stratigraphy.

Section 6.4 is a description of the transect profiles, which defines the peat stratigraphy of each transect and classifies the general development of the landscape in that area of the bog. Section 6.5 is an examination of the differences in the stratigraphy between transects 1-3. Sediments in all transects were examined for variations and similarities.

This is followed by section 6.6, the reconstruction of the bog basin, and Tollund Man is positioned within the bog basin. It is followed then by, section 6.7, where the radiocarbon dates from core T1c2, T1c15 and T3c15 are described. Section 6.8 describes the artefacts found on Bjældskovdal bog. Additionally, in section 6.9 the archaeological finds within 5km of Bjældskovdal bog are examined spatially. Finally, chapter 6.10 concludes with an evaluation of the new knowledge gained from the results.

The general peat types are below, and the study site is shown in figure 6.1 below.

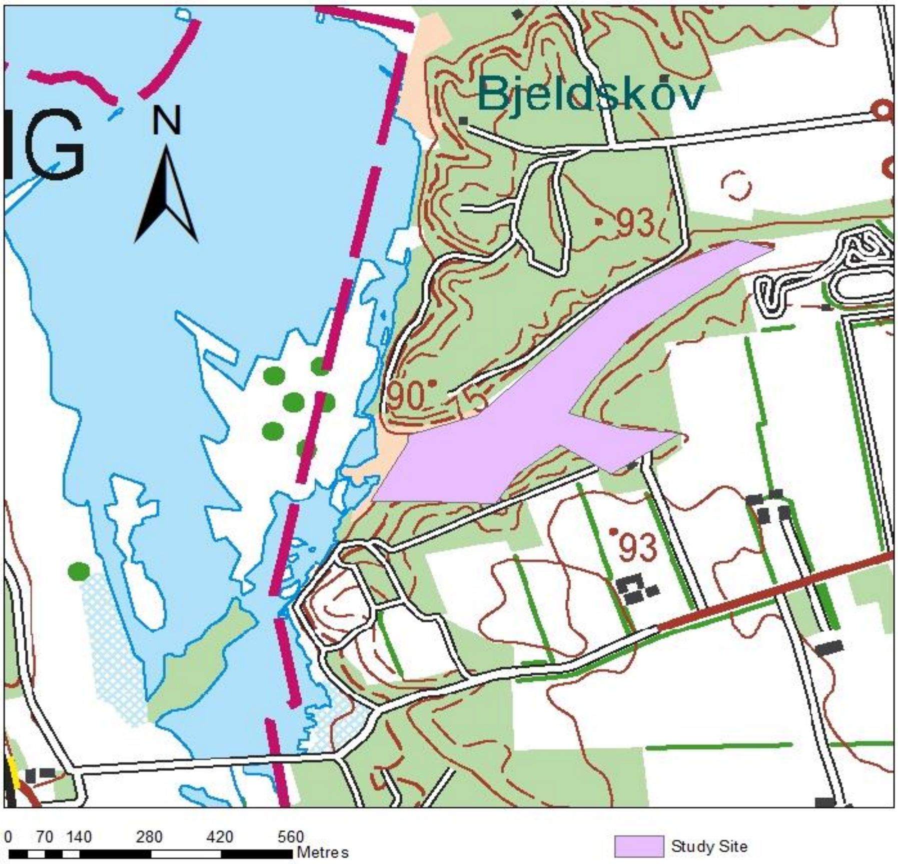


Figure 6.1 Study Site: Bjældskovdal bog, situated in the Bølling Lake system

6.2 General Peat Types on Bjældskovdal Bog

The general sediments identified on Bjældskovdal bog from the profiles contained in the borehole survey are reported below. To represent all the peats on Bjældskovdal bog, eight archetype cores were assigned to demonstrate the variations and enable the description of mire development. These were selected on the basis of representing all peat types on Bjældskovdal bog. An archetype core is in this case an example of a sample of peat stratigraphy found on Bjældskovdal bog. The archetype cores are: T1c1, T1c5, T1c9, T2c5, T3c3, T3c5, T3c6, T3c15. The map below shows their locations on the study site in (figure 6.2). The diagram below (figure 6.3) shows the materials present in T1c1.

Figure 6.2 Map of Transects on Bjældskovdal Bog

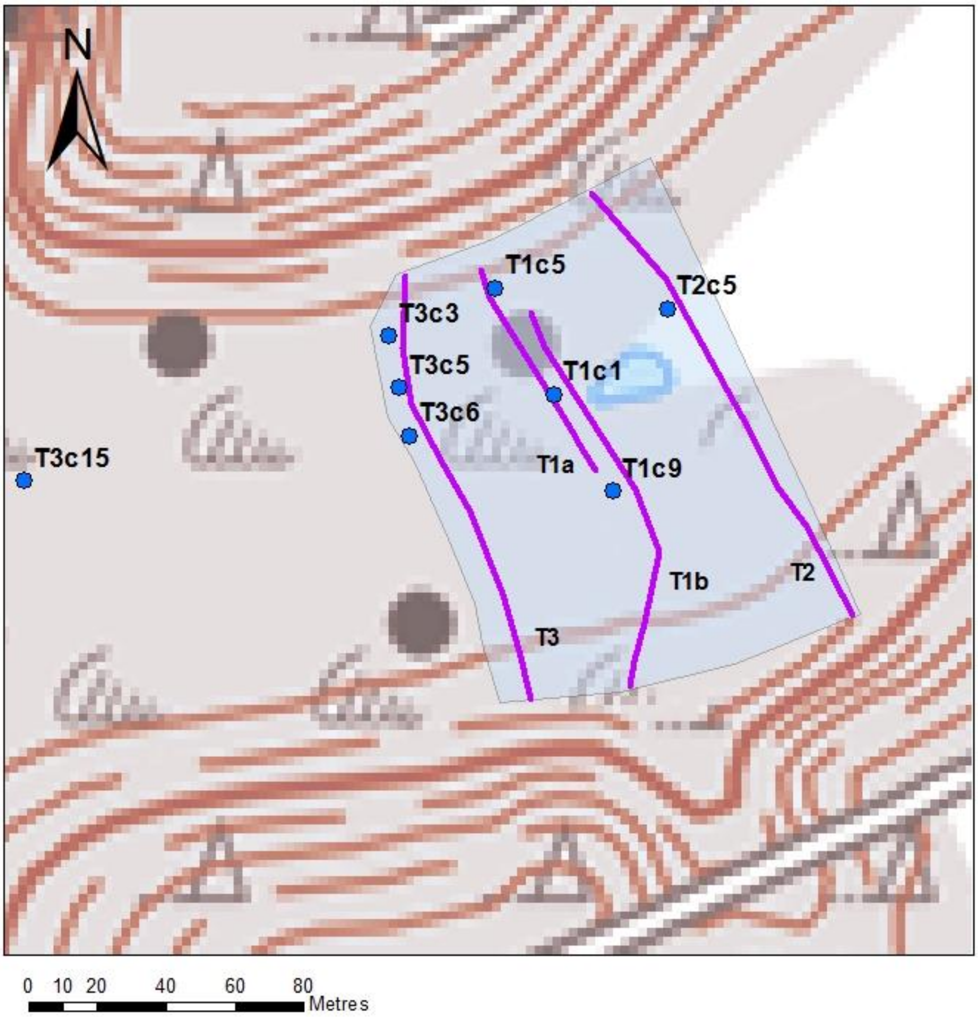


Figure 6.3 Locations of Archetype Cores

6.2.1 Stratigraphy of Core T1c1

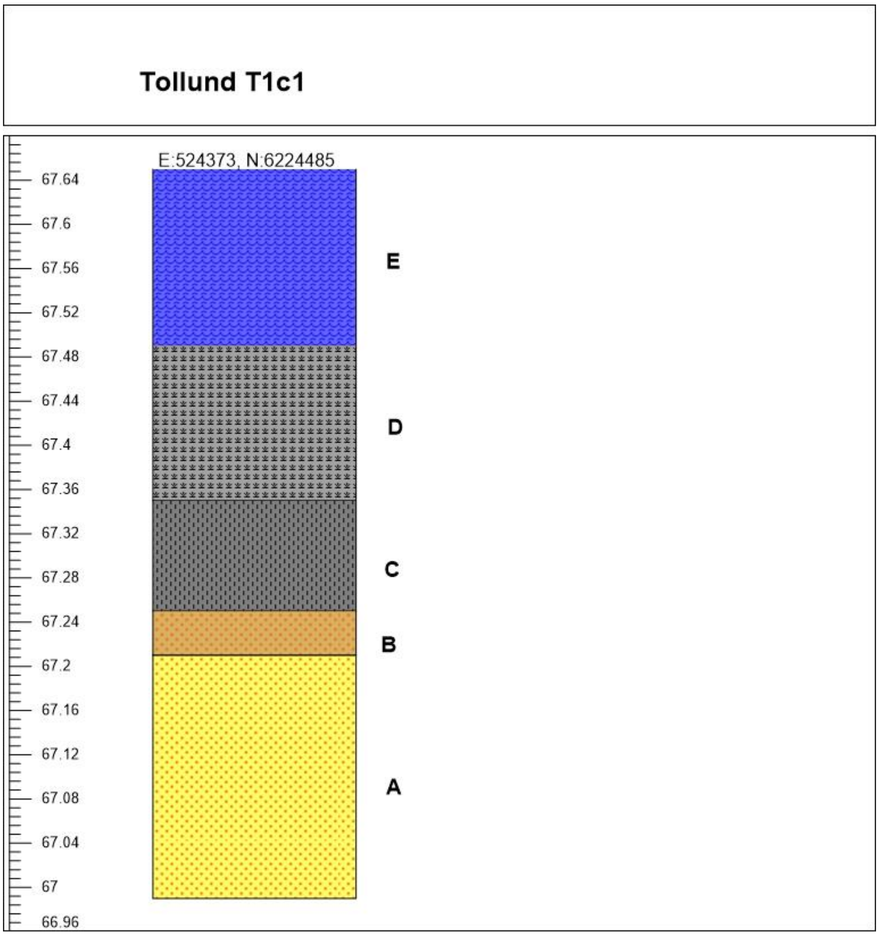


Figure 6.4 Core T1c1 showing stratigraphy

The general stratigraphy of T1c1 is described and presented below, units are A – E and start at the base of the core progressing upwards. The peat units are measured in metres OD preceded by a description of the material.

- 67.21 – 66.99m OD Unit A was organic stained medium coarse sand.
- 67.25 – 67.21m OD Unit B medium sand in humified peat matrix.
- 67.35 – 67.25m OD Unit C comprised of well humified loose black silty peat.
- 67.49 – 67.35m OD Unit D consisted of sedge rich peat of *Carex* L. that was well humified.

- 67.65 – 67.49m OD Unit E water

The materials contained in core T1c1 (above) showed the general development in this area of Bjældskovdal bog landscape which was initially very wet with open freshwater marsh with pools of sedges.

The diagram below (figure 6.4) shows the second archetype core of T1c5 which identifies some variations on peat stratigraphy at the study site.

6.2.2 Stratigraphy of Core T1c5

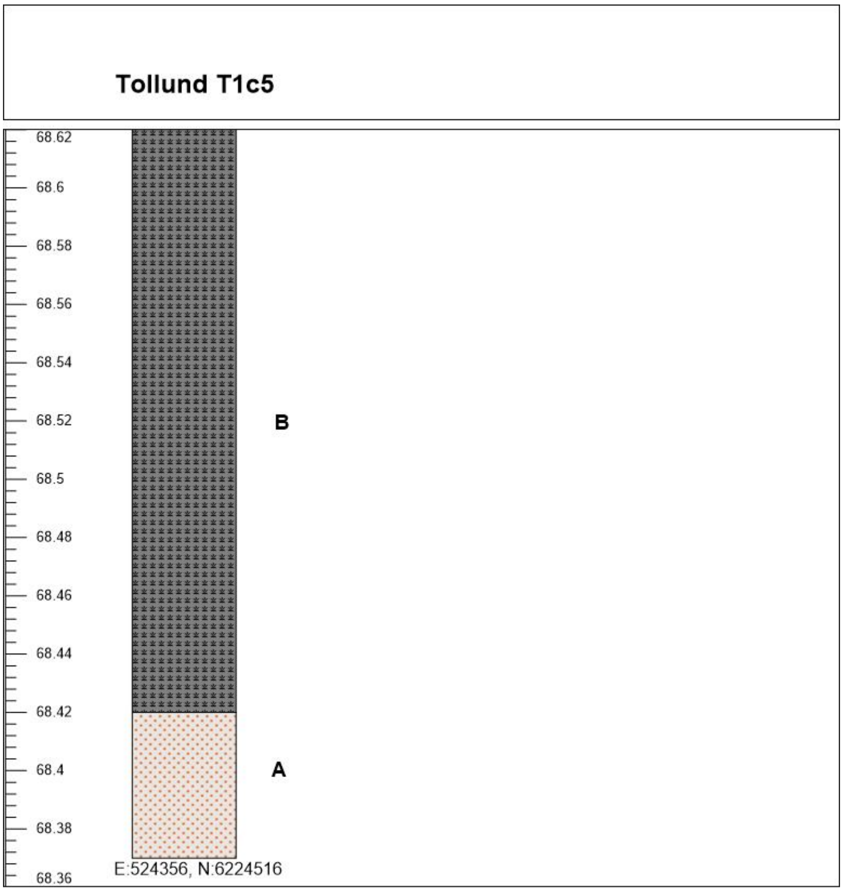


Figure 6.5 Core T1c5 showing stratigraphy

The materials contained in T1c5 are presented and described. Units are A – B and depths of peat are recorded in metres OD.

- 68.42 – 68.37m OD Unit A was black stained medium grey sand.
- 68.62 – 68.42m OD Unit B consisted of black humified reed peat of common *Phragmites australis* (Cav.)

The peat profile of core T1c5 indicated the landscape development in this area was very wet freshwater reed marsh with open water and minerotrophic conditions.

The diagram below figure 6.5 presents the third archetype core to represent peat stratigraphy observed on Bjældskovdal bog in core T1c9.

6.2.3 Stratigraphy of Core T1c9

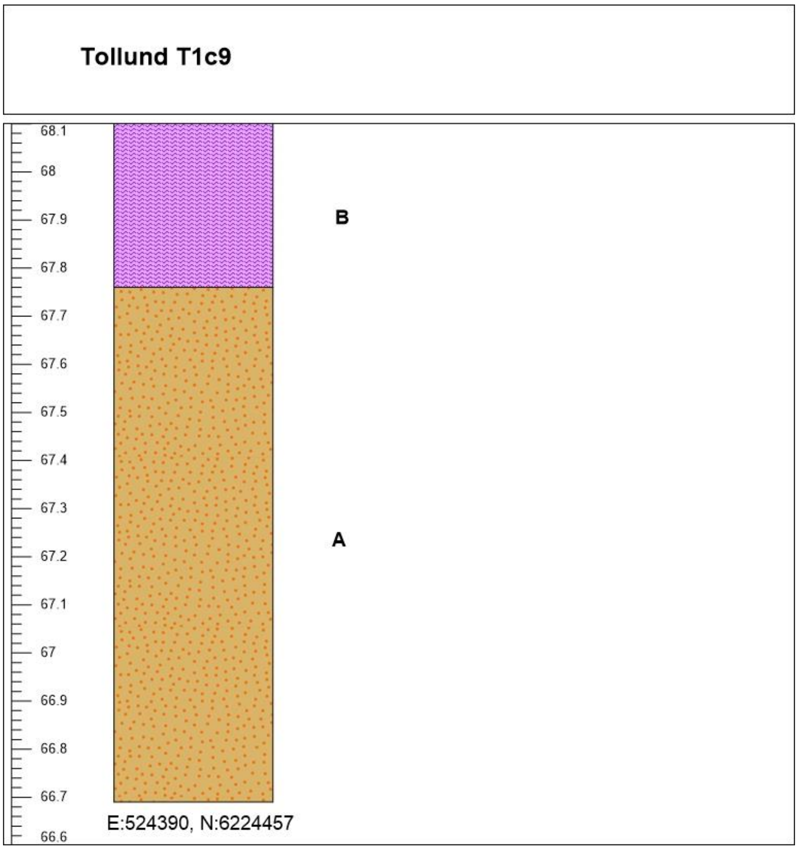


Figure 6.6 Core T1c9 showing stratigraphy

The stratigraphic units contained in T1c9 are explained and presented; depths of materials are measured in metres OD and units are A – B.

- 67.76 – 66.69m OD Unit A comprised brown organic stained medium coarse sand.
- 68.1 – 67.76m OD Unit B consisted of heather rich peat.

The materials contained in core T1c9 show the development of the bog landscape in this location was patches of heather peat which indicated acidic bog with oligotrophic conditions which overlies sand.

The diagram figure 6.6 below presents the fourth archetype core T2c5.

6.2.4 Stratigraphy of Core T2c5

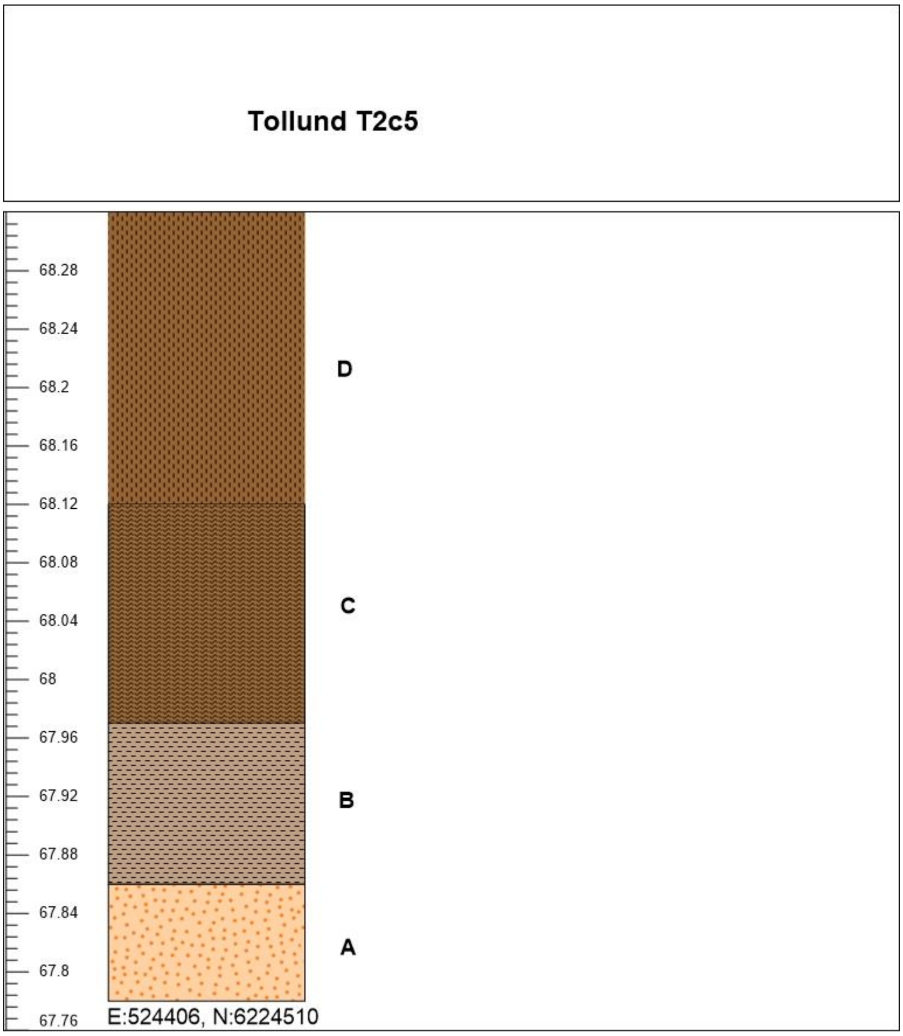


Figure 6.7 Core T2c5 showing stratigraphy

The peat profile of core T2c5 from transect 2 is described in units A – D.

- 67.86 – 67.78m OD Unit A was formed of orange medium coarse sand.
- 67.97 – 67.86m OD Unit B consisted of well humified black peat.
- 68.12 – 67.97m OD Unit C was a *Sphagnum* rich peat.
- 68.32 – 68.12m OD Unit D comprised of modern peat.

The materials contained in core T2c5 signify the development of the bog landscape in the area of transect 2 was open water and shallow pools with slow growing acidic bog of *Sphagnum* moss. Unit A indicates the formation of modern peat as the upper core deposit. Subsequently, this demonstrates how very little peat stratigraphy remains and has been lost due to peat cutting on Bjældskovdal bog.

The following diagram below figure 6.7 presents the fifth archetype core T3c3.

6.2.5 Stratigraphy of Core T3c3

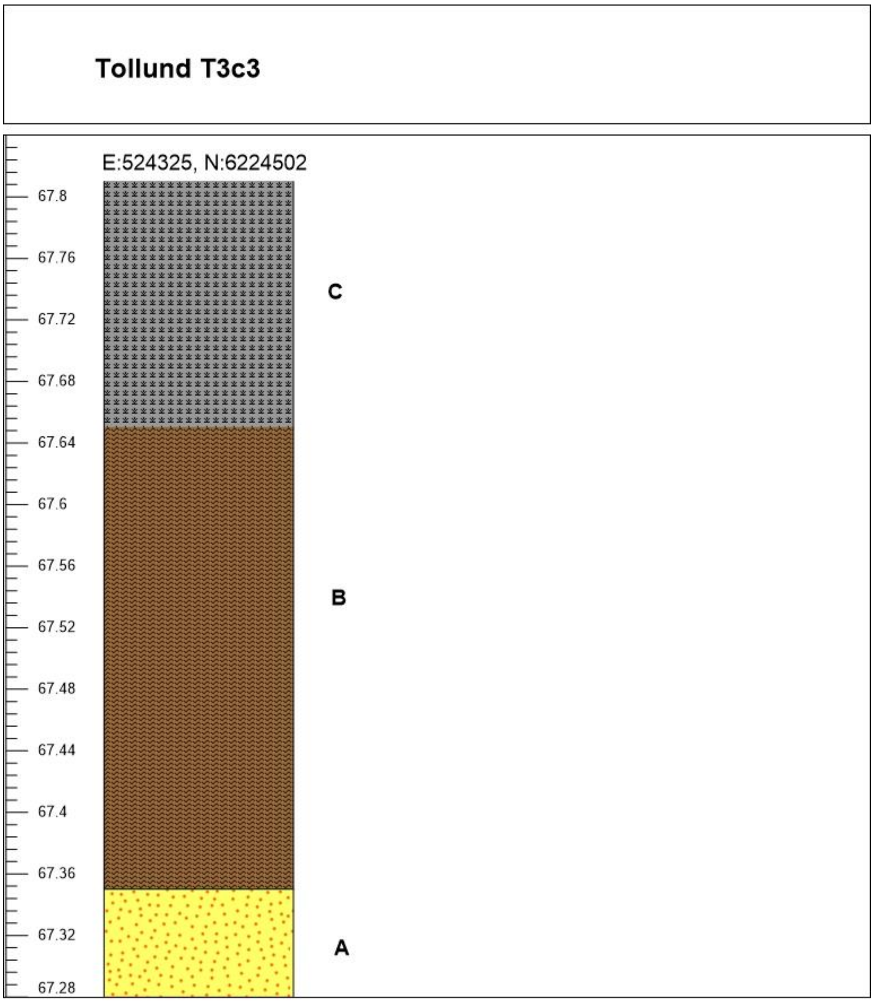


Figure 6.8 Core T3c3 showing stratigraphy

The materials contained in core T3c3 are described in units A – C.

- 67.35 – 67.28m OD Unit A comprised of medium coarse sand.
- 67.65 – 67.35m OD Unit B was very well preserved *Sphagnum* peat*.*
- 67.81 – 67.65m OD Unit C consisted of common reed, peat of (*Phragmites australis*.)

The unit description of core T3c3 has shown in this area of transect 3 the landscape formed as a *Sphagnum* bog with open water and shallow pools with oligotrophic environmental conditions. This was followed by a wetter sequence of open water demonstrated by reed peat and a potential transition to minerotrophic conditions.

The diagram below figure 6.8 shows the materials observed in the sixth archetype core T3c5.

6.2.6 Stratigraphy of Core T3c5

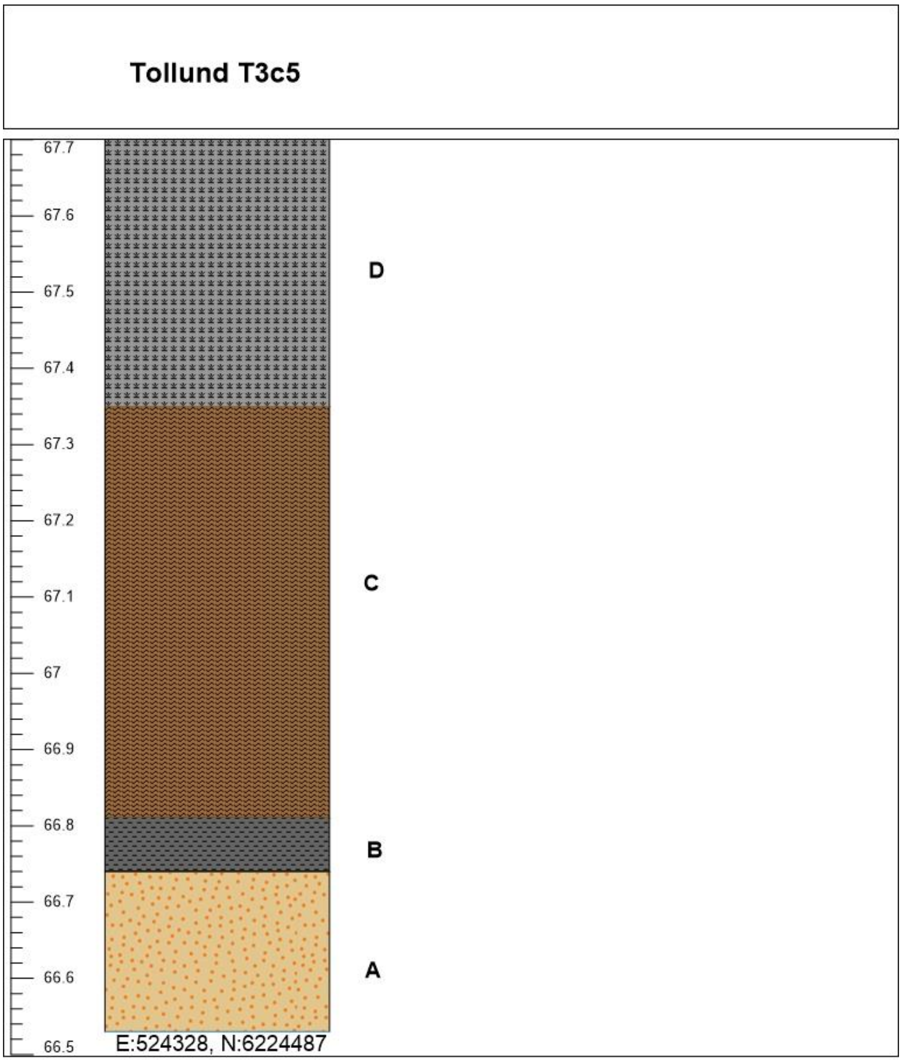


Figure 6.9 Core T3c5 showing stratigraphy

The peat profile of core T3c5 is described in units A – D.

- 66.74 – 66.53m OD Unit A consisted of medium coarse light brown sand.
- 66.81 – 66.74m OD Unit B was *Eriophorum* rich peat at the top of the unit graduating to a loose silty black peat at the base.
- 67.35 – 66.81m OD Unit C consisted of well humified dark brown *Sphagnum* peat.

- 67.7 – 67.35m OD Unit D comprised of reed peat of *Phragmites australis*.

The peat stratigraphy of core T3c5 indicates that in this area of transect 3, the development of the bog landscape began as shallow pools with hummocks of *Eriophorum* indicating oligotrophic conditions. The landscape became wetter with open water, and shallow pools of *Sphagnum* moss. A rise in the water table is signified by reed peat which suggests open water marsh of reeds and a transition to minerotrophic conditions. The following diagram presents the seventh archetype core T3c6 in figure 6.10

6.2.7 Stratigraphy of Core T3c6

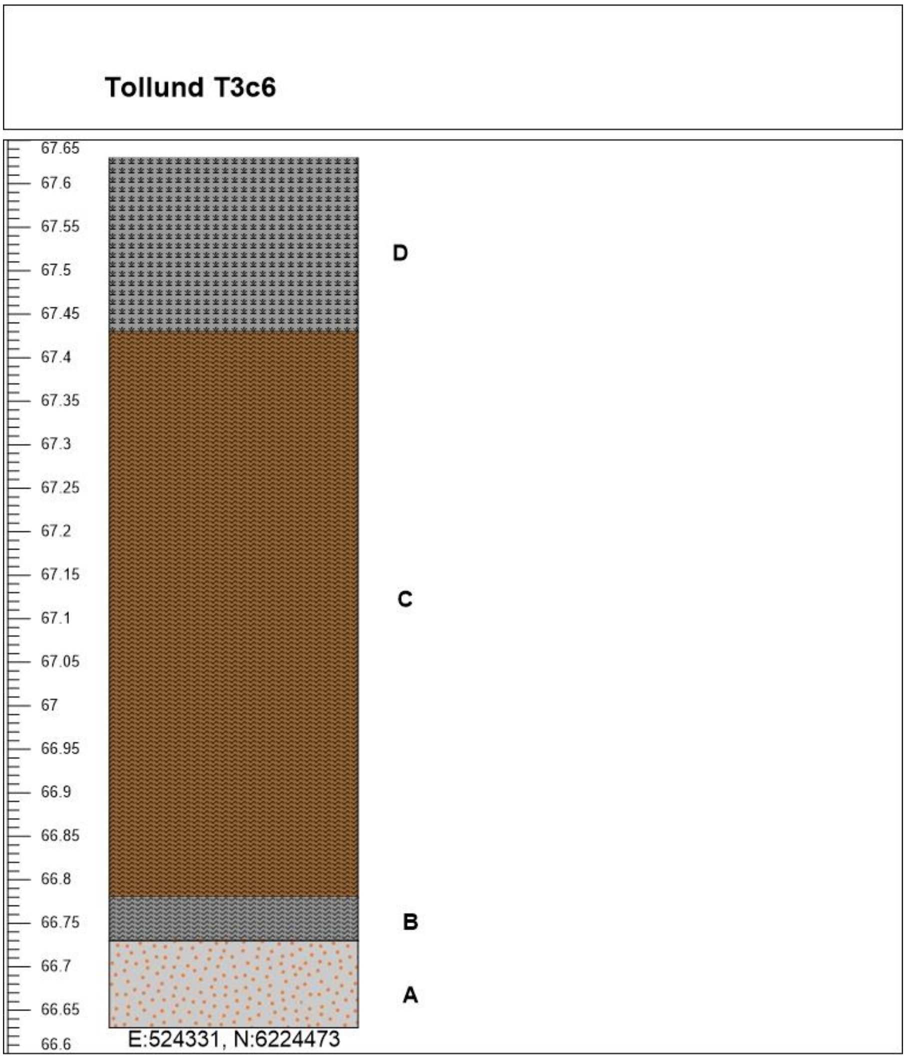


Figure 6.10 Core T3c6 showing stratigraphy

The materials in core T3c6 are described below in units A – D.

- 66.73 – 66.63m OD Unit A was medium coarse grey sand.
- 66.78 – 66.73m OD Unit B comprised of loose black humified silty *Sphagnum* peat.
- 67.43 – 66.78m OD Unit C consisted of *Sphagnum* peat.
- 67.63 – 67.43m OD Unit D was modern sedge peat.

The peat profile of core T3c6 has shown that in this area of transect 3, sand covers the basin and the development of the landscape of Bjældskovdal bog in this area was open water and shallow pools with raised bog features of *Sphagnum*. The upper deposit of modern sedge peat demonstrates that the majority of relic peat stratigraphy has been lost to peat cutting. Subsequently, modern sedge indicates more recent landscape development of open water of freshwater fen.

The diagram below figure 6.10 shows the eighth archetype core T3c15 to represent the stratigraphy on Bjældskovdal bog.

6.2.8 Stratigraphy of Core T3c15

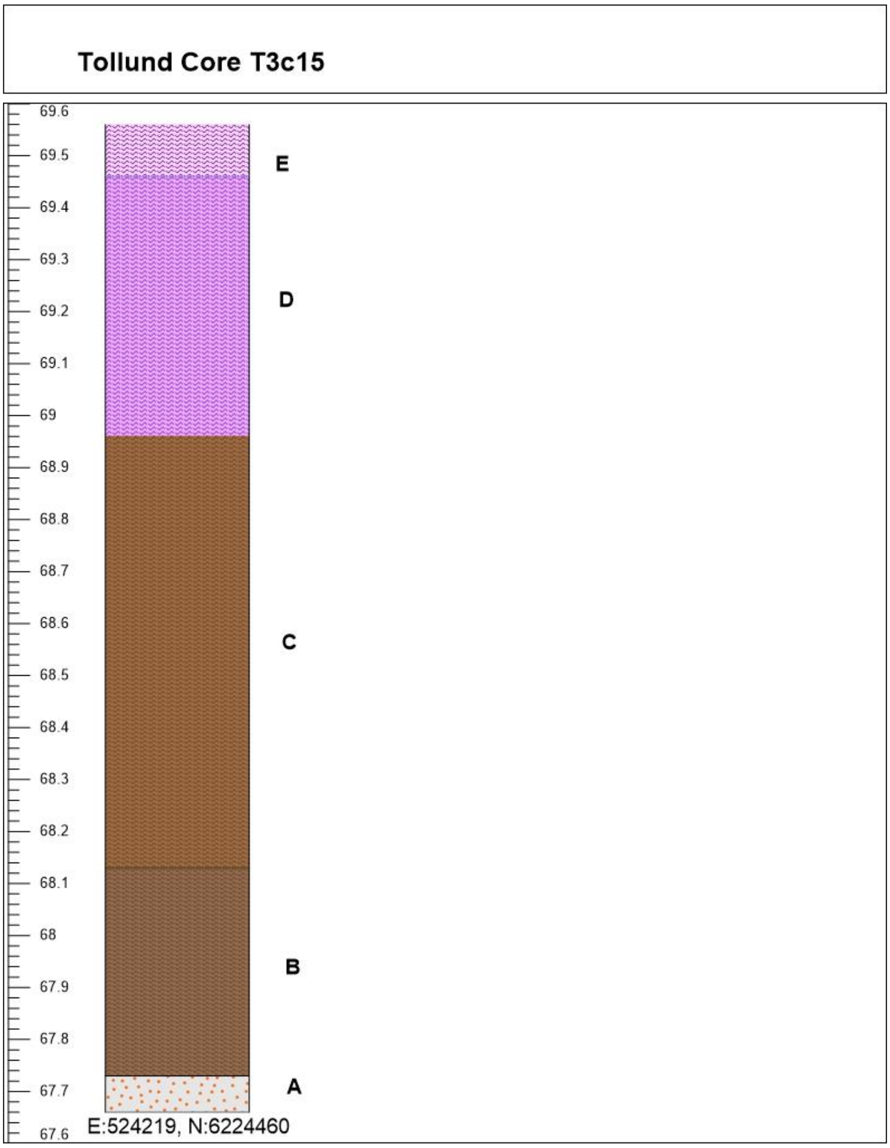


Figure 6.11 Core T3c15 showing stratigraphy

The peat profile of core T3c15 is described in units A – D.

- 67.73 – 67.66m OD Unit A consisted of medium grey sand.
- 68.13 – 67.73m OD Unit B was *Sphagnum* in black humified peat matrix becoming blacker and loose silty at the base.
- 68.96 – 68.13m OD Unit C comprised of well-preserved *Sphagnum* peat.

- 69.46 – 68.96m OD Unit D consisted of humified dried out heather peat.
- 69.56 – 69.46m OD Unit E was modern heather growth

The peat stratigraphy of T3c15 has demonstrated in this area, sand overlies the basin, the development of the landscape of Bjældskovdal bog was open water, with shallow pools of an acidic bog of *Sphagnum* moss. Peat inception was around 3636-3504 cal BC, 3428-3381 cal BC (UBA-32485) during the development of *Sphagnum* bog. This was followed by formation of heather peat which demonstrated drier acidic oligotrophic conditions continued in this area. The upper unit of heather was modern growth which demonstrated older peat profiles have been lost to extensive peat cutting of the bog. Samples of peat were taken for radiocarbon analysis from this core.

6. 3 Bog Landscape

The intention of this section is to outline the general formation of the bog landscape on Bjældskovdal bog from the results of the core archetypes above. The core archetypes have demonstrated that in those areas of Bjældskovdal bog that sand overlies the bog basin. The general landscape has developed as an acidic bog of *Sphagnum* and *Eriophorum* with open water and shallow pools demonstrating oligotrophic environmental conditions, indicated by the peat stratigraphy of cores T2c5, T3c3, T3c5, T3c6 and T3c15.

A freshwater marsh of open water with areas of sedge and reeds was demonstrated in the areas by cores T1c1 and T1c5 around the northern edge of the bog. In this area minerotrophic peat developed under very wet groundwater conditions.

Generally, this was followed by formation of modern reed and sedge peats in cores T3c3, T3c5, T3c6 and T2c5. This demonstrated a shift to freshwater probably influenced by drainage of this area of the bog and modern growth of reeds and sedges as the Bølling Lake system has been restored and is directly linked to Bjældskovdal bog (Nielsen *et al.* 2018, 1533-1534). Fen peat most likely developed under topographical conditions after the restoration of the Bølling Lake system. Although evidence of acidic *Sphagnum* and *Eriophorum* bog have probably been removed by the cutting of peat. At core T3c15 modern heather peat demonstrated drier landscape conditions that were acidic and an oligotrophic environment at this location. Core T3c15 was situated on a relict peat baulk in the west of Bjældskovdal bog with elevations of 69.56 – 69.46m.

On Bjældskovdal bog localised variations in the formation of the bog landscape development have been identified. However, with the areas of freshwater reed and sedge landscape at cores T1c1 and T1c5 it is possible these may have manifested from modern development of the landscape rather than from prehistory, from redeposited peats and restoration of the Bølling Lake System. The differences identified in development of the bog landscape were probably influenced by topography, ground water, extensive peat cutting, regeneration of the Bølling Lake system and rainfall.

The peat profiles have demonstrated the general development of the hydrosere on Bjældskovdal bog. Despite the loss of relict peat to peat cutting activities it has enabled comparisons with previous research undertaken on raised bogs presented in chapters 1 and 8.

6.4 Transect Profiles

This section will describe the nature of the deposits in transects 1-3. These are described individually and afterwards, the general development of the landscape in that area is outlined. Units of sediments which run coherently across the transect are identified by a line and labelled, with the intention of showing how each sediment is associated to another in the transect. Sequential identification of peat layers in cores classify the general development of the bog landscape in those areas of Bjældskovdal bog. The base of bog topography is described. This is followed by, examination of the differences across all transects to distinguish how they change across the study site. The diagram below figure 6.12 shows the locations of the three transects carried out on Bjældskovdal bog. The diagram of each transect shows the distance between each core. There are four transects on Bjældskovdal bog.

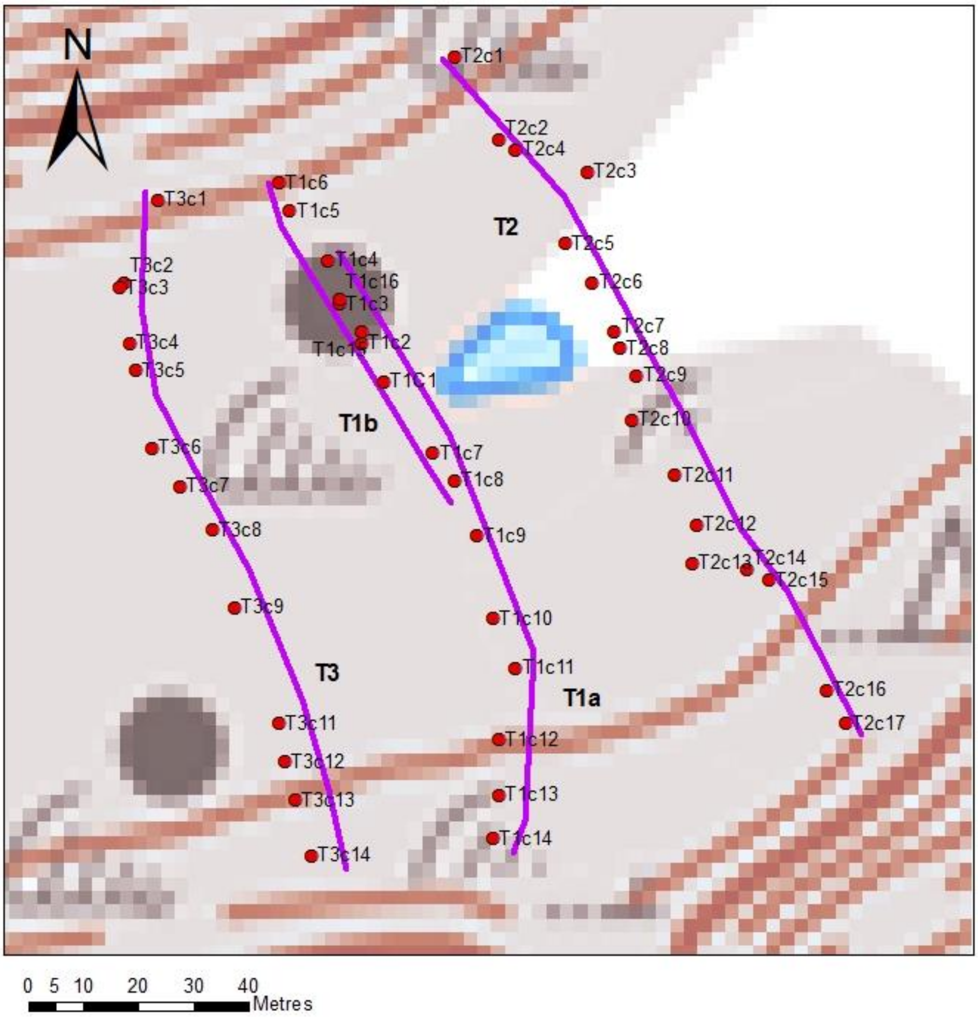


Figure 6.12 Locations of transects and cores.

6.4.1 Transect 1a

The peat profile and depths of materials are shown in the diagram below in figure 6.13, and the location of transect 1a is illustrated in figure 6.12. Consistent units of peat identified across the cores are marked with a line, labelled and explained. The distance between each core is stated on the transect diagram. Transect 1a comprised of cores: T1c4, T1c16, T1c3, T1c15 T1c9, T1c10, T1c11, T1c12, T1c13, T1c14.

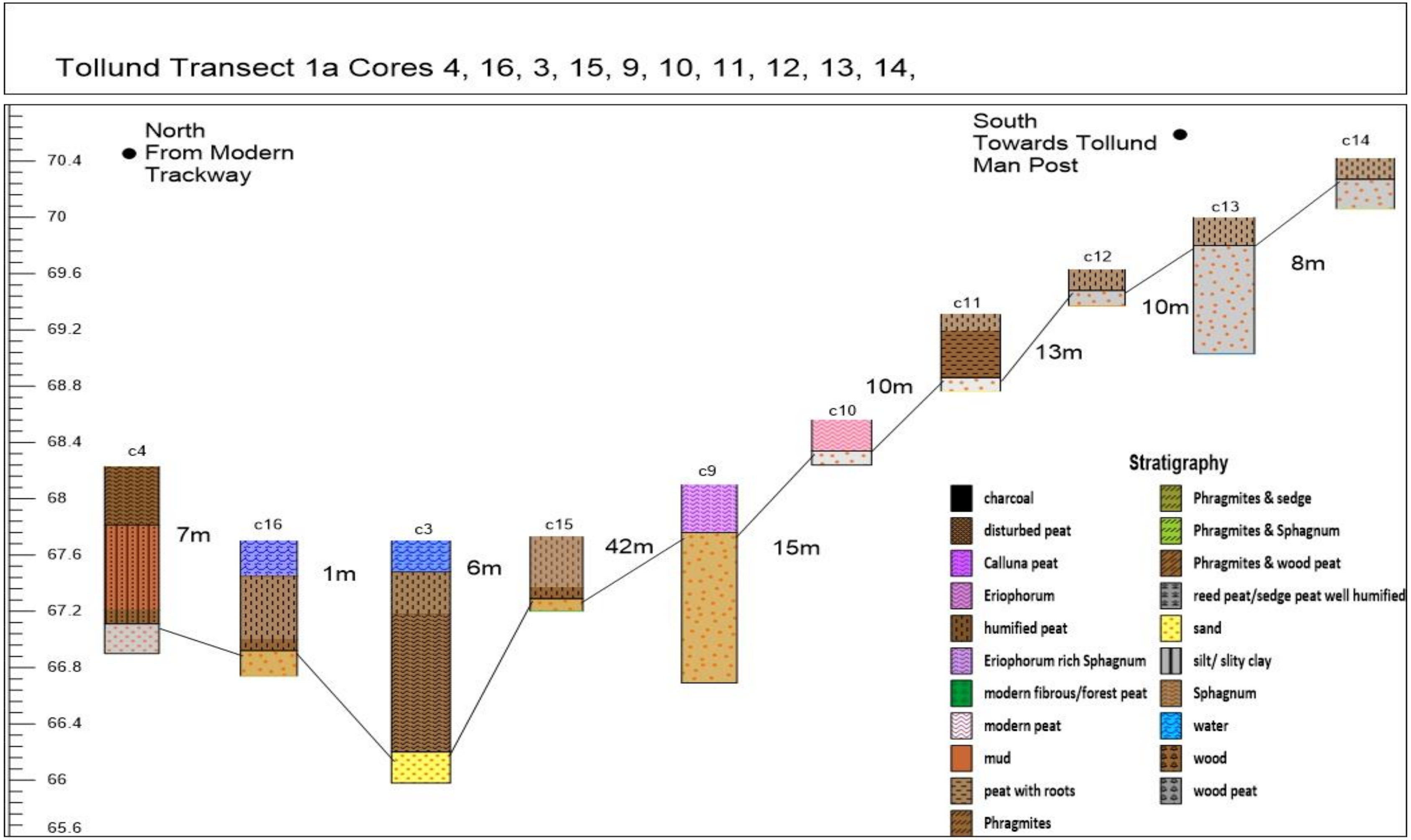


Figure 6.13 Transect 1a core stratigraphy

1. In transect 1a organic deposits in all cores overlie sand.
2. *Sphagnum* peat dominated transect 1a, core T1c4 contained 0.42m of *Sphagnum* which was truncated by a wet loose matrix of silty peat (0.60m). A further deposit of *Sphagnum* was classified in core T1c3 (0.98m).
3. Cores T1c14, T1c13, T1c12 contained upper deposits of root peat ranging from 0.15m – 0.20m.
4. Black humified peat was identified in cores T1c16 (0.08m) and core T1c15
5. Sediments of loose matrix peat and modern soil, modern forest peat and modern peat comprised of (0.40m) in core T1c15, (0.45m) in T1c16 and T1c11 and 0.30m in core T1c3.
6. Heather rich peat 0.34m depth which was situated as the bog topography rises.
7. Peat with bilberry bush roots were deposited in core T1c10 (0.22m).

The deepest peats in transect 1a were contained in core T1c3 which terminated organics at 1.5m depth. The second deepest peats were recorded at T1c4 measuring 1.12m depth. The shallowest peats were contained in cores T1c12 and T1c14 at 0.15m. The basin of the bog from core T1c4 to T1c3 declines by 0.91m, and from core T1c3 to T1c14 the base of the bog rises significantly by 4.07m.

6.4.2 Summary of Transect 1a

It was established from the sediments in the two deepest cores T1c4 and T1c3 that they contained layers of *Sphagnum* peat which indicated the formation of the landscape in this area of transect 1a was open water, shallow pools of *Sphagnum* moss. Acidic landscape conditions continued and was shown by sediments of heather in core T1c9 which determined local variations in development of the hydrosere, in this area it was slightly drier and generally the bog development in this area was an oligotrophic environment. As bog topography elevated in the south of transect 1a cores T1c12, T1c13 and T1c14 consisted of very little peat, and was root peat, modern sediments ranging from 0.15m to 0.20m depth. Subsequently, cores T1c11 and T1c10 comprised of upper modern peats ranging from 0.12m to 0.20m depth. Modern peat formed the upper most layer in core T1c3 overlying *Sphagnum*. It is evident from the peat profiles of transect 1a most of the peat has been lost as a result of peat cutting, modern sediments and peats have formed in the upper deposits of the peat stratigraphy. Consequently, the information obtained has not been extensive and has not enabled a detailed hydrosere to be determined on Bjældskovdal bog in the area of transect 1a.

The information gained from transect 1a has established new knowledge of the hydrosere in this area of Bjældskovdal bog and predominantly the shape of the bog basin.

6.4.3 Transect 1b

The materials and depths of units are presented and described and shown in the diagram below, figure 6.13. The location of transect 1b at the study site is shown in the diagram below, figure 6.11. Consistent materials identified running across transect 1b are indicated with a line, labelled and explained. The distance between each core is stated on the transect diagram. Transect 1b contained six cores, T1c6, T1c5, T1c2, T1c7, T1c8.

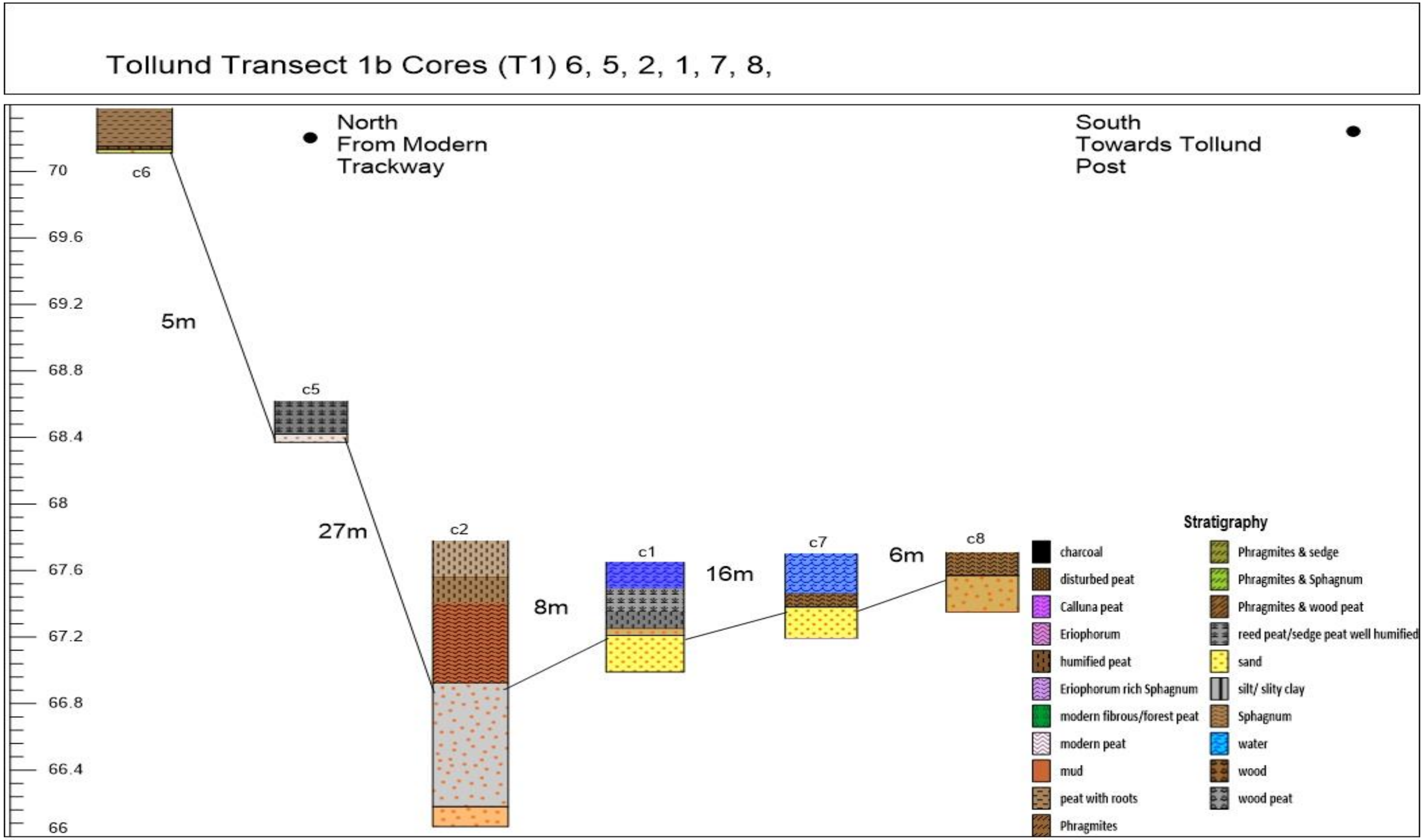


Figure 6.14 Transect 1b stratigraphy

1. Sand which underlies the basin; the organic materials in transect 1b overlie sand.
2. *Sphagnum* peat the profiles of cores T1c7(0.08m) and T1c8 (0.34m) contained basal layers of *Sphagnum*; in T1c8 the *Sphagnum* was in a loose silty matrix. In contrast, *Sphagnum* contained in core T1c7 had an upper layer. *Sphagnum* peat deposits in transect 1a were mainly in the southern area. A deposit of *Sphagnum* peat was also present in core T1c2, this was not a consistent unit; it was probably the same unit as T1c7 and T1c8. The peat record has been removed by sustained peat cutting of the area and as a result a consistent unit of *Sphagnum* peat cannot be identified.
3. Sedge peat was present in core T1c1 (0.14m) truncated by 0.04m of black silty peat.
4. Reed peat was contained in core T1c5 (0.20m) which was situated on the elevated edge of transect 1b.
5. Modern peat formed an upper deposit of core T1c2 and T1c6, which was on the outer edge of transect 1b.

The deepest peats were 1.6m contained in core T1c2. The shallowest peats were recorded in T1c7 which comprised of 0.08m of organics. The bog basin from core T1c6 to T1c2 dropped steeply by 3.95m, from T1c2 to T1c8 the base of bog topography elevated by 1.19m.

6.4.4 Summary of Transect 1b

The new information obtained from the peat profile of transect 1b in general showed the landscape in the area developed as acidic bog of *Sphagnum* with open water and shallow pools and an oligotrophic environment. On the outer northern edge of transect 1b formation of the bog landscape was reed marsh that indicated an area that was probably freshwater and minerotrophic in this area.

In the centre of the bog in the area of core T1c2 it was demonstrated that the landscape developed as wet acidic raised bog with *Sphagnum* moss which continued intermittently along transect 1b (T1c7 and T1c8). Sedge peat in core T1c1 indicated very wet conditions and open water. Although, the sedge peat may be modern peat which has developed after substantial loss of relict peat. Subsequently, due to peat cutting on Bjældskovdal bog the peat profiles of transect 1b were short and modern sediments have been classified in T1c2, T1c6 and T1c7 as upper layers.

The topography of the bog basin has been determined in this area. The base of the bog is more elevated in the north and declined steeply downwards by 3.95m. Subsequently, it started to rise from T1c2 to T1c8 by 1.19m. The materials contained in the boreholes carried out by Troels Smith (1952) do not correlate with the peat stratigraphy of transect 1b.

The new data gained from the stratigraphy of transect 1b has provided a general outline of the development of the landscape in this area. The hydrosere developed as wet acidic bog in the centre of the bog, with open water and shallow pools. On the edge of the bog there was an area that developed as reed marsh. The depths of peats were very short and demonstrated that much of the relict peat has been cut away and no longer survives. Furthermore, new knowledge of the pre–peat landscape has been established from the base of organics and has revealed that from the northern edge of transect 1b, the bog drops steeply then rises in the middle of this transect.

6.4.5 Transect 2

The materials and depths of units in transect 2 are presented and described and shown in the diagram below figure 6.14. The location of transect 2 is shown in figure 6.11. There were seventeen cores in transect 2: T2c1, T2c2, T2c3, T2c4, T2c5, T2c6, T2c7, T2c8, T2c9, T2c10, T2c11, T2c12, T2c13, T2c14, T2c15, T2c16, T2c17.

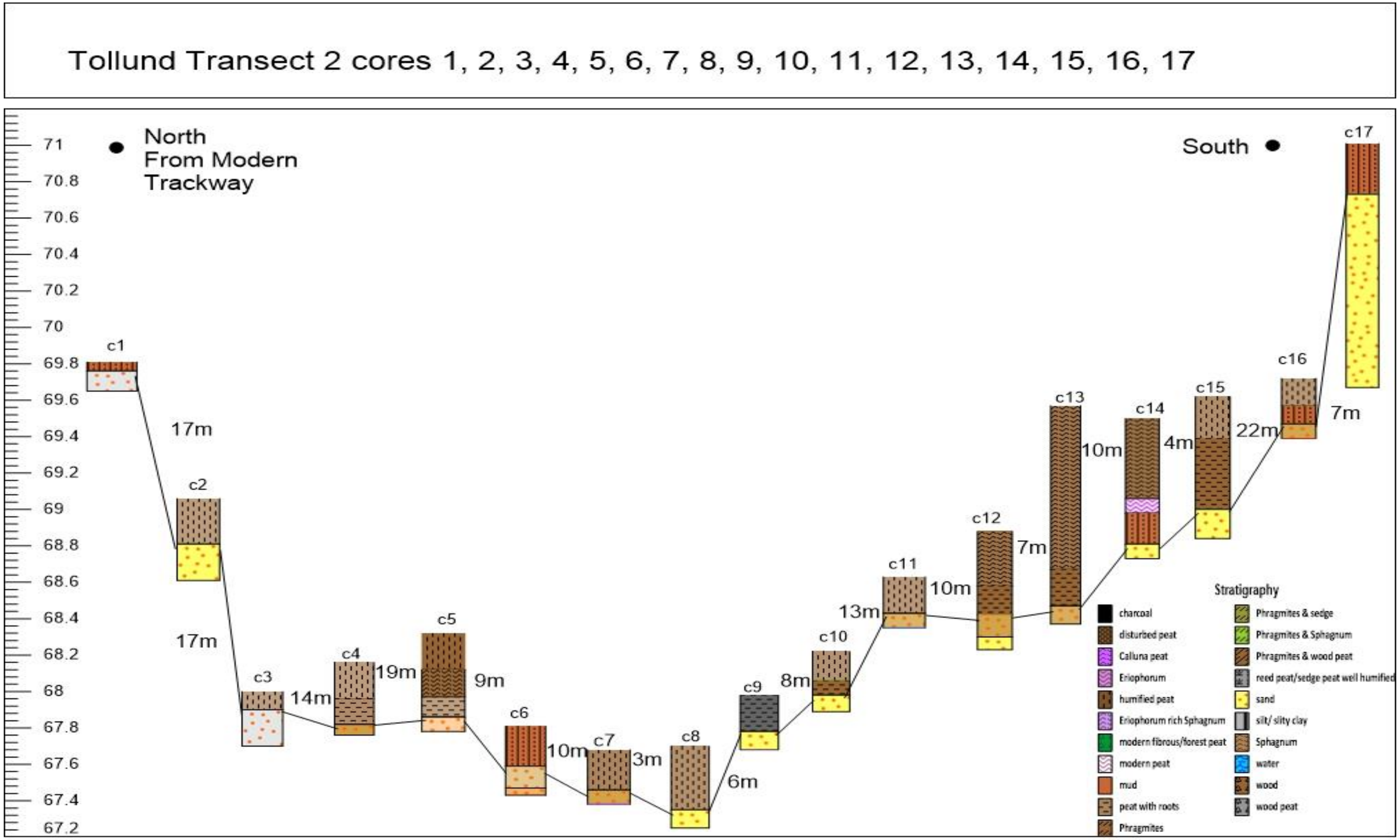


Figure 6.15 Transect 2 stratigraphy

1. Sand which runs coherently across all cores and underlies the basin. Situated north near the modern trackway, core T2c1 consisted of sandy peat (0.05m) on the outer edge.
2. Modern sediments dominated transect 2 from north to south and were classified in cores T2c2 (0.25m), T2c3 (0.10m), T2c4 (0.2m), T2c5 (0.20m), T2c10 (0.16m), T2c11 (0.20m), T2c15 (0.23m), and T2c16 (0.15m). The peat profiles of T2c7 contained 0.22m of modern Jancus rush, core T2c8 comprised of 0.35m, these were in the deepest area of the bog basin.
3. Modern *Sphagnum* peat comprised an upper layer in core T2c12 (0.30m) towards the edge. Units of *Sphagnum* were identified in cores T2c5 (0.15m), T2c13 (0.9m) and T2c14 (0.30m).
4. *Sphagnum* mixed with *Eriophorum* peat was contained in core T2c14 (0.11m).

The deepest peats in transect 2 were contained in core T2c13 at 1.1m. The shallowest peats were identified in core T2c1 which consisted of 0.05m depth of organics. The bog basin topography in the area of transect 2 was determined. The bog basin from T2c1 to T2c3 declined downwards by 1.86m, from T2c3 to T2c5 declined by 0.04m. A further drop in bog topography of 0.51m was determined from T2c5 to T2c8. The basin of the bog started to rise by 1.08m from T2c8 to T2c11 and continued to elevate on the southern edge of transect 2 by 2.3m from T2c11 to T2c17.

6.4.6 Summary of Transect 2

The general landscape in this area of transect 2 developed as an acidic raised bog of *Sphagnum* moss. This was demonstrated on the lower area of the bog basin at core T2c5. Open water, shallow pools and acidic bog of *Sphagnum* were identified on the outer southern edge of the bog basin as it elevated upwards at core T2c13. This continued towards the outer southern edge at core T2c14 which consisted of *Sphagnum* and *Eriophorum* mixed peat which indicated in this area the water table fluctuated and was slightly drier. The upper deposit of core T2c14 comprised of *Sphagnum* which showed a continued development of open water, shallow pools with acidic raised bog characteristics and fluctuating water levels. In this area the bog developed influenced by oligotrophic environmental conditions. Fluctuation of water levels was probably influenced by topography, ground water supply and paludification.

The stratigraphy of transect 2 was dominated by modern sediments which highlight the severity of peat cutting on the bog as very little relic peat remained to examine. Modern *Juncus* (rush) was present in the profiles of cores T2c7 and T2c8 and showed that in the central area of the bog, the modern landscape was probably freshwater marsh with open water, with shallow pools in some areas. Furthermore, core T2c12 on the outer southern edge demonstrated modern acidic raised bog characteristics of *Sphagnum* with open water, shallow pools.

The bog basin was elevated in the north and declines by 1.86m south, from T2c3 to T2c5 the basin continued to decline by 0.04m. Subsequently, the base of the bog declined downwards by a further 0.51m and from T2c8 elevated by 2.3m to T2c17 in the southern edge of the bog. The profile of the bog basin in the zone of transect 2 corresponds to a water channel feature of the landscape. Furthermore, the shape of the bog basin suggested that Bjældskovdal bog was a valley type bog.

Despite the stratigraphy of transect 2 being depleted of peats they suggested the landscape was a far wetter marsh, of acidic raised bog with open water, shallow pools, hummocks and hollows landscape than the profiles of Troels Smith's (1952) cores. Additionally, the results of chapter 6 and Troels Smith's cores (1952) have both identified localised variations in the landscape development on Bjældskovdal bog.

A general formation of the hydrosere and the underlying bog basin in this section of Bjældskovdal bog has been established from the peat stratigraphy of transect 2.

6.4.7 Transect 3

The peat stratigraphy and depth of units are presented and described below in figure 6.15. The location of transect 3 is shown on the map in figure 6.11. Materials that run across cores coherently are indicated by a line and labelled (figure 6.19). There are thirteen cores in transect 3: T3c1, T3c2, T3c3, T3c4, T3c5, T3c6, T3c7, T3c8, T3c9, T3c11, T3c12, T3c13, T3c14.

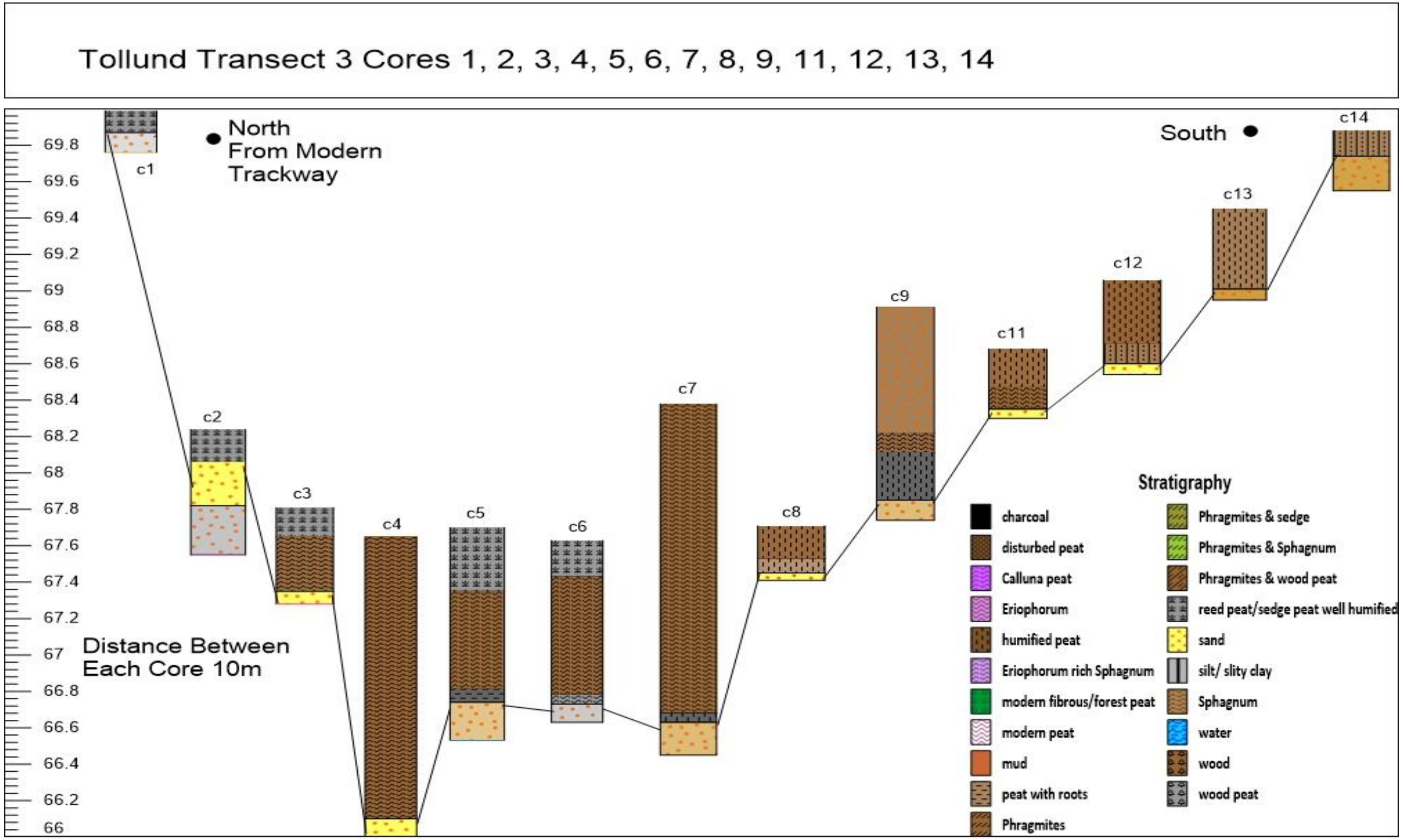


Figure 6.16 Transect 3 Stratigraphy

1. Sand runs across all cores in transect 3 and underlies the basin.
2. Modern reed mat which was classified running across cores from north of the modern trackway to south in T3c1 (0.12m), T3c2 (0.18m) and T3c3 (0.16m).
3. *Sphagnum* peat was in cores T3c3 (0.3m), T3c4 (0.55m), T3c6 (0.65m), T3c7 (1.7m). In core T3c5 the layer of *Sphagnum* was mixed with an upper lens of *Eriophorum* in a loose silty matrix truncated by black peat 0.07m. A further deposit of *Sphagnum* was present in the profile of core T3c11 (0.12m). The profile of core T3c6 (0.05m) contained a lower layer of black humified silty *Sphagnum* peat which was followed by an upper deposit of *Sphagnum*. Units of *Sphagnum* peat were present in core T3c9 profile which consisted of an upper deposit of sand and organic material (0.69m), succeeded by 0.11m of silty *Sphagnum* peat. In transect 3 *Sphagnum* peat is fairly concentrated from the northern edge to the middle of the transect.
4. Silty peat was classified in T3c8 (0.08m) and T3c9 (0.26m) which contained significant amounts of sand in the matrix. Core T3c9 profile consisted of an upper deposit of sand and organic material (0.69m), succeeded by 0.11m of silty *Sphagnum* peat which represented disturbance of sediments from water run off or increase in water level.
5. Humified sandy soil, peaty soil comprised upper layers of the peat in cores T3c11 (0.21), T3c12 (0.35), T3c13 (0.44m) and T3c14 (0.14m). These were situated on the outer edge south in transect 3. Core T3c6 comprised of an upper layer of modern sedge (0.20m).

The deepest peats were classified in T3c7 which was positioned in the middle of the bog with the base of organics terminating at 1.75m. The shallowest peats were established in T3c1 with base of organics at 0.12m at the northern edge of the bog. The bog basin declines downwards by 3.77m from T3c1 to T3c4, the base of the bog rises from T3c4 to T3c7 by 0.53m. The base of bog topography from T3c7 to T3c14 elevates steeply by 3.11m.

6.4.8 Summary of Transect 3

The data obtained from the stratigraphy of transect 3 has provided new information about the general landscape development on Bjældskovdal bog. Modern reed mat and peaty soils formed significant stratigraphy in transect 3. However, in the area of transect 3, units of *Sphagnum* peat dominated the peat profiles. The sediments in cores T3c3, T3c4, T3c5, T3c6, T3c7 and T3c11 have demonstrated the hydrosere developed as an acidic bog of *Sphagnum* moss with open water and shallow pools demonstrating an oligotrophic environmental conditions in this area. These features were concentrated in the lowest part of the bog topography, in the middle of the bog and progressed across to southern edge.

A fluctuation in the water table was identified in core T3c5 with a sequence determined by an upper deposit of *Eriophorum* mixed with *Sphagnum*. The predominance of modern reed peat, peaty soils and sedge peat indicated that relic peats have diminished as a result of extensive peat cutting and the formation of modern peats demonstrated more recent landscape development in this area of transect 3 was probably freshwater marsh with open water and pools with minerotrophic conditions.

At the bottom of the southern edge of transect 3 core T3c9 stratigraphy suggested that there was localised water run off down the slope into the centre of the bog or flooding from the Bølling lake system, as core T3c9 comprised of 0.69m of sand mixed with organics.

The shape of the underlying bog basin has been established. The northern edge of the bog basin is elevated and drops steeply by 3.77m from T3c1 to T3c4; the basin elevates by 0.53m from T3c4 to T3c7. Subsequently, the base of bog topography rises sharply from T3c7 to T3c14 by 3.11m. The shape of the bog basin profile parallels a channel or valley feature in the landscape.

6.5 Bog Formation on Bjældskovdal Bog

It was established by the profiles of transects 1a, 1b, 2 and 3 that development of the landscape began as acidic bog of *Sphagnum* which dominated the stratigraphy across Bjældskovdal bog north to south and was more concentrated and deeper in the centre. On the northern edge and centre of transect 1a, formation of the bog landscape was acidic *Sphagnum* bog of open water and shallow pools with oligotrophic environmental conditions. The southern lower edge of transect 1a, heather peat demonstrated acidic landscape conditions continued and was drier in this area.

The northern edge of the bog basin around transect 1b, showed that the landscape developed as freshwater reed marsh. Around the central deeper area of the bog basin of transect 1b, the landscape formed mainly as an acidic *Sphagnum* bog across to the southern edge. The formation of the bog landscape in the area of transect 2 continued to develop as an acidic *Sphagnum* bog from the lower area of the bog basin across towards the southern edge. A mixed peat matrix of *Eriophorum* and *Sphagnum* demonstrated fluctuating water levels in this area at core T2c14.

From the middle of transect 3 and across to the southern edge of the bog basin the landscape began as an acidic *Sphagnum* bog. A mixed peat of *Sphagnum* and *Eriophorum* at core T3c5 indicated varying water levels around this area of Bjældskovdal bog. On the southern edge of the basin in transect 3, cores T3c11 (0.12m), T3c9 (0.11m) and in the centre at core T3c6 (0.05m) comprised of units of silty *Sphagnum*. Silty *Sphagnum* deposits were not identified in transect 1a, 1b and 2 stratigraphy. Silty *Sphagnum* suggested that there was an increase in water in this area causing redeposited sediments. Water inundation mixed sand and with *Sphagnum* moss that formed a silty *Sphagnum* layer. The deepest layer of silty *Sphagnum* was T3c11 (0.12m). The two deepest units of *Sphagnum* were contained in the centre of the bog in cores T3c7 (1.7m) and T1c3 (0.98m).

Formation of the landscape on Bjældskovdal bog began predominately as acidic *Sphagnum* bog with oligotrophic conditions. This was generally followed by development of modern reed peats and sedge peats across the bog that represented modern landscape formation which seemed to indicate freshwater marsh now prevails. This was probably facilitated by the restoration of the Bølling Lake complex (Nielsen *et al.* 2018).

Distinct differences of sediments were identified in transect 2 and 3 which were not contained in the stratigraphy of transects 1a and 1b. This sediment was mixed

Sphagnum and *Eriophorum* peat were identified in core T2c14 (0.11m) on the southern outer edge of transect 2 and T3c5 (0.54m) which was in the middle of the bog at transect 3. Furthermore, mixed *Sphagnum* and *Eriophorum* peat indicated the water table fluctuated and the landscape became slightly less wet. Another difference classified was in transect 1a which consisted of a unit of heather peat in core T1c9 (0.34m) situated in the middle of the bog. This suggested in the middle of the bog in the area of transect 1a there was a patch of landscape that was a dry hummock of heather and acidic landscape conditions continued.

The profile of transect 1b was distinct as it contained one unit of reed peat in T1c5 (0.20m) on the northern edge of the bog and one unit of sedge peat in T1c1 (0.14m). Reed and sedge indicate very wet conditions and that open water and shallow pools were present on the northern edge of the bog. These sediments were not identified in the stratigraphy of transects 1a, 2 and 3.

Lower deposits of black humified peat were present in T1c16 (0.08m), T1c15 (0.08m), T1c6 (0.02m), T1c1 (0.04m) T2c4 (0.14m), T2c5 (0.11m), T2c13 (0.20m) and T3c5 (0.26m) and were concentrated in the northern central area of the deepest part of the bog basin, apart from T3c9, T1c11 and T2c13 which were on the southern edge. Consequently, the concentration of humified black peats in the deepest part of the bog indicating representation of the bottom of a pool can be seen in all transects.

Unpublished borehole data from fieldwork carried out in 1952 by Troels Smith was evaluated and related to the peat stratigraphy of transects 1a-3 on Bjældskovdal bog.

Transect 1a - The new information obtained from the stratigraphy of transect 1a was compared to peat samples taken by Troels Smith (1952) as part of pollen analysis of the area surrounding the findspot of Tollund Man. Troels Smith (1952) examined profiles of four cores.

The profile of core A (Troels Smith 1952) indicated some distance away from Tollund Man, the landscape developed as an acidic bog with a fluctuating water table demonstrated by silty *Eriophorum*. This was followed afterwards by black *Eriophorum* and heather peat indicating a slightly drier phase in bog landscape development.

The landscape development indicated by core B (Troels Smith 1952) suggested in this area of Bjældskovdal bog the landscape began as an acidic bog with *Eriophorum* and heather peat. This is significant because it indicates the surrounding area where Tollund Man was deposited had a fluctuating water table and patches of landscape may have been potentially easier to access.

Moreover, Troels Smith's (1952) findings paralleled the results of this chapter and have shown that the landscape development on Bjældskovdal bog developed with localised variations in the landscape and formation of the bog landscape was mainly acidic bog. Cores A and B contained upper deposits of modern sediment (Troels Smith 1952). Consequently, in 1952 it was apparent from the core stratigraphy of A and B that significant amounts of relic peat had already diminished as a result of peat cutting.

In **transect 1a** core T1c9 was comparable to Troels Smith's (1952) profiles of core A and B.

Transect 1b - According to the stratigraphy of Troels Smith's cores the sediments show no similarity to the results of transect 1b.

Transect 2 - The peat stratigraphy of the boreholes undertaken by Troels Smith (1952) show similarities with the materials contained in transect 2. Core T2c14 showed the landscape developed as acidic bog with *Sphagnum* and *Eriophorum* at the southern edge of the bog basin.

Transect 3 - The peat profiles of transect 3 do not correspond with the cores taken by Troels Smith (1952). No heather peat was identified in transect 3 and very little *Eriophorum* was present in stratigraphy, which suggested from the peat stratigraphy of transect 3 that it was far wetter in this area of Bjældskovdal bog. Although, at transect 3 the development of the bog landscape was predominately acidic *Sphagnum* bog.

The maximum depths of surviving peats were classified in transect 3 T3c7 (1.75m) nearest the Bølling lake system in the east of the bog. Transect 1b core T1c2 (1.6m) consisted of the second deepest peats, transect 1a T1c5 contained 1.5m and transect 2 T2c13 was 1.1m depth. The minimum depths of surviving peats were identified in transect 2 T2c1 at 0.05m, followed by transect 1b T1c7 (0.08m). The shallowest peats at the study area ranged from 0.05m to 0.15m.

A potential flooding episode from the Bølling Lake system or localised run off from the top of the southern edge was classified in transect 3 core T3c9 which consisted of 0.69m of sand and organic material.

The stratigraphy of transects 1a, 1b, 2 and 3 have shown the development of the landscape was not consistent. Small differences across the transects have been identified and localised variations of the hydrosere were classified. Localised differences of landscape development were probably influenced by rainfall, topography, anthropogenic activity and ground water.

6.6 Reconstruction of the Underlying Bog Basin

The intention in this section is to reconstruct the shape of the underlying bog basin obtained from the new data from the results of the borehole survey on Bjældskovdal bog. The maps below show the locations of the transects in figure 6.17 and cores on Bjældskovdal bog in figure 6.18. The underlying shape of the bog basin has been reconstructed and presented as a DEM (figure 6.19). The DEM shows the base of the bog basin and is described. The shape of the bog basin and the locations of the bodies are examined in relation to the edge of the peatland below shown in figures 6.21 and 6.22. The diagram of figure 6.18 and the DEM figure 6.20 shows the locations of transects and cores to give context to the description of the reconstruction of the underlying bog basin.

Figure 6.17 Location of Transects 1-3 on Bjældskovdal Bog

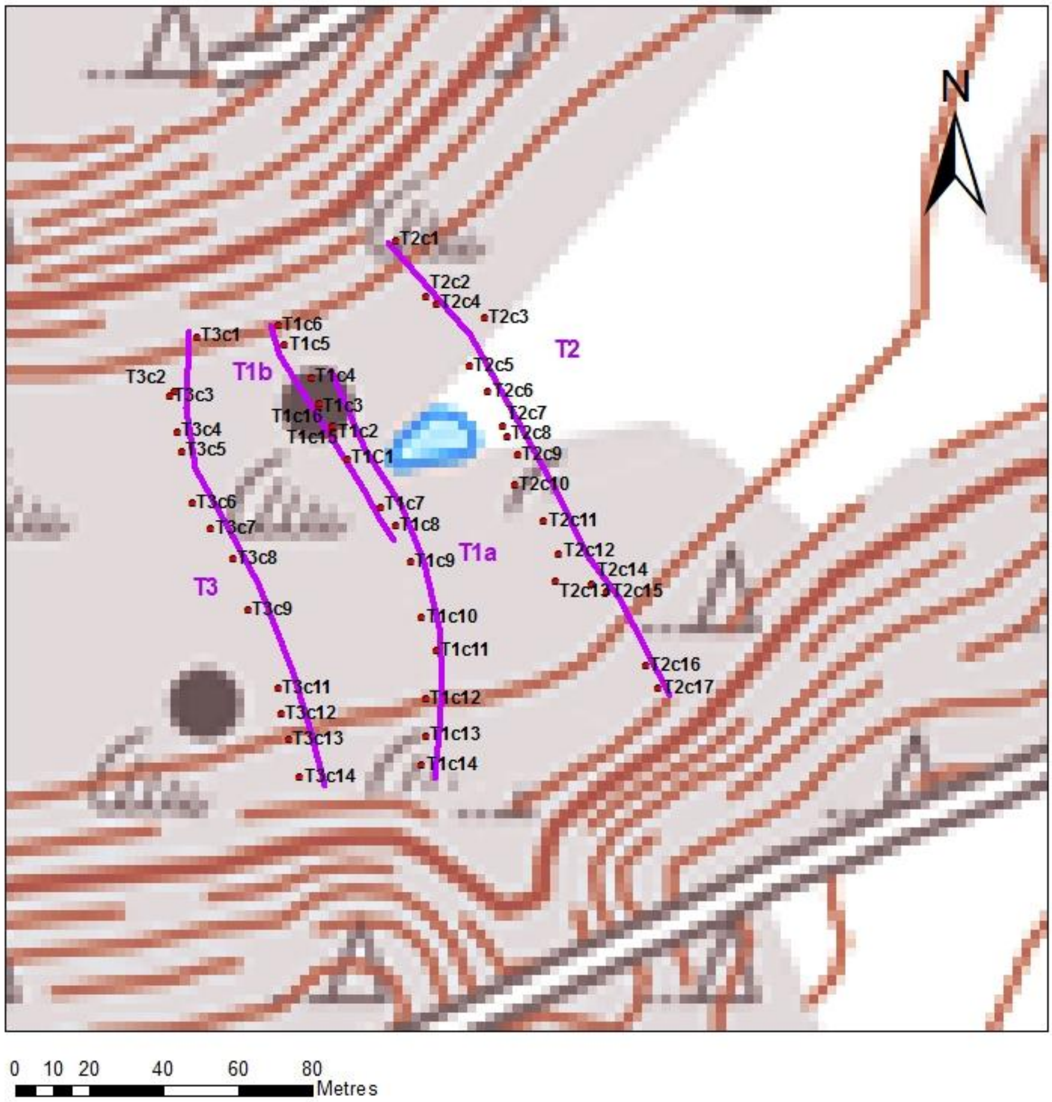
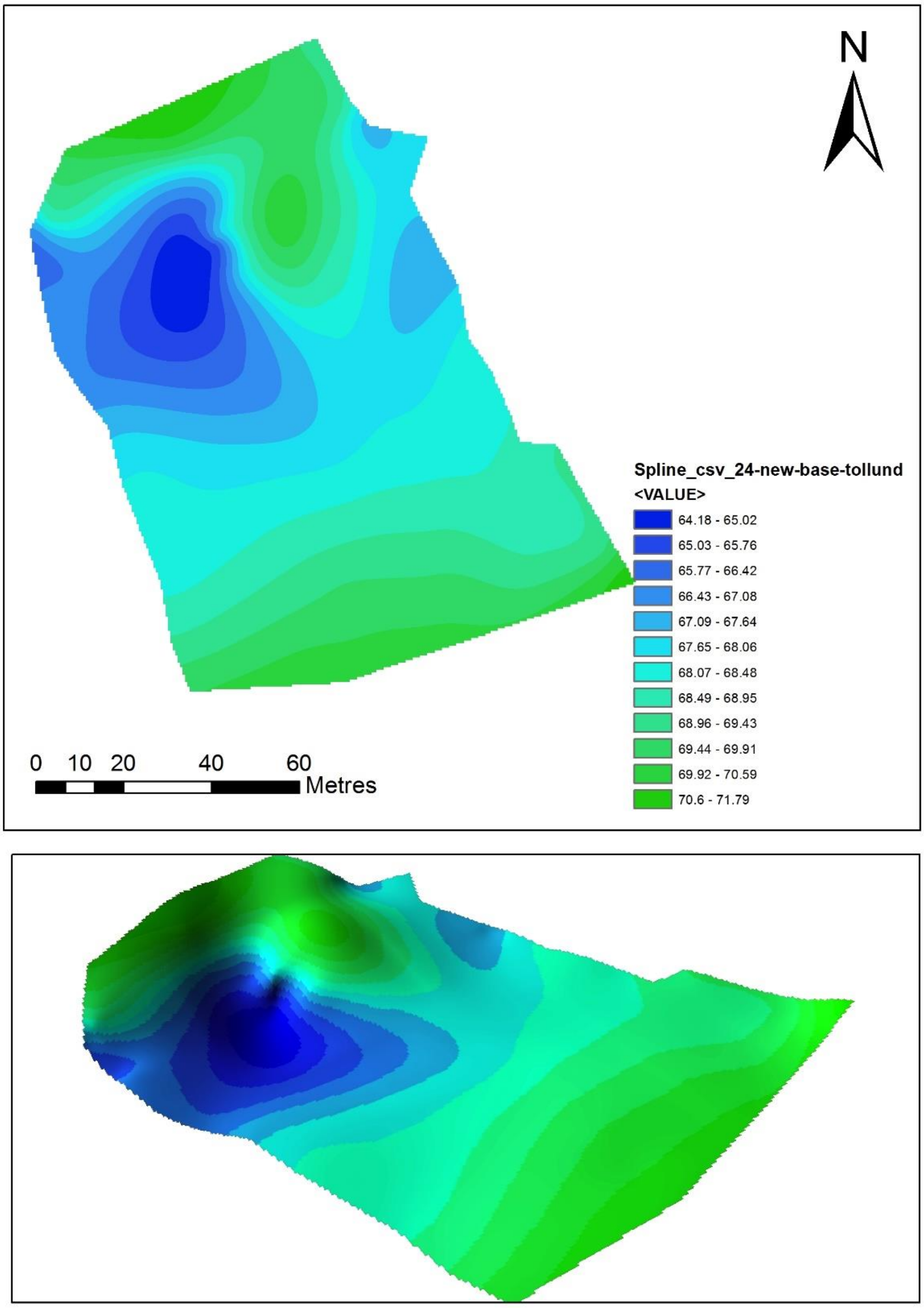
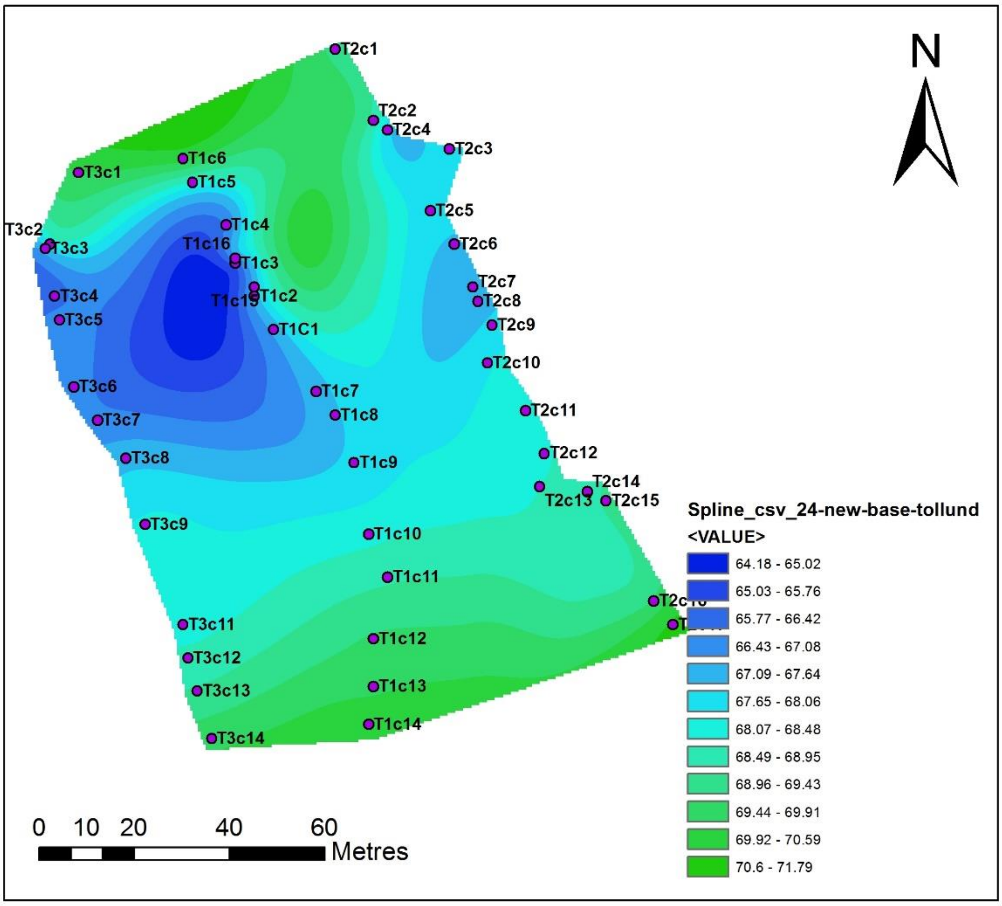


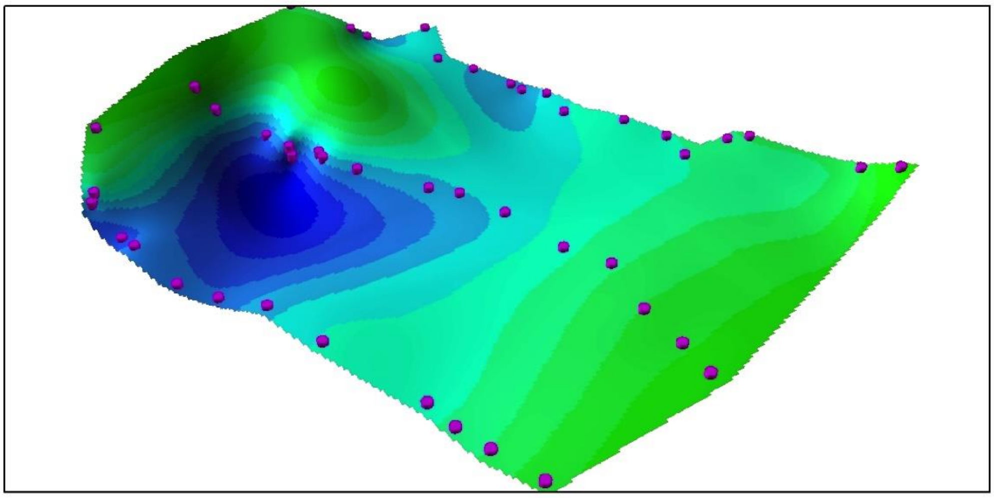
Figure 6.18 Transect and cores on Bjældskovdal Bog



View looking north east- Vertical exggeration x 2

Figure 6.19 The pre-peat landscape





View looking north east- Vertical exggeration x 2

Figure 6.20 DEM of pre-peat landscape and core locations

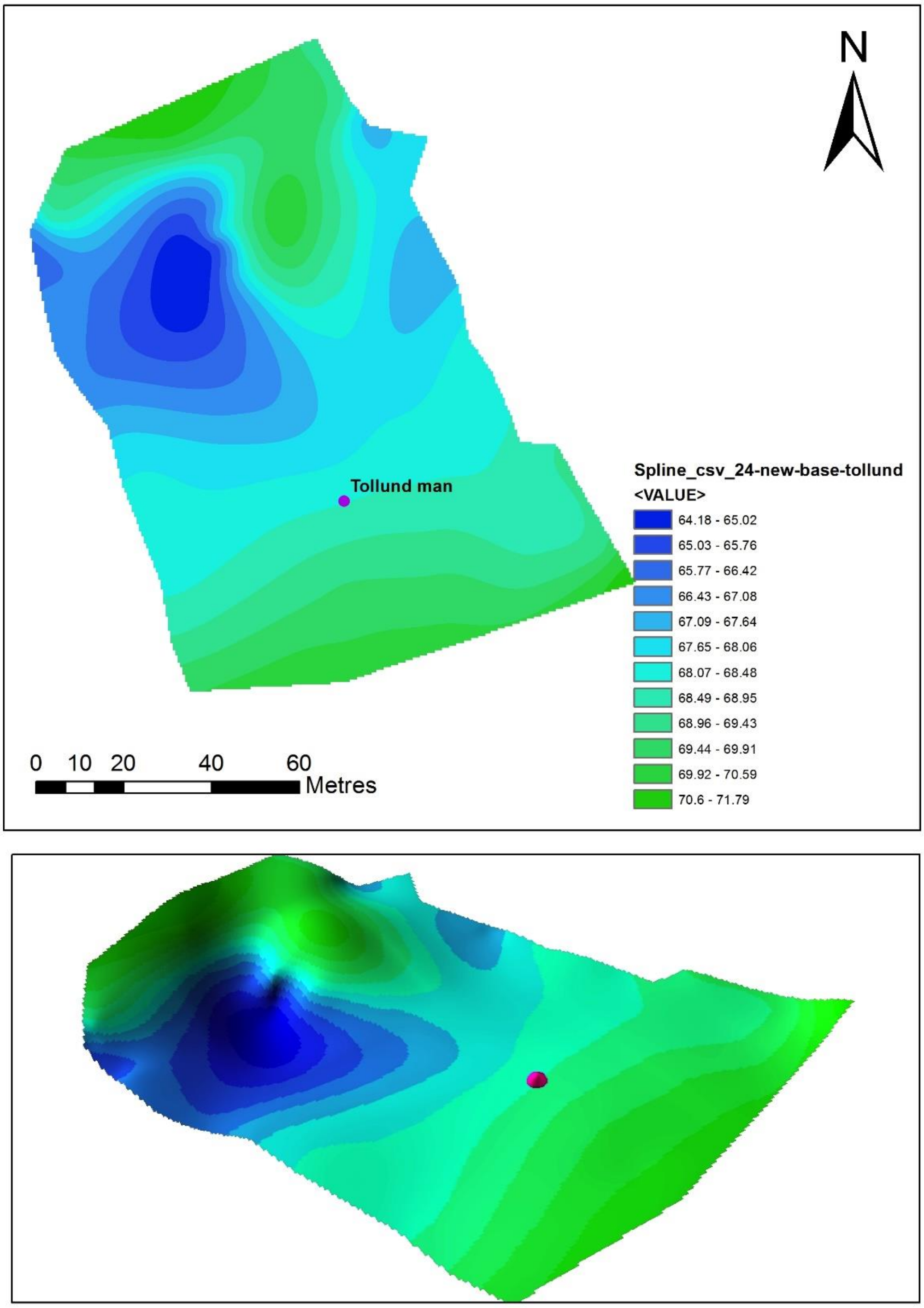
The topography of the bog basin in the area of transect 1a established that from the modern trackway north T1c4 to T1c3 there was a decline of 0.91m followed by a steep rise from T1c3 to T1c14 in the south of the bog of 4.07m. The profile of transect 1b showed that the base of the bog from T1c6 north to T1c2 dropped steeply by 3.95m. Followed by, an increase in elevation from T1c2 to T1c8 of 1.19m in the south.

The base of bog topography from the profiles of transect 2 determined from the modern trackway north T2c1 to T2c3 declined by 1.86m. From core T2c3 to T2c5 there was very little change in elevation as the base of the bog rose by 0.04m. The basin drops by 0.51m from T2c5 to T2c8. The bog basin rises steeply by 3.38m from T2c8 to T2c17 south.

The northern edge of transect 3 drops steeply by 3.77m from T3c1 to T3c4, then elevates from T3c4 to T3c7 by 0.53m. As the transect profiles progress south from T3c7 to T3c14 the base of the bog elevated steeply by 3.11m.

The data obtained from surviving peats of transects 1a, 1b, 2 and 3 have shown the deepest area of Bjældskovdal bog has elevation values ranging from 64.18m – 66.71m in the centre of the bog (figure 6.21). Subsequently, the highest elevated areas of the bog basin landscape were at the northern and southern fringes of the bog with values of 69.26m – 71.78m.

The position of Tollund Man is shown in figure 6.21 below in relation to the extent of the contemporary peatland (69.92-70.79m) around the time he was deposited in Bjældskovdal bog .



View looking north east- Vertical exggeration x 2

Figure 6.21 Tollund Man contemporary peatland extent 69.92-70.79m

The elevation of Tollund Man was approximately 70m (Chapman *et al.* 2019), shown in figure 6.21. The extent of peatland that Tollund Man was placed in at that time was 69.92-70.79m. The widest area across Bjældskovdal bog north to south was 141m around the time of Tollund Man's placement in the bog. The body was furthest away from the deepest area of the bog basin. Tollund Man's body was positioned approximately 64m from the southern edge and 91m from the northern edge of the peatland.

This is a significant result because Tollund Man was not placed on the periphery of the peatland. The body was deposited some distance away from both the southern and northern edges of the bog. This information is new and previously unknown, it has implications on the interpretation of Tollund Man.

The elevation of Elling Woman was calculated to be around 68m (Chapman *et al.* 2019). The distance of Elling Woman from Tollund Man has been recorded differently in each publication and the digital file from Silkeborg Museum. Digital data files from Silkeborg Museum place Elling Woman at 110m east from Tollund Man. Fischer (2012, 18) has indicated the location of Elling Woman was 40m from Tollund Man. Then in Fischer (1979) she was 92m east from Tollund Man. However, Nina Helt Nielsen (pers. com. 2018) from the Silkeborg Museum has suggested 70m east is more likely.

If the elevation of the body was approximately 68m (Chapman *et al.* 2019) the peatland extent at the time of deposition was 67.65-68.06m. If the body was placed 110m east from Tollund Man, Elling Woman was 50m west and 65m south west of contemporaneous edges of the bog landscape. If she was positioned 60m from east of

Tollund findspot Elling Woman was 17m south and 16m north west of contemporaneous edges of the bog. At 70m from Tollund findspot Elling Woman was 26m from the south west edge and 47m from the western dryland edge.

The diagram below figure 6.22 shows the approximate positions of Elling Woman, Tollund Man and the unexcavated bog body on Bjældskovdal bog.

The deposition site of Elling Woman is located adjacent to the entrance to a palaeochannel in the south east branching off the bog and she is placed in a narrower area of Bjældskovdal bog. Whereas, Tollund Man is placed in the widest area and opposite a forked shallower channel or landscape feature in the south.

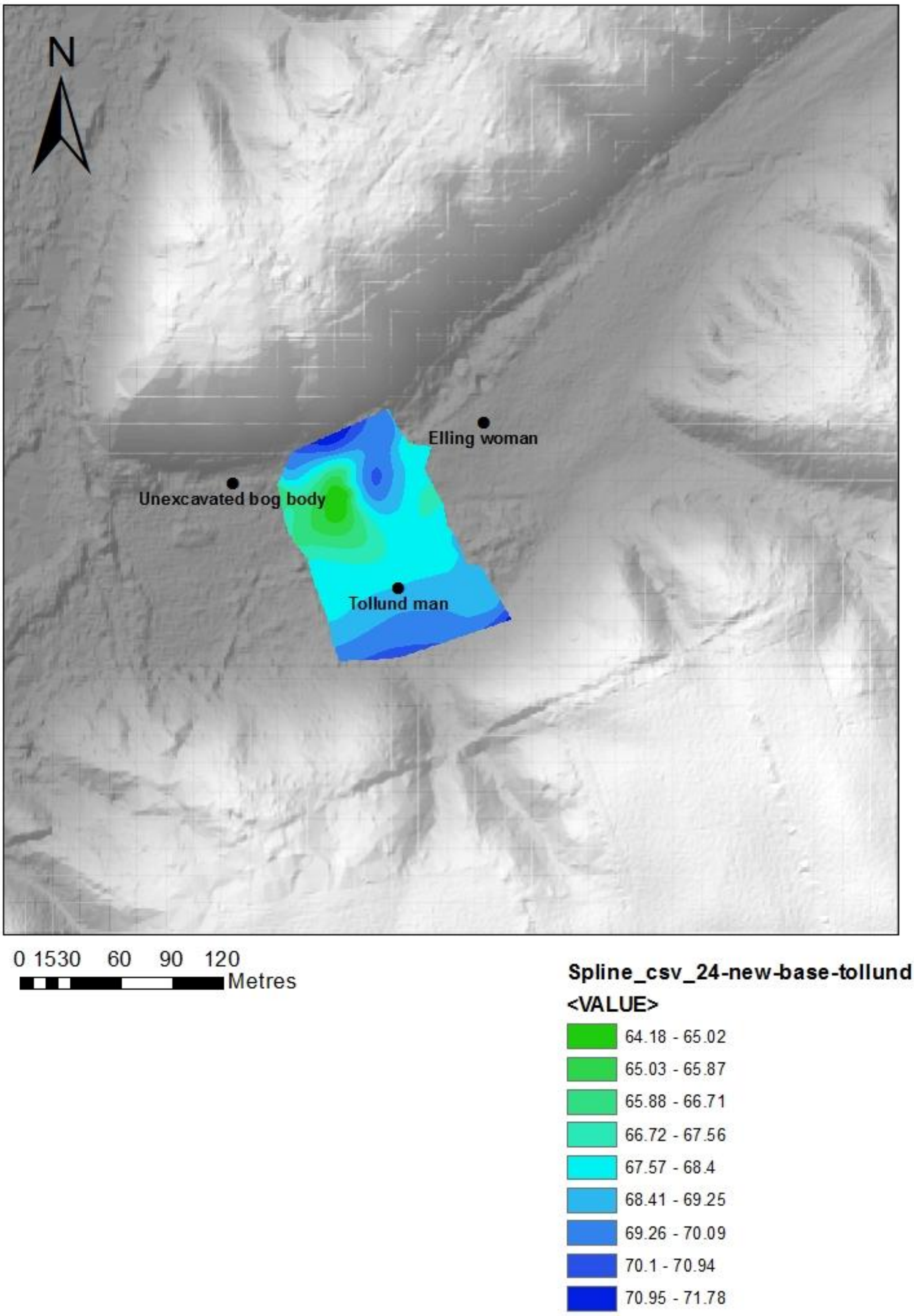


Figure 6.22 Locations of Bog Bodies on Bjældskovdal bog

The positions of Elling Woman and the unexcavated bog body fall outside the DEM created from the stratigraphy of the borehole survey undertaken on the study site. Subsequently, there has been no data to confirm their place of deposition within the base of the bog basin with accuracy. The diagram below figure 6.23 shows the study site within the landscape of the Bølling Lake system.

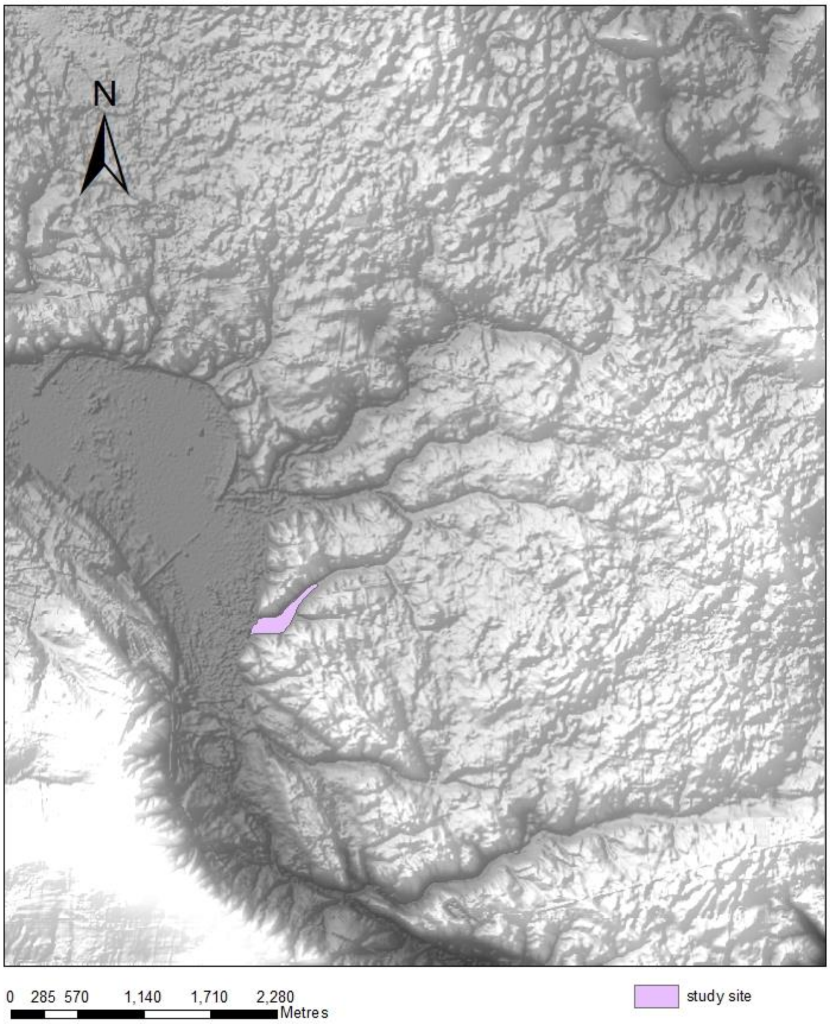


Figure 6.23 LiDAR of Bølling Lake System and Study Site

Bjældskovdal bog is in a channel leading off the Bølling Lake system which is connected to the river Funder A. Several palaeochannels can be seen branching off the lake in the east. The topography of Bjældskovdal bog can be compared to a valley type bog or riparian bog. Consequently, the development of the hydrosere was influenced by the fluctuating ground water levels and events in the Bølling Lake system, river Funder A, rainfall and topography. It is probable that potential flooding detected above was connected to wider landscape conditions within the Bølling Lake system.

6.7 Radiocarbon Dates from Core T3c15, T1c2, T1c15

The locations of cores T1c15, T3c15 and T1c2 is shown in the diagram below in figure 6.24.

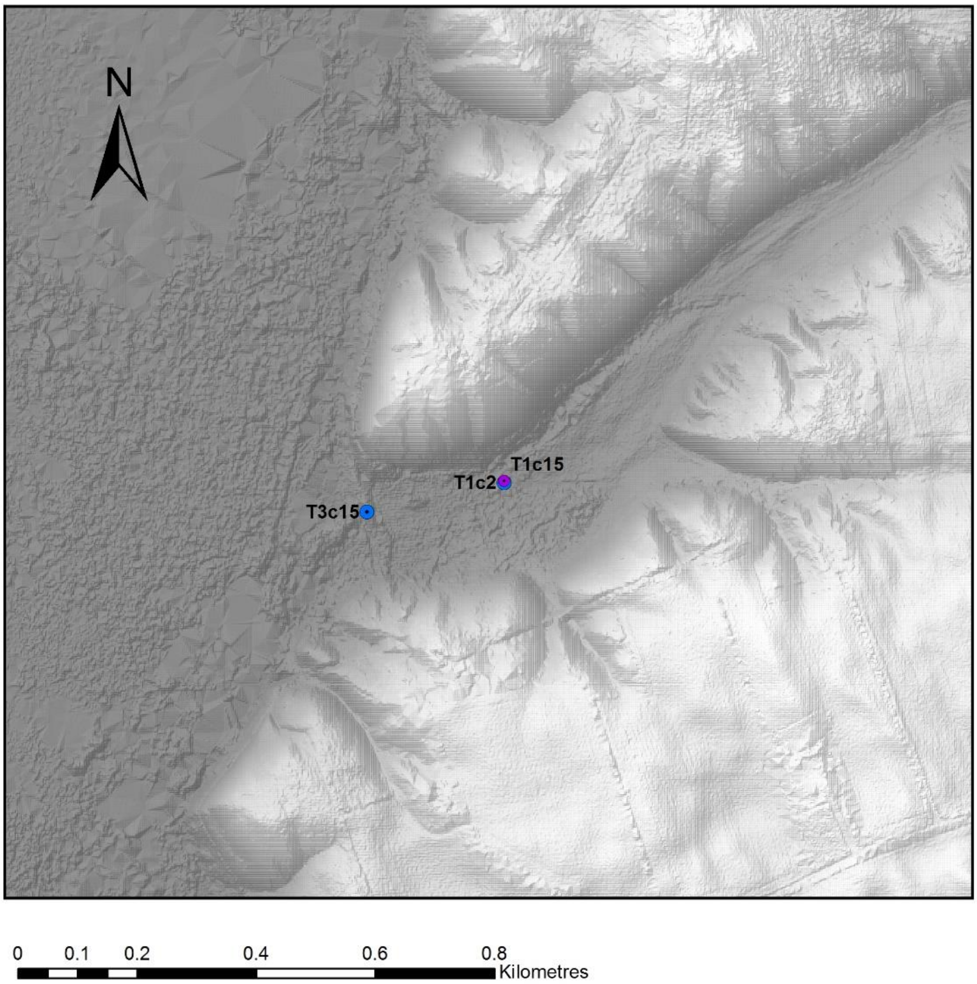


Figure 6.24 Locations of cores T1c15, T3c15 and T1c2

Samples of peat were taken from the core profile of T3c15 at 1.70 – 1.80m and 60 – 70m depth and T1c2 at 50cm basal depth. The results of radiocarbon dates are reported below in figure 5.25. Radiocarbon dates from the base of core T3c15 sample 5, confirms that peat development in the bog began during the mid-Neolithic. The survival of peat extends well after the date of Tollund Man, sample 1 core T1c2 suggests 41 cal BC – 87 AD 106 – 120 AD. Subsequently, core T1c15 sample 2, shows that in this area bog initiation began in the late mid Neolithic period approximately 2,000 years later than the area nearest Bølling lake system represented by core T3c15 sample 5. Consequently, the radiocarbon dates reported here have demonstrated that bog initiation has not developed in a uniform way across the bog. It has developed at different periods in various locations. Nearest Bølling lake it began earlier and, in the east, developed approximately 2,000 years afterwards.

Lab number	Core & sample number	material	position	Absolute height	C14	Calibrated date 95.40% (2 sigma)
UBA-32481	T1c2 Sample 1	Peat (Humin fraction)	Basal 50cm depth	70.13	1963 ± 30BP	41 cal BC -87 AD 106-120 AD
UBA-32482	T1c15 Sample 2	Peat (Humin fraction)	Basal 53cm depth	69.63	6615 ± 51BP	5625-5483 cal BC
UBA-32483	T3c15 Sample 3	Peat (Humin fraction)	Top 10cm depth	69.71	2723 ± 27BP	916-815 BC
UBA-32484	T3c15 Sample 4	Peat (Humin fraction)	65cm depth	69.16	1126 ± 29BP	777-291cal AD 807-819 cal AD 825-242 cal AD 862-990 cal AD
UBA-32485	T3c15 Sample 5	Peat (Humin fraction)	Base 178cm depth	68.03	4743 ± 30BP	3636-3504 cal BC 3428-3381 cal BC

Figure 6.25 Radiocarbon dates taken from T3c15, T1c15 and T1c2

6.8 Artefacts Found on Bjældskovdal Bog

Archaeological objects found deposited on Bjældskovdal bog are shown in the diagram below in figure 6.26. The wooden trackway post was dated to 780 – 520 cal BC (GrN-22994, GrN-23165) (van der Plicht *et al.* 2004). The wooden peat spade was dated approximately to the early Iron Age period (Silkeborg Museum). The location of the samples taken by Troels Smith in 1952 are indicated on the map. It was approximately in this area that another wooden peat spade was found by peat cutters but has been lost.

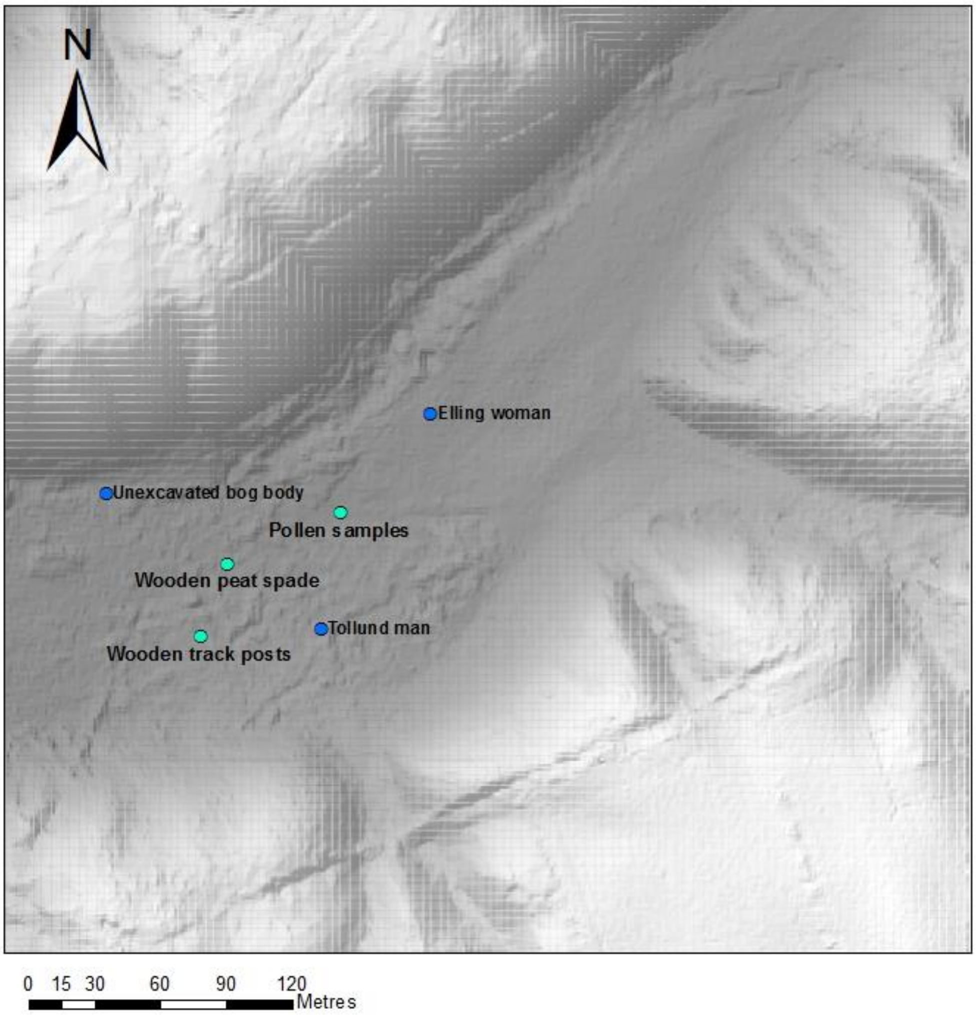


Figure 6.26 Locations of Artefacts found on Bjældskovdal bog

6.9 Archaeology Finds Within 5km of Bjældskovdal Bog

Archaeological finds within a 5km radius of Bjældskovdal bog are presented below in figure 6.27. The study site has been shown in purple in figure 6.27 to give context to the archaeology in the area in relation to Bjældskovdal bog. The Iron Age settlement was 1.8km distance from the study site, and the tomb/round mound dated to 1 – 374 AD was 2.3km away. The tomb/round mound is in a low valley, whereas, the Iron Age settlement is on more elevated ground near the Bølling Lake system and either side of two streams branching from the Bølling Lake. The fire pit and urn cremation site is 2.5km away from Bjældskovdal bog and the stone grave dated to pre Roman period is 4.7km distance from the study site and is located at the base of a small incline. The fire pit and urn cremation site is situated on the edge of a stream on slightly elevated ground and it is located 0.9km from the Iron age settlement.

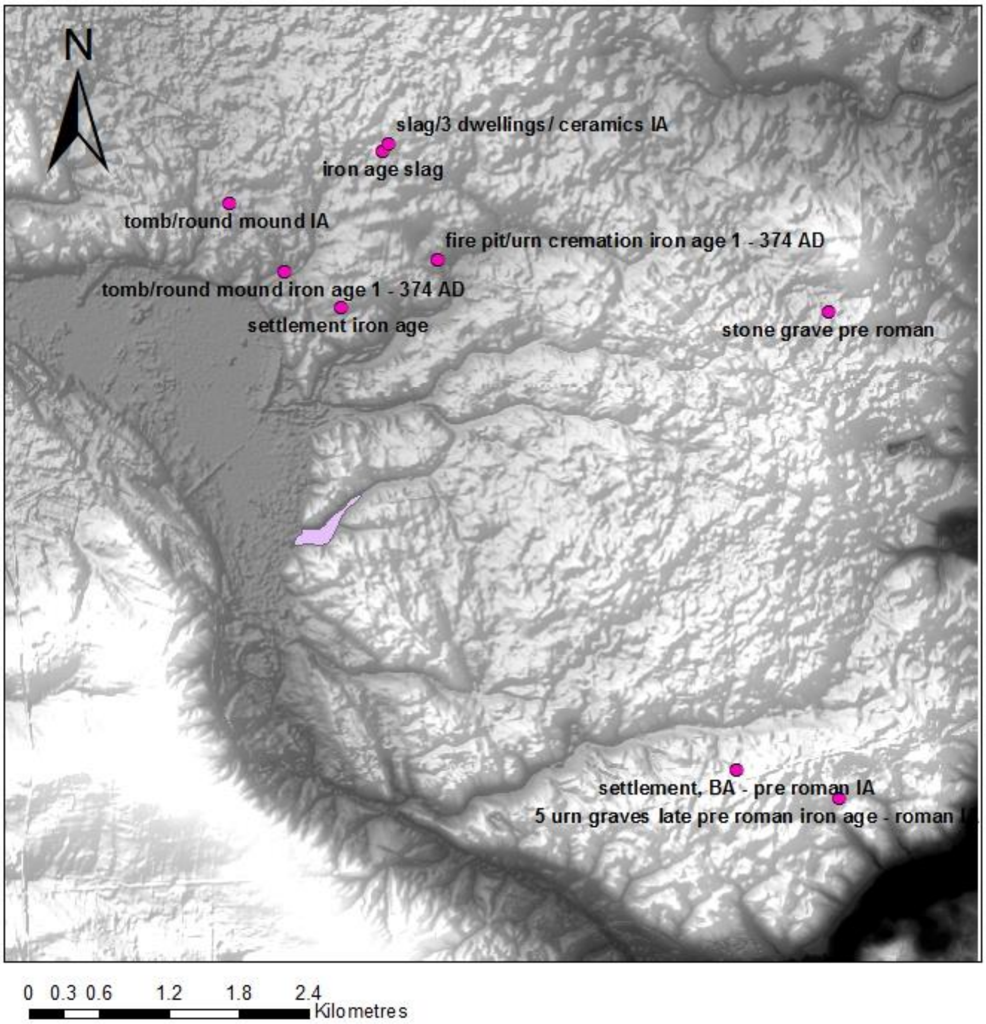


Figure 6.27 Locations of Archaeology within the area of Bjældskovdal bog

Subsequently, 3.3km from the study area three dwellings, Iron Age ceramics and slag were identified in archaeological investigations. These dwellings were situated on more elevated topography 1.8km from the edge of the Bølling Lake system and at least 0.6km distance from the nearest palaeochannels, and valleys. Furthest north is a second tomb/round mound dated to Iron Age period which was 2.9km from the bog. The geographical situation of the second tomb/round mound is on higher ground than the first tomb/round mound and overlooks the Bølling Lake and a palaeochannel/valley. The settlement located south of Bjældskovdal bog sits on elevated ground between two palaeochannels/valleys. The settlement was active from the Bronze Age to pre–Roman Iron Age. Further south 0.9km from the settlement, 5 urn graves were discovered dated to late pre–Roman Iron Age to Roman Iron Age. The urn graves are perched on elevated topography on the edge of a palaeochannel/valley fed by the Funder A and therefore, have a wide ranging view of the river valley. It was very striking that Tollund Man was placed in Bjældskovdal bog where very little archaeology surrounding it has been found apart from the finds associated with the bodies and the wooden trackway. The nearest settlement was approximately 1.8km from Tollund Man's findspot in the Bjældskovdal bog. This is an important result because it has demonstrated that the location of his deposition was in an area that was set apart from cultural archaeology, especially settlements, and burials.

6.10 Conclusion of Bjældskovdal Bog Results

The new data gained from this chapter has aimed to establish the development of the bog landscape. The radiocarbon dates have confirmed that bog initiation began in the mid Neolithic period (sample 5, T3c15, 3428-3381 cal BC) nearest the Bølling Lake system. Further east, bog development started approximately 2000 years later (sample 2 T1c15, 5625-5483 cal BC). The radiocarbon dates have established the hydrosere developed at different rates and at different locations across the bog through prehistory. Additionally, the bog landscape has been identified by peat stratigraphy and developed as an acidic raised mire. There were small areas of localised variations of the landscape development, which was overall dominated by *Sphagnum*. On the southern edge in transect 2 and in the middle of transect 3, two core profiles identified fluctuating water levels where the landscape was less saturated with water. Furthermore, in the middle of transect 1a, the hydrosere was a patch of heather peat which was not identified elsewhere on site. Heather peat showed the landscape became drier with heath, open woodland and a bog landscape (Stace 2010). The wettest area was identified on the northern edge of the bog and was very wet with open water, shallow pools of reed and sedge in transect 1b. This was generally followed by the development of modern peats which represent the modern bog landscape and indicate how very little of the peat record survives on Bjældskovdal bog.

New information was gained from basal deposits of black humified peat which were concentrated in the deepest central area of the bog basin. Subsequently, basal black humified peat identified the bottom of a pool which extended to the southern edge. Moreover, a potential flooding episode or local runoff from the southern edge of transect 3 was identified.

Unpublished work by Troels Smith (1952) have indicated within the area of Tollund Man findspot there was an area of landscape that was less wet and water levels varied. The implications of this relate to the accessibility of this area of the bog.

We have now gained new information about the base of the bog. The shape of the underlying bog basin was reconstructed and has shown the deepest area was in the north of the bog. The deepest area of the bog basin seems to correlate with the development of the hydrosere and identified mainly, that the deepest central area of the bog was acidic raised mire and very wet with open water and shallow pools. The reconstruction of the bog profile has demonstrated that it is a valley bog. Furthermore, the shape of the bog basin has been established and the position of Tollund Man within it has been identified. Tollund Man was placed in the shallowest area of the bog basin if the location of the body was accurate. Additionally, Tollund Man has been deposited on the edge of the bog basin approximately 89m away from the deepest area of the base of the bog in the north and around 33m away from the southern edge of the peatland edge which was contemporary to deposition in the bog. The width of the bog around the time Tollund Man was placed in the bog was approximately 124m.

The positions of Elling Woman and the unexcavated bog body fall outside the DEM of the shape of the base of the bog. Therefore, it remains speculative now on how their location relates to the shape of the bog basin. However, based on the current location of Elling Woman, she was in the narrowest area, opposite a palaeochannel or stream in the south east of the bog system. Whereas, Tollund Man was placed some distance from the edges of peatland in a part of the bog basin adjacent to a forked palaeochannel, valley or stream in the south.

The remains of the wooden trackway were located across the widest part of the bog south to north 55m west of Tollund Man. Moreover, the wooden peat spade was found placed in the deepest and wettest area of the bog basin and was approximately 35m distance from remains of the wooden trackway. Elling Woman was placed in an area of Bjældskovdal bog where it narrows in width from 150m at its widest to 78m.

The surrounding archaeology has demonstrated the area was of importance during the Bronze Age, Iron Age and early Roman age. Contemporary settlements in the areas and small scale industrial activity have been identified. Two of the archaeological sites fall outside the date range of Tollund Man. However, they provide an interesting perspective on the use of the cultural landscape surrounding Bjældskovdal bog. The burial tombs, mounds and urn graves, and cremations suggest disposal of the dead did not follow one convention, the use of the surrounding wetlands landscape for settlement and burials are distinctive. Interestingly, the second tomb, mound overlooked the Bølling Lake and a palaeochannel or valley. Settlements were located on slightly higher more elevated land some distance from Bølling Lake and palaeochannels. Furthermore, the settlement south of the study area was on elevated ground situated between two palaeochannels/valleys. Additionally, the urn graves were on elevated ground on the edge of a palaeochannel or valley of the river Funder A with a view of the river valley.

In summary, Chapter 6 set out to gain new knowledge about the general nature of bog development and the landscape by analysing the peat stratigraphy. This was achieved despite the loss of relict peat to peat cutting. The peat units that were encountered across the site were assessed and due to the variations in profiles eight archetype cores were assigned to represent the peat on Bjældskovdal bog. The peat stratigraphy across each transect were defined and examined to identify similarities and variations. Now we have new information about the development of the bog landscape.

Using the new data, a reconstruction of the underlying bog basin was achieved. Finally, chapter 6 sought to understand the shape of the bog basin in relation to the position of Tollund Man and this has been realised. Subsequently, he was deposited in the shallowest area of the bog basin some distance away from the edges of the bog basin. Furthermore, contextual data of artefacts and archaeological sites of the Bronze Age, Iron Age, pre-Roman period within a 5km of the study site has provided valuable information on the cultural use of the surrounding landscape to consider and situated Tollund Man in his cultural landscape. Significantly, Tollund Man was placed in an area that was archaeologically barren for 1.8km surrounding Bjældskovdal bog.

Chapter 6 is followed by a detailed discussion of the landscape context of Lindow II, Lindow III, Tollund Man and Elling Woman based on the results reported and previous research undertaken on the respective study sites. These are compared with past archaeological and environmental research on raised bogs with preserved human remains.

CHAPTER 7 DISCUSSION

7.1 Introduction

In chapters 5 and 6 the results from the application of methods outlined in chapter 3 were reported in relation to the two case studies described in chapter 4. This chapter discusses these results in relation to the aim of the thesis. The research aim of this thesis was to understand the broader landscape potential of bog bodies, to assess the wider cultural archaeological evidence and to improve understanding of their deposition in relation to their cultural landscape. Contextualising bog bodies in such a way as would help to establish whether this methodological approach was valuable and if it had the potential to advance research on bog bodies. To achieve the aim of this thesis there were four objectives:

- To determine the pre-peat landscapes.
- To understand the development of the bog landscapes.
- Reconstruct the shapes of the bog basins with the positions of bog bodies within it.
- To evaluate the relationships between the human remains and broader cultural activities as revealed from previous studies.

The wider landscape investigation of bog bodies on Lindow Moss and Bjældskovdal bog described above has shown the effectiveness of applying this approach to bog body research with considerable additional evidence about the physical landscape gained.

The main contribution of this thesis is that it has shown through integration of surrounding cultural archaeology, reconstruction of the wider bog landscape and spatial analyses of the locations of Lindow II and Tollund Man in their contemporary peatland extent and how people in prehistory used the geographical area. A broader landscape investigation of Lindow II and Tollund Man has provided a richer context to their deposition. This has only been addressed by the research carried out on Tumbeagh bog body (Bermingham and Delaney 2006). Consequently, a broader landscape investigation of bog bodies has the potential to significantly have an impact and add to the bog body debate and interpretations.

Despite the depletion of the peat record especially on Bjældskovdal bog, it has been possible to gain limited information about the development of the bog landscape and underlying bog basin. On Lindow Moss the peat record was better preserved and provided excellent information about the bog landscape. The depths of the peat record remaining on Lindow Moss was probably due to the underlying shape of the bog basin.

The aims and objectives outlined in chapter 1 have been restated in section 7.1. Section 7.2 is Lindow Moss: Challenges of elucidating the bog body record, the difficulties encountered on Lindow Moss are outlined. In section 7.3 Bjældskovdal bog: Challenges of elucidating the bog body record and how these difficulties were resolved are discussed. Section 7.4 discusses the pre-peat landscape of Lindow Moss and section 7.5 the pre-peat landscape of Bjældskovdal bog.

The development of the bog landscape on Lindow Moss is discussed and the peat stratigraphy generated from this research identifies the variations of the vegetational history in 7.6. In section 7.7 the discussion of the development of the bog landscape on Bjældskovdal bog is presented. Whilst section 7.8 examines the radiocarbon dates in relation to the formation of peat on Bjældskovdal bog.

Reconstruction of the shape of the underlying bog basin and the position of Lindow II within it are analysed and discussed in section 7.9. In section 7.10 reconstruction of the shape of the underlying bog basin and the position of Tollund Man within it are discussed.

Section 7.11 follows with the discussion of the cultural archaeology within 5km of Lindow Moss and of Bjældskovdal bog and in section 7.12 its implications. This is followed by an outline of the research successes of a wider landscape approach to bog body investigations. Chapter 7 are summarised in section 7.13 with a conclusion of the discussion.

7.2 Lindow Moss: Challenges of Elucidating the Bog Body Record

The peat profiles on Lindow Moss provided a considerable amount of new information about the development of the bog landscape. The depths of peat remaining on this bog were considerably deeper and had preserved more detail about the peat record compared with Bjældskovdal bog. Previously published palaeoenvironmental analysis of Lindow II findspot and the NWWS have contributed to the evaluation of the development of the hydrosere as reported in chapter 5 and have enabled a wider landscape context when integrated with data from this research and monographs of previous studies (Stead *et al.* 1986; Turner and Scaife 1995; Leah *et al.* 1997).

One of the main problems to mitigate was there was an absence of OD heights of Lindow bog bodies, despite Lindow II and Lindow III being discovered *in situ* and having ordnance survey coordinates documented of their findspots. The lack of published OD heights for Lindow II have proven to be slightly problematic because hypothetical heights have been calculated from the diagrammatical information available that was published in West (1986, 80), and Connolly (1985, 15). Calculating the OD height of Lindow II was done by using the nearest OD height of a NWWS core (Lin 28) and deducting the depth of the body measured from diagrams by West (1986, 80), and Connolly (1985, 15) (Chapman 2015). The OD height of Lindow III was calculated using the OD height of NWWS core Lin 8 and deducting the depth of which Lindow III was recorded lying below the peat surface in the study of peat sequences associated to Lindow III by Branch and Scaife (1995, 26) (Chapman 2015). This means the elevations for the bodies were hypothetical and approximate. The archive data for Lindow II and III provided better scaled diagrams to calculate approximate elevations.

A further significant issue identified was on Lindow Moss after discovery of the Lindow bog bodies removal of peat continued. Removal of the peat record directly affected elevations of the bodies in relation to the original surface of the bog and their position below it. On Lindow Moss peat extraction continues and it was difficult to predict the amount of peat stripped away from this bog since discovery of Lindow II. Furthermore, due to loss of the peat record vital information relating to the development of the bog landscape has been lost. Fortunately, on Lindow Moss the depths of peat profiles were considerable and yielded much information about the hydrosere.

7.3 Bjældskovdal Bog: Challenges of Elucidating the Bog Body Record

The peat stratigraphy on Bjældskovdal bog provided a limited profile because this bog has been extensively cut for peat and this has affected the amount of data obtained in relation to the formation of the bog landscape. However, additional limited information from Troels Smith's fieldnotes from 1952 have contributed slightly to the data related to the peat profiles on Bjældskovdal bog.

Removal of peat on Bjældskovdal bog continued after the discovery of the bog bodies. The impact of removal of peat from Bjældskovdal bog directly affected elevations of the bodies in relation to the original surface of the bog and their position within it. At Bjældskovdal bog the peat record has been severely depleted. However, this problem was overcome by calculating elevations from archival data which provided a hypothetical elevation of the body and possible contemporary bog surface for Tollund Man.

One of the main challenges was that no elevations of the body were recorded or published. It was therefore necessary to use heights calculated from Troels Smith's diagram showing spot heights of a nearby relict peat bulk (Chapman *et al.* 2019). From this hypothetical height of Tollund Man a hypothetical contemporary peatland extent was generated from the borehole data of this research.

Another problem encountered was that Troels Smith's notes were unpublished, written in pencil in note form, tricky to read and in Danish. The author of this research has translated the information about the boreholes taken, from Danish into English. Crucially, Troels Smith's notes contained data about peat stratigraphy that was relatively close to the findspot. Again, the problem here was that the exact location of the body and the area sampled for peat were vaguely recorded. Troels Smith's notes lacked detail such as the elevations of Tollund Man and coordinates of his location within Bjældskovdal bog, as well as not recording coordinates and elevations of areas sampled for peat analysis.

If in the future further bog bodies were discovered *in situ* these problems can be mitigated by thoroughly documenting elevations and coordinates of the body. In addition, undertaking a borehole survey to establish the formation of the bog landscape and determine the shape of the bog basin would provide a wider landscape context to the body. If we consider the research on Tumbeagh bog body, this has set the precedent and achieved vital information which has impacted on the interpretation of this body (Bermingham and Delaney 2006). Also, the nature of Tumbeagh bog was established from a broader landscape investigation and demonstrates the value of moving beyond the body and the information it contributes (Bermingham and Delaney 2006).

7.4 The Pre-Peat Landscape of Lindow Moss

Previous to this research, the pre-peat landscape of Lindow Moss was not known. The borehole surveys carried out on Lindow Moss have provided robust data on the character of the pre-peat landscape. The depths of peat stratigraphy across Lindow

Moss have enabled the pre-peat landscape to be modelled and visualised as shown in figure 7.1.

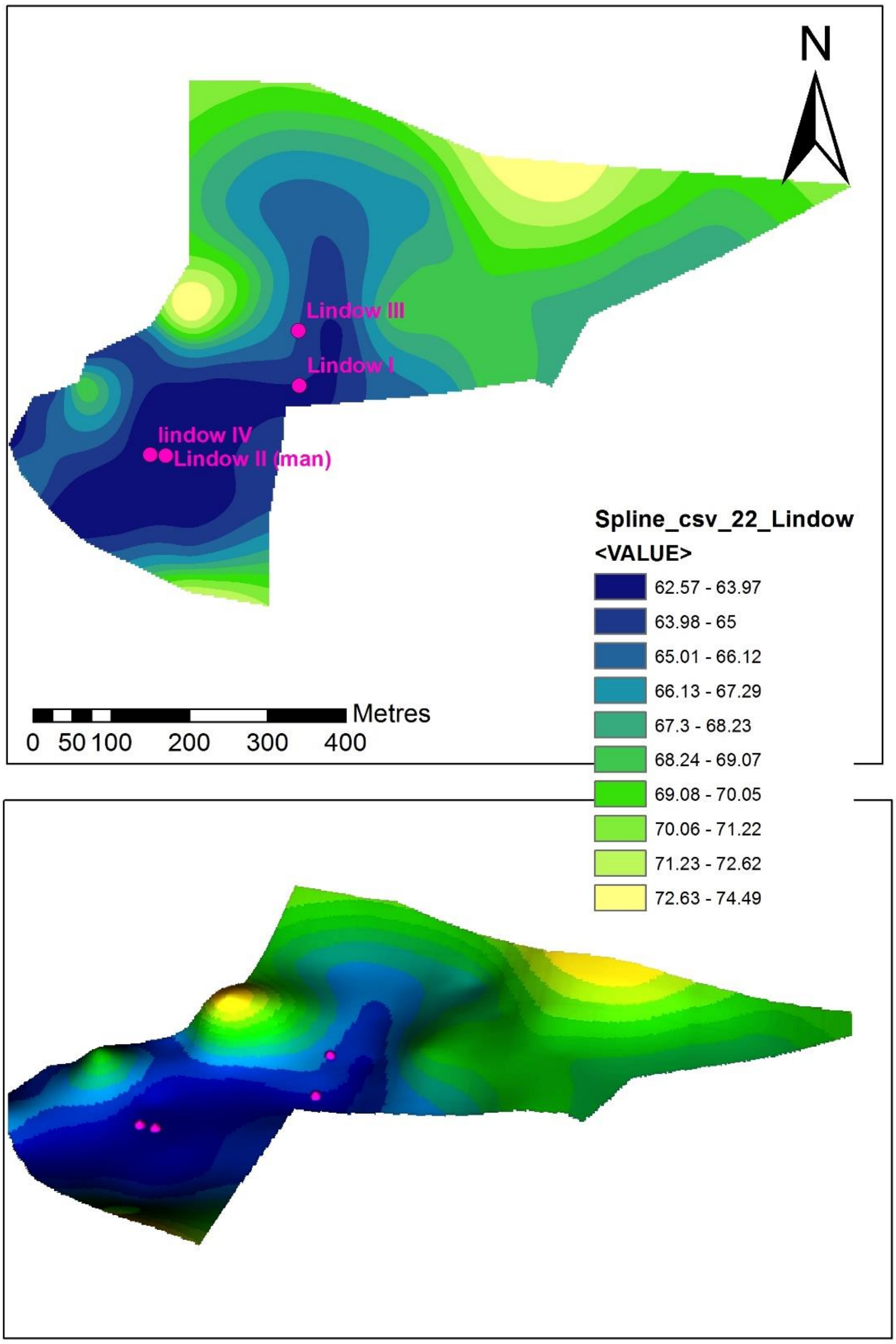


Figure 7.1 DEM of the pre-peat landscape on Lindow Moss 62.57-74.49m OD

The new data shows the morphology of the basin at Lindow Moss and suggests it is a kettle hole bog with a scarp feature shown in the north east edge of the bog basin.

The base of bog topography elevations range from 62.57-74.49m OD. The lowest elevations were 62.57-64.95m OD and the highest were ranging from 71.18-74.89m OD. The topography of the base of the bog elevated by 11.92m OD across 676m. From the top of the scarp there was a steep drop of 4.57m.

Lindow Moss has been classified by Leah *et al.* (1997) as a discrete kettle hole. However, it sits within a Late Pleistocene hummocky glacial terrain, which includes other kettle holes, dissected during the postglacial period by the River Bollin (Leah *et al.* 1997). This adds hydrological complexity since the fields that surround Lindow Moss are active floodplains and become inundated during times of flood.

The new information of the pre-peat landscape confirmed it was a kettle hole bog. Palaeochannels from the river Bollin shown on LiDAR in figure 5.23 arc above the north and fed into Lindow Moss in the north east and north west. This study suggests that Lindow Moss is a kettle hole bog which is also prone to inundation from streams connected to the River Bollin in the north which scour along the scarp and down through the centre of the bog.

The NWWS by Leah *et al*. (1997) did not establish the pre-peat landscape on Lindow Moss or show the morphology of bog topography in a DEM but the study did examine peat stratigraphy across the bog and wider Cheshire wetlands. This research has gained original data about the pre-peat landscape of Lindow Moss.

The new knowledge of the pre-peat landscape has shown in the central area of Lindow Moss had the lowest elevations 62.57-64.95m OD and seems probable that early peat formation began in this area. The NWWS analysed core Lin8 for pollen and results indicated that peat formation began around the Flandrian II period (Atlantic Period Zone VIIA) and corresponded with Birks (1965) pollen analyses around Lindow Moss (Birks 1965; Branch and Scaife 1995, 21; Leah *et al.* 1997, 60). The upper 200cm was analysed in the pollen study and peat stratigraphy on Lindow Moss, the lower earlier Flandrian deposits of peat were not investigated (Branch and Scaife 1995, 21). Furthermore, the samples on Lindow Moss analysed for pollen, peat stratigraphy and radiocarbon dating were taken from the upper 119-121cm, 763-677 cal BC (UB-3240) and 188-190cm, 2202-2039 cal BC (UB-3241) of peat rather than from the base of the peat profile (Branch and Scaife 1995, 20-21).

It seems more likely that the inception of peat may have begun earlier as NWWS core Lin8 was located in an area of Lindow Moss with basal topography elevations of 64.96-67.1m OD. Whereas, the lowest elevated area of bog topography demonstrated by this research was 62.57-64.95m OD. By comparing the pre-peat landscape morphology to radiocarbon dates of basal peat deposits in specific areas enables an integrated landscape analysis of the bog. Especially as in this case Lindow II was placed in the area of the bog basin with the lowest elevations.

The depths of peat which have survived on Lindow Moss ranged from 0.74m-4.92m. New data has been gained despite the loss of peat through commercial cutting. In the south western area of Lindow Moss an undulating channel feature was identified. This corresponded to the formation of pools and potential water inundation, which was demonstrated in the peat stratigraphy in the area of transect 5. The pre-peat landscape on Lindow Moss has shown the morphology of the bog basin correlated to formation processes of the bog landscape demonstrated in the peat stratigraphy.

In comparison, palaeoenvironmental analysis of the depositional context of Oldcroghan Man did not include the reconstruction of the broader bog landscape and morphology of the bog basin for further analyses in relation to the position of the body and its distance from peatland edges (Plunkett *et al.* 2009). Macrofossil and beetle remains have indicated Oldcroghan Man was placed in a pool towards the northern part of Clonearl bog (Plunkett *et al.* 2009).

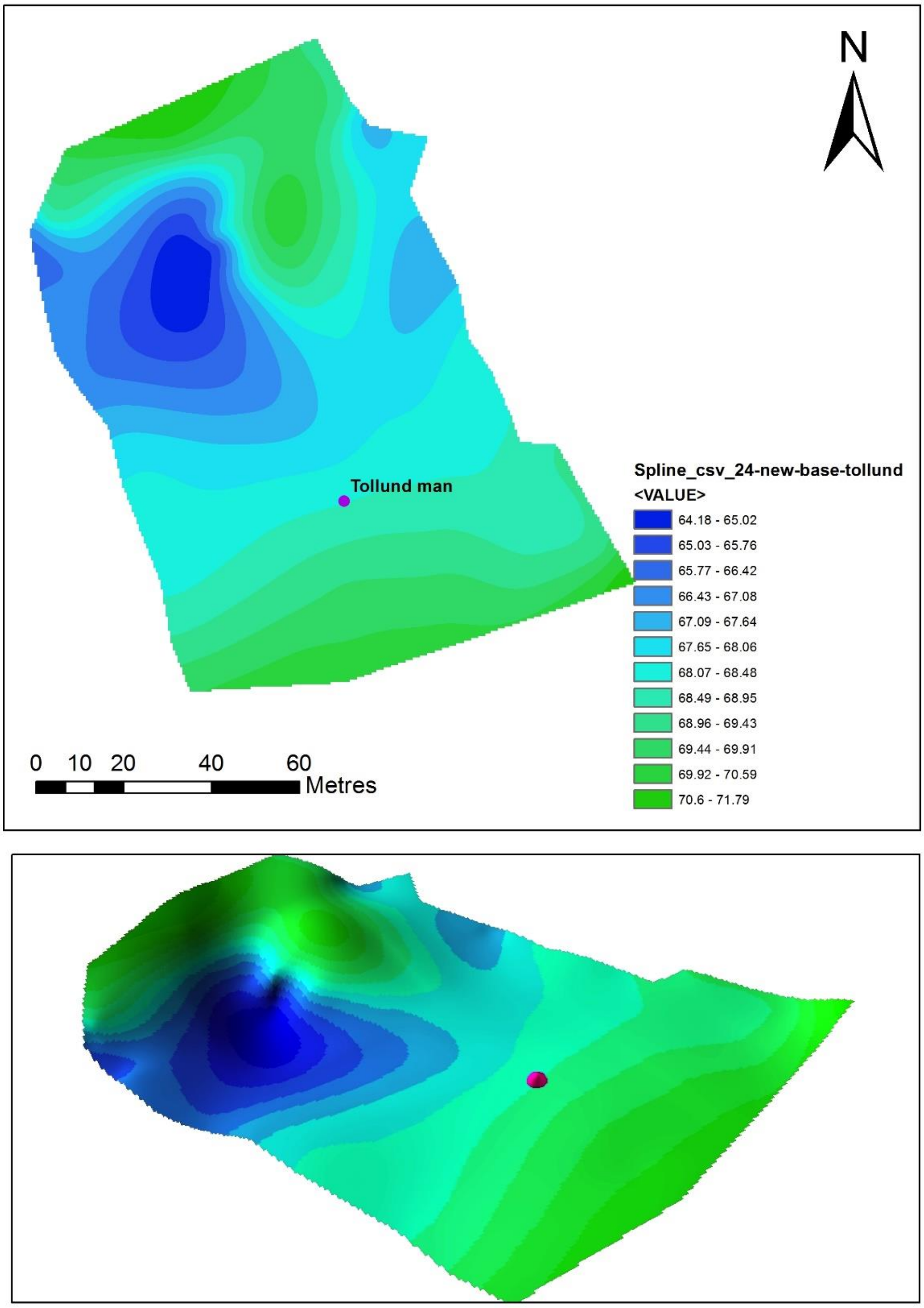
The importance of determining the pre-peat landscape of Lindow Moss in relation to bog body deposition is that it helps understand the spread and development of peat on Lindow Moss (Chapman 2015). Additionally, the pre-peat topography is then used to correlate with data gained from the borehole survey. To examine the development of the bog landscape and how this may relate to the underlying topography of the basin.

Furthermore, the DEM generated from the borehole data showing the pre-peat topography provides an accurate 3D background in ArcGIS to create and visualise the contemporary peatland of Lindow II and Lindow III. In order to understand the bog landscape of Lindow Moss conventional maps do not present accurate representations of peatlands and therefore do not form the basis of which to analyse the bodies within their landscape (Chapman 2015).

7.5 The Pre-Peat Landscape of Bjældskovdal Bog

Previous to this study the pre-peat landscape of Bjældskovdal bog was unknown. The borehole survey has provided original information on morphology of the pre-peat landscape on Bjældskovdal bog. The depths of peat stratigraphy has facilitated a DEM to visualise the pre-peat landscape in figure 7.2. We now know that the base of the bog topography range in elevation from 64.18-71.78m. The elevations of the pre-peat landscape rise by 7.6m across 150m. On Bjældskovdal bog the shape of the bog basin is a valley type bog which was connected to the Bølling lake system in the east. The morphology of the bog basin shows it is deeper in the northern area of Bjældskovdal bog.

New information has been gained about the depths of peat surviving on Bjældskovdal bog these ranged from 0.05m-1.75m. The peat stratigraphy has been depleted through the cutting of peat. However, surviving peat deposits have provided data on the pre-peat landscape. Troels Smith's unpublished pollen analysis and limited boreholes taken have not yielded data that has established the pre-peat landscape on Bjældskovdal bog.



View looking north east- Vertical exggeration x 2

Figure 7.2 DEM of the Pre-Peat Landscape 64.18-71.78m and Tollund Man’s Location.

Furthermore, the bog basin deepens towards the northern edge of Bjældskovdal bog. Around the northern area elevations were 64.18-65.87m.

This study has established new information from radiocarbon dating analyses of basal deposits from cores T1c15, T1c2 and T3c15. The results from radiocarbon dating of core T1c15 has indicated in this area of the pre-peat landscape where elevations were lowest, probably formation of peat probably began in late mid Neolithic period 5625-5483 cal BC (UBA-32482). However, 2m away at core T1c2 radiocarbon dates were 41 cal BC-87 AD, 106-120 AD (UBA-32481 41). The differences in dates at core T1c2 were probably related to removal of older basal peat through the cutting of peat or contamination of younger new peat growth.

Radiocarbon dates of core T3c15 are not discussed here in relation to the pre-peat landscape as this core was located too far to the west from transect 3 to be included in creation of the DEM. It has been discussed in chapter 6 and below.

New knowledge about the location of Tollund Man in the pre-peat landscape of Bjældskovdal bog is discussed in further detail below. The new information is significant because we have now moved beyond the body for a broader landscape context of Tollund Man to consider in relation to the deposition of his body. In contrast, Grauballe Man was deposited in a kettle hole bog (Jørgensen 1956; Glob 1969, 37; Asingh and Lynnerup 2007, 17) the pre-peat landscape has not been established to examine the morphology of the bog basin, development of the bog landscape and the location of the body within it and its distance from the peatland edges. Although, Nebelgård fen is now flooded (Nielsen pers. com. 2017) vital information on the character of the pre-peat landscape in relation to the location of the body had the potential to generate new information. Nebelgård fen is just one example whereby obtaining new data about the pre-peat landscape has immense potential to understand the landscape context of bog body deposition.

The pre-peat landscape matters because new information starts to emerge that contextualises the bog body within its broader landscape of which was not known before this research. By establishing the pre-peat landscape of Bjældskovdal bog it has now been possible to identify the morphology of the bog basin which facilitates better understanding of the bog landscape development. This data forms the basis on which the contemporary peat landscape is created as a DEM, which locates Tollund Man and Elling Woman within this landscape for analyses. Further spatial analyses related to the locations of the bodies within their contemporary peatland is below.

The new data outlined above has generated original information about the pre-peat landscape of Bjældskovdal bog that was different from research on bog bodies presented in chapter 1 and 2.

7.6 Development of the Bog Landscape on Lindow Moss

The originality of this research centres on a broad landscape investigation of bog bodies. The gap in previous studies identified in chapter 1 and 2 clearly showed there was an absence of wider landscape context of bog bodies.

The new data has shown that development of the bog landscape in the eastern area of Lindow Moss began as a fen environment with sedge and reeds around the basin edge.

This continued for some time in this area during bog formation. Additionally, on the eastern edge of the bog basin there was evidence of burning identified from deposits of charcoal. Around the centre of the bog basin a transition to acidic landscape conditions was identified by *Sphagnum* peat in some areas. Later development of the bog landscape was generally *Eriophorum* towards the eastern edge of the bog basin and the central area in the west of Lindow Moss. Afterwards later formation of the bog landscape on the eastern edge was *Sphagnum* then *Eriophorum*.

In other locations along the eastern edge of the bog basin later development was followed by sedge. This indicated a transition from acidic to freshwater landscape conditions. In contrast, further along the eastern edge of the basin later development of the bog landscape after *Eriophorum* was a wood peat. The new information has already identified the variability of the development of the bog landscape in the eastern area both in location and through time. The ecological environment was varied through time and across the bog influencing growth of specific bog vegetation suited to minerotrophic or oligotrophic conditions.

New data related to the pre-peat landscape has identified a scarp was present in the eastern area extending outwards towards the western central area of the basin. The findings from this research has shown that at transect 4 core T3c7 which was approximately 61m distance away from the edge of the scarp with a drop of 4.57m from the top of the scarp. The formation of the bog landscape began as open water and pools demonstrated by silts, clays. Acidic landscape conditions later formed with *Eriophorum* peat at T3c7. A shift to freshwater was identified by development of sedge in this area.

Later formation of the bog landscape was that of wood peat and this was followed by *Sphagnum*. This demonstrated a transition back to acidic bog at T3c7. A further shift to freshwater water conditions of sedge developed in this area under the scarp. Development of the bog landscape continued with a wood peat and a return to acidic bog with *Sphagnum* and *Eriophorum*. Landscape development in this area persisted with wood peat and *Eriophorum* in this central area of the basin under the scarp extending west.

The findings from this research has demonstrated that in the south western quadrant of Lindow Moss, the development of the bog landscape started as acidic *Sphagnum* bog with a wood peat on the outer southern edge of the basin. This continued in this area for much of its development. This was generally followed by the formation of *Eriophorum* that indicated acidic landscape conditions continued in this area. Whereas, in the south west area later formation of the bog landscape was heather peat indicating a drier phase. There may have been a shift to freshwater conditions with formation of reeds and bog bean around the north western edge of the bog basin. It seems highly probable that acidic conditions may have persisted especially as *Sphagnum* was predominant in this area of the bog.

Establishing the pre-peat landscape has classified a channel feature or low depression in the morphology of the basin in the north western section of Lindow Moss. Building on this new data, the peat stratigraphy from transect 5 has identified two episodes of formation of pools in this area of the bog basin in addition to the channel or depression. Furthermore, pool muds have indicated open water or water inundation around the channel feature or hollow in the basin, scouring through the north west edge of the bog basin.

The pool muds identified on Lindow Moss seem to partially correspond with the NWWS core Lin4 which contained two upper deposits of pool muds (Leah *et al.* 1997, 53-62), of which the lowest pool mud sequence most likely represented the pool Lindow II was placed in. The peat pool that related to Lindow II was radiocarbon dated to approximately 400-200 cal BC (HAR-6521, 6562, 6565) at 95% confidence (Otlet *et al.* 1986, 27-30; Ambers *et al.* 1986, 25-26). Furthermore, the peat profile of the east facing section which was used to obtain pollen samples and analyse peat stratigraphy associated to Lindow III whose leg was encased in a block of peat, showed an upper deposit of pool mud at 45.5-48.5cm (Branch and Scaife 1995, 19-30). A second sequence of pool mud was identified in the pollen analysis diagram relating the sediments (Branch and Scaife 1986, 22-23).

The new data from this research has not classified two successive sequences of degraded pool muds within one core profile. However, pool muds were present in cores T4c7, T3c3, T3c4. Most likely any upper stratigraphy that contained evidence of further mud pool sequences that could be correlated across the stratigraphy to Lindow II findspot have been removed by peat cutting in the area of Lindow Moss since the NWWS in 1997 and excavation of Lindow II in 1986 and further investigations on finding Lindow III in 1995. From below the scarp towards the west formation of pools, open water and water inundation seems to cluster along this central area across Lindow Moss out towards the channel feature or depression in the north western edge of the bog basin.

There is now new information about the northern edge of the south area of Lindow Moss. In this area the formation of the bog landscape began as a wood peat on the edge near the modern trackway and acidic bog of *Sphagnum* and reeds. Around the area of core T5c2 freshwater reed marsh dominated bog landscape development. In comparison just 29m away from Lindow II findspot development of the bog landscape was acidic *Sphagnum* bog with open water and pools. Followed by wood peat showing a fen carr woodland. Reconstruction of the formation of the bog landscape from new data acquired by this research has paralleled analyses of coleopteran by Girling (1986). Supporting evidence of pools around the area of Lindow II's findspot and across the bog. Species of Hydrophilids were present, aquatic Scirtidae and Caddisfly larvae are found in weedy pools and correspond with the peat stratigraphy from this research (Girling 1986). Presence of woodland was supported by *Rhychaenus* and *Rhyncolus Lignarius* species of fossil beetles specifically associated to trees (Girling 1986). Analyses of Dipterous remains also demonstrated there were pools (Skidmore 1986). Generally, in the south area of the bog basin, formation of the bog landscape was followed by *Eriophorum* except on the northern edge of the basin of which heather peat developed. Species of fossil beetles that were specific to *Eriophorum* correspond with this phase of vegetation in this area (Girling 1986).

The presence of charcoal in five core profiles on Lindow Moss have been identified in cores T1c2, T1c3, T3c1, T3c6, T5c3. Four cores containing charcoal were clustered around the north east area of the bog. The fifth core T5c3 was located south 29m away from the findspot of Lindow II. Charcoal identified in the peat profiles of this study may relate to natural lightning strikes seen on relict scorched pine boles on Lindow Moss during fieldwork and macroscopic particles may have settled into existing sediments at that time. Although, pollen analyses of Lindow Moss has demonstrated that the area was subject to anthropogenic forest clearance and burning approximately 4980±70 BP (HAR-8875), it seems more likely to represent this (Birks 1965; Oldfield *et al.* 1986; Branch and Scaife 1995).

The presence of charcoal from the research of this thesis corresponds to deposits of macroscopic charcoal identified throughout the stratigraphy in the NWWS cores across Lindow Moss (Leah *et al.* 1997, 63). Furthermore, excavation of the western sand island on Lindow Moss revealed a layer of charcoal rich soil which was radiocarbon dated to approximately 3970-3640 cal BC early Neolithic (HAR-8875) (Turner 1995, 17). It is unclear if these charcoal deposits from this study relate directly to same event identified by Turner (1995) on the western sand island.

However, it does seem likely that charcoal classified by this research is probably related to burning of vegetation on the western sand island or wider area of Lindow Moss because during fieldwork it was evident that relic tree stumps exhibited some features related to burning. This observation correlates with the NWWS (Leah *et al.* 1997).

The presence of charcoal deposits in the peat profiles of Lindow Moss also parallels macroscopic pinewood on Danes Moss, Walkers Moss and White Moss which indicate these areas were subject to burning of woodland (*ibid*) Whether, this was natural, manmade and accidental or deliberate burning of woodland, all are possible (Leah *et al.* 1997).

The findings from this research have differed from the study of Tumbeagh bog. The hydrological development of the bog lake on Tumbeagh was established, and bog bursts identified at different phases of its development (Casparie 2006). In contrast, on Lindow Moss, there was not a bog-lake and no bog bursts were identified. Data that indicates a bog burst are the lack of rooted or floating plant species in the peat stratigraphy and presence of algae that would suggest clear-water environment (Casparie 2006). Coleopteran analyses would indicate a decrease in species associated to fen peat showing a drop in bog water-table occurred (Casparie 2006). However, the new data on the pre-peat landscape and development of the bog landscape has yielded valuable information that contributes to Lindow II's depositional biography of which was not previously known.

This work has increased our understanding of the pre-peat landscape of Lindow Moss and the development of the bog landscape. Some of the findings from this research (above) have partially paralleled aspects of (charcoal, muds, pools) from previous studies.

7.7 Development of the Bog Landscape on Bjældskovdal Bog

The originality of this research is further supported by the new data generated on the development of the bog landscape on Bjældskovdal bog. Previous studies on Tollund Man have centred on the investigation of the corpse (Helbæk 1951; Thorvildsen 1951; Thorvildsen 1962; Glob 1969; Fischer 2012; Nielsen *et al*. 2018).

Troels Smith's unpublished pollen and peat stratigraphy analysis was limited to an area some distance from the findspot of Tollund Man in a discrete section of the bog (Nielsen pers. com. 2018). These results have established the development of the bog landscape across a wider area of Bjældskovdal bog and gained new information.

The formation of the bog landscape began as acidic *Sphagnum* bog, and this persisted across the bog north to south. *Sphagnum* was more concentrated in the central area of Bjældskovdal bog. This was generally followed by the formation of modern reed and sedge peats that represented the development of the modern bog landscape and of which indicated freshwater landscape conditions now predominate.

Although, on the northern edge of transect 1b the development of the bog landscape started as reed marsh at core T1c5 and sedge at T1c1 demonstrating freshwater landscape conditions in these areas. It is entirely possible that these deposits of reed and sedge peats in cores T1c5 and T1c1 may represent modern peats post drainage.

The new data from this research has demonstrated in the southern area of the Bjældskovdal bog, cores in transect 3 showed *Sphagnum* in a sandy silty matrix which indicated there was an increase in water and redeposited sediments in the stratigraphy of three cores. Additionally, peat stratigraphy of core T3c9 demonstrated water inundation, with sandy organic deposits in the southern area of transect 3. This probably may have arisen from an increase in water run-off from a channel or valley slope that was located south in figure 6.24 due to erosion and agricultural development at that time. Alternatively, it suggests the river channel was more active at this time and in this area.

The information from Troels Smith's cores have shown generally that the bog landscape in a discrete area of Bjældskovdal bog was predominately acidic bog. The findings of this research has established the formation of the bog landscape across the wider area of the bog and identified areas of acidic bog and freshwater landscape development. Furthermore, identification of modern reed and sedge peats have informed us of the modern landscape which developed afterwards. Water inundation has been demonstrated through the southern area of transect 3 and provides valuable information about the development of Bjældskovdal bog that was not previously known before this research.

Through the central area of the bog at core T1c9, formation of heather peat was demonstrated in this area. Heather peat was not identified in any other core on Bjældskovdal bog, core T3c9 was located approximately 17m south of Tollund Man's findspot.

If the data from Troels Smith's notebook is considered, the discrete area surrounding Tollund Man's site of deposition, according to core A and B showed the hydrosere was acidic bog of *Eriophorum* and heather peat. This suggested fluctuating water levels, drier phases and variations in formation of the bog landscape across the bog basin. The significance for the deposition of Tollund Man is that the bog landscape was predominately acidic bog with open water and shallow pools that may have been difficult to access across the bog, especially during autumn and winter. Furthermore, the variations demonstrated landscape development across the bog at the time would mean that it was most likely unpredictable terrain to negotiate and perhaps during the summer season may have been possible.

In general, the development of the landscape on Bjældskovdal bog was comparable with Hatfield Moors because the remaining peat types identified were similar to Bjældskovdal bog and both sites were extensively cut for peat (Chapman and Gearey 2013, 65). One aspect of this study demonstrated on Hatfield moors it was predominately an acidic bog (Chapman and Gearey 2013). Although, very little variations in the peat stratigraphy was demonstrated on Hatfield Moors due to the cutting of peat removing most of the peat deposits (Chapman and Gearey 2013). The research for this thesis is different because the study of the development of the bog landscape has provided new information that helps to understand the landscape context of Tollund Man. Significantly, it identifies the development of the bog landscape and shows the conditions of the bog in relation to the location of Tollund Man and the impact of accessibility in that area of Bjældskovdal bog. The development of the landscape on Bjældskovdal bog has shown it parallels the research by Walker (1970), in that the hydrosere of raised bogs was complex and varied. The formation of the bog landscape across Bjældskovdal bog varied in location and through time.

New information has been demonstrated by evidence of lake bottoms, or open water approximately 5625-5483 cal BC (UBA-32482). On Bjældskovdal bog basal deposits of very well humified black peat were identified in cores across transects 1-3 and were concentrated in the northern central area of the bog extending to the southern area. These deposits represented the bottom of open water where sediment accumulation started approximately 5625-5483 cal BC (UBA-32482) in the east and around 3636-3504 cal BC, 3428-3381 cal BC (UBA-32485) in the western area. No further sequences of pool formation across the bog was able to be identified because the peat profiles had been removed and thus evidence of variations in the hydrosere temporally have been lost.

There are limitations to consider in relation to formation of the bog landscape on Bjældskovdal bog. As the peat archive is no longer complete due to the cutting of peat. An estimated 2-4m of peat has been removed from Bjældskovdal bog (Chapman *et al.* 2019). This means that information from peat stratigraphy related to the development of the bog landscape has been removed. Furthermore, palaeoenvironmental data related to landscape conditions and surface wetness on Bjældskovdal bog is at the moment unknown; research is still under way by the University of Birmingham on deposits sampled from a relic peat baulk.

On Bjældskovdal bog there were no charcoal deposits identified in the peat stratigraphy. This may be attributed to a different type of vegetational history. Specifically, no burning of vegetation occurred surrounding this area or there were a lack of lightning strikes. Alternatively, charcoal deposits have not been visible in the peat record because much of the peat stratigraphy of Bjældskovdal bog has been removed through the cutting of peat and evidence of burning has perhaps been lost.

On Bjældskovdal bog peat profiles from this study were examined and deposits of wood peat which related to a fen carr landscape were not classified in the peat record. This may be attributed to removal of the peat record due to cutting of peat and thus the evidence for a fen carr phase has vanished. Alternatively, fen carr may not have developed in this area of the Bølling lake system. Currently the modern landscape of Bjældskovdal bog has woodland on the edges of the valley slopes. As you walk through to the bog area some tree boles are standing in the periphery of the wet bog edge. The general vegetational history of Denmark has shown the landscape was birch and pine woodlands and later lime, oak, hazel, alder and elm were established (Fischer 2012, 58). Open landscape returned during the During the Neolithic period when forest clearance the landscape was open fields representing agriculture(*ibid*).

7.7 New Radiocarbon Dates of Peat Formation

New data has been gained from this study. This study has obtained new radiocarbon dates from samples of peat taken from cores on Bjældskovdal bog during this research. The inception of peat development has been established on Bjældskovdal bog (above). Formation of peat began in the Neolithic period approximately 5625-5483 cal BC (UBA-32482) nearest to the area of the findspot of Tollund Man at core T1c15 (east). This date was around 2000 years earlier than peat formation nearest to the Bølling lake system which was dated to approximately 3636-3504 cal BC 3428-3381 cal BC at 95.4% confidence interval (UBA-32485) from organic deposits at the base of core T3c15 (west).

Nearest the Bølling Lake system (west) core T3c15 has demonstrated that peat inception in that area of the bog formed approximately 2000 years later than in the eastern section at T1c15, the peat baulk that T3c15 was sampled from has provided a sequence of radiocarbon dates of peat (see figure 6.25). The samples range from the top of the core to approximately 916-815 cal BC (UBA-32483). Furthermore, from the middle of the core dates were approximately 777-291cal AD 807-819 cal AD 825-242 cal AD 862-990 cal AD (UBA-32484) at 95.4% confidence interval.

The radiocarbon dates from the peat profile of core T3c15 have shown in the western area of Bjældskovdal bog formation of peat began around 3636-3504 cal BC, 3428-3381 cal BC (UBA-32485) and continued to develop to approximately 916-815 cal BC (UBA-32483). It seems likely that upper younger peat deposits have been lost due to cutting of peat. On Bjældskovdal bog the radiocarbon dates for the development of peat was not previously known, so new information has been achieved from this study and contributes to our understanding of the bog landscape.

Even though radiocarbon dating peat should be easy because it consists of the remains of plants that have grown within the localised area where peat has developed (Blaaux *et al.* 2004), penetration of rootlets from a higher layer of peat which was younger into an older layer beneath it may yield younger radiocarbon dates in peat samples as a result (Shore *et al.* 1995). Other issues that potentially affect radiocarbon dating samples of peat are that peat may be a mixture of sediments that are different ages such as, fine organic matter that has drifted into the peat matrix, charcoal, rootlets from an above layer of sediment and fungal mycelium (Kilian *et al.* 1995; Shore *et al.* 1995; Nilsson *et al.* 2001).

A study to investigate the reservoir effect in peat bulk sampling on raised bogs was carried out by Blaaux (*et al*. 2004). This was established from five peat bulk samples taken from Engbertsdijkksveen, Netherlands which were Wiggle-Match Dated (WMD) using high resolution sequence of AMS ^{14}C dates of cleaned and selected plant remains

(Blaaux *et al.* 2004, 1539). The same peat core was sampled conventionally, and radiocarbon dated without removing any rootlets (*ibid*). The results demonstrated that there was no reservoir effect and radiocarbon dates from the study were the same as AMS ^{14}C dates of specifically selected and cleaned plant remains from the same levels (Blaaux *et al.* 2004, 1539-40). Blaaux *et al.* (2004) concluded that radiocarbon dating peat samples can be accurate.

If the above limitations and strengths of radiocarbon dating peat are considered in relation to core T1c2 which yielded at date of 41 cal BC-87 AD, 106-120 AD (UBA-32481). In contrast, core T1c15 was dated to approximately 5625-5483 cal BC (UBA-32482). Above the sampled layer in core T1c2 it was possible that modern peat which lay above may have contributed to a younger radiocarbon date when compared to the dates of T1c15. Although no rootlets were described in the lithology and the peat sampled was basal well humified dark peat in T1c2, perhaps a mixture of different sediments with a variety of ages, organic material which drifted into the peat matrix of T1c2 contributed to the differences in the two dates of cores T1c2 and T1c15 (Kilian *et al.* 1995; Shore *et al.* 1995; Nilsson *et al.* 2001). However, given that Blaaux *et al*. (2004) have postulated that radiocarbon dating peat samples is accurate, in this study it is suggested that T1c2 has a significantly younger radiocarbon date because most of its peat profile has been removed in this area during peat cutting activities and peat continued to accumulate. At core T1c15 peat cutting activities have not stripped the older basal peats so severely in this area of the bog and has yielded an older date to indicate peat inception.

Interpretation of radiocarbon calibration curves can be problematic these can be generally associated to age-reversals and plateaux (Blaaux *et al.* 2007). However, these characteristics of calibration curves can provide accurate age-depth radiocarbon dates for peat samples by using WMD (Clymo *et al.* 1990; Christen *et al.* 1995; Kilian *et al.* 2000; Mauquoy *et al.* 2002; Blaaux *et al.* 2004). It has been demonstrated that Wiggle-Match Dating is a more accurate application for radiocarbon ages than using calibrated dates for peat deposits (Blaaux *et al.* 2007). This is a relevant factor to consider when dating samples of peat.

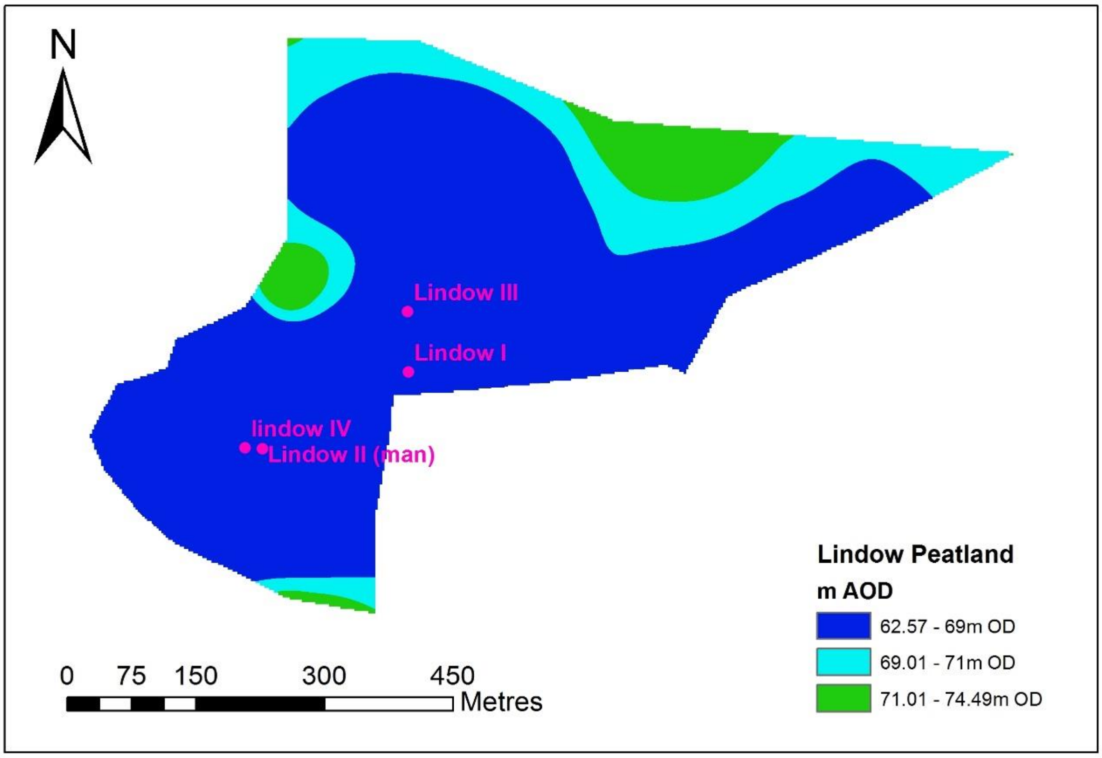
The earliest dates for peat formation and continued development has been demonstrated in the central area where elevations were lowest see DEM figure 6.20.

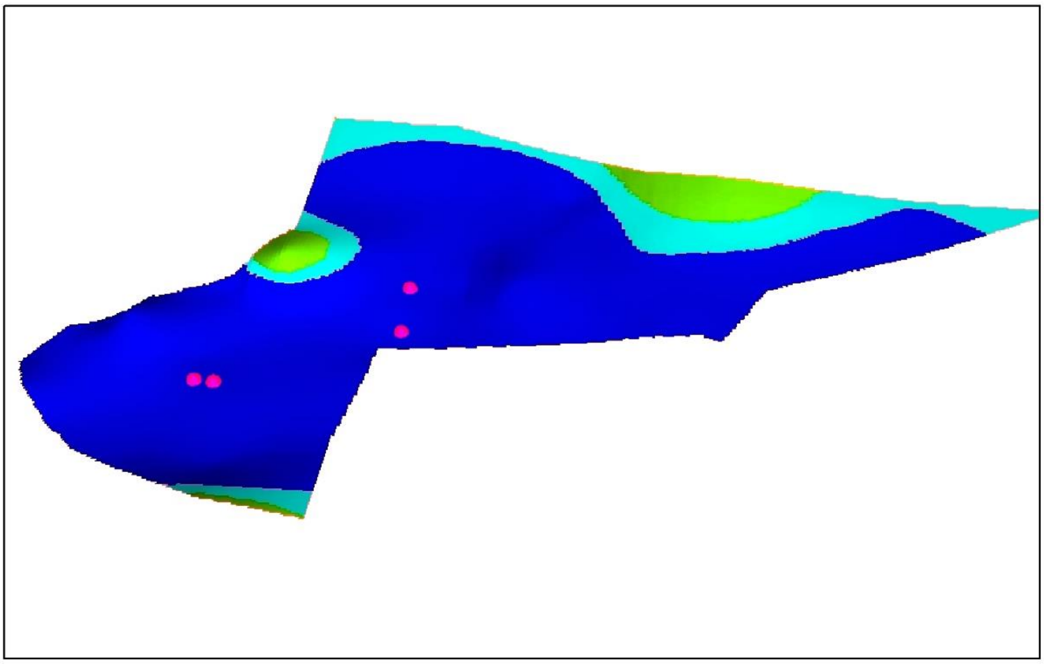
7.8 Reconstruction of the Shape of the Underlying Bog Basin and the positions of Lindow II within it

Previous research on Lindow Moss have focussed on the palaeoenvironmental depositional context of Lindow II and Lindow III (Stead *et al*. 1986; Turner and Scaife 1995). Whereas, the NWWS has investigated the wider area of Lindow Moss and surrounding Cheshire wetlands (Leah *et al*. 1997). The findings from the research for this thesis have established new data in relation to the location of Lindow II within the extent of the contemporary peatland in figure 7.3. of which was unknown before.

A hypothetical elevation of Lindow II has been calculated (see methodology) at a minimum depth of 69.80m-70.0m OD and this elevation of the body at the time of deposition has also provided the minimum level of the extent of the peat landscape contemporaneous to Lindow II. Although the minimum peatland extent may have been slightly lower due to the compression of peat. The edges of contemporaneous peatland in the DEM ranges between 69.08m-71.17m OD. Chapman (2015) has already created a hypothetical edge of peatland contemporary with Lindow II based solely on legacy data from the NWWS (Leah *et al.* 1997). Whereas, this research has combined both the NWWS data with new peat stratigraphy surveys carried out on Lindow Moss.

Analyses of the positions of Lindow I and Lindow IV within their contemporary peatland is hypothetical as they were found approximately in the areas shown below but not *in situ* (Stead *et al.* 1986, Turner and Scaife 1995). Based on the locations obtained from HER Cheshire East data Lindow I was approximately in the central area of the peatland (above). Access to the place of deposition was probably from the nearest peatland edge of Lindow Moss at that time, from the western edge (141m). Lindow I was 335m from the north eastern edge and around 273m from the southernmost.





First Century Peatland 3D vertical exaggeration x 2

Figure 7.3 Lindow II Contemporary Peatland Extent 1st Century AD 69.80m-70m OD

Lindow IV was positioned approximately equal distances from the north (179m) and south (171m) edges of Lindow Moss bog landscape, access on to the bog may have been from either north or south edges. Lindow IV and Lindow II were both equal distances from northern and southern edges of the wetland and considerable distances from the periphery.

Analysis of the placement of Lindow II in his contemporary peatland has revealed striking results. Lindow II was placed in the centre of the peatland equal distances from the northern and southern dryland edges.

Lindow III was placed nearer the north western peatland edge and at least 348m away from the northern edge and 106m from the western edge. It is clear that Lindow III was placed a substantial distance from the northern and western edges. Furthermore, Lindow II was placed 164m from the north edge and 169m from the southern peatland edge.

This invariably has an impact on the interpretation of both bog bodies. It means that the locations Lindow II and Lindow III were deposited may have been deliberately selected, it was isolated and challenging to get to. Reconstruction of the bog landscape has demonstrated on Lindow Moss there was open water and pools across the site at the time the bodies were placed there. Across Lindow Moss the nature of the bog landscape was very variable and unpredictable. Barber (1986, 86-89) has already suggested surface wetness conditions showed that walking across Lindow Moss would have been fraught with difficulties. Trying to walk across the bog without sinking knee deep in water would have been impossible (Barber 1986). This means that access across the bog would have been difficult to navigate across safely. Unless there was prior knowledge of the bog landscape with safe routes to cross the bog. This evidence suggests the centre of Lindow Moss may have been specifically selected and their deposition may have been a planned event. If Lindow II and Lindow III were spontaneously and rapidly disposed of on Lindow Moss the quickest and easiest way would be to dump these bodies near the dryland edge.

It seems likely that access to Lindow Moss for the deposition of Lindow III may have been from the nearest edge in the first century AD from the eastern area of the bog. Access across the bog for the deposition of Lindow II is speculative especially as the body was positioned in the central area of the bog. Access to the place of deposition may have equally been from the north edge of the peatland or from the southern edge. Although there is no way of knowing this for sure, it is entirely hypothetical.

The most significant result from generating the shape of the underlying bog basin with the location of Lindow bodies within it and analysis of their placement in their contemporary peatland extent is that it has shown the bodies were considerable distances from the edges of dryland. The locations of Lindow II and Lindow III were in the central area of the bog that corresponded to the scarp in the east and episodes of pools and water inundation through this area and around the channel feature north west. These results indicate the location for the deposition of Lindow II was clearly difficult to get to. Through this central area of the bog basin formation of pools, scouring of water and water inundation was a feature in this area across the bog through the channel feature in the north west.

Access across to the central area of Lindow Moss would have been quite perilous. The development of the bog landscape (above) has demonstrated open water and pools through the centre of the bog. Further evidence of a wet landscape at the time of Lindow II's placement in the bog has been demonstrated by peat macrofossil analysis which indicated an increase in macrofossil plants that represented the development of widespread pools (Barber 1986, 86-89). Whilst pollen analysis of peat associated to Lindow II and Lindow III also indicated an increase in wetland vegetation such as *Sphagnum* moss (Oldfield *et al*. 1986; Branch and Scaife 1995).

It seems sensible to think that Lindow II's body may have been transported out to the central location of Lindow Moss by a log raft or boat. Or simply there was knowledge of a safe route across to the centre of the bog. There is certainly no evidence at this time of a wooden trackway across the central area of Lindow Moss or wood remains of log boats. Although, a wooden trackway documented by Norbury (1884, 65) seems to have been located on the Mobberley side of Lindow Moss although its precise location was unspecified. Alternatively, in the absence of trackways and wooden boats it is seems the only other way was to wade across on foot to the central area of the bog.

Lindow II and Lindow III were also placed in sight of the larger sand island to the north west of Lindow II 71.01-74.49m OD and the scarp in the north east 71.01-74.49m OD. The sand island and scarp may have provided an area that was sufficiently elevated to view the killing of Lindow II and Lindow III. However, this seems unlikely from the evidence gained from the formation of the bog landscape as the surface of the bog was wet with open water and pools. Localised environmental landscape conditions around the area of Lindow II findspot has also demonstrated from the palaeoenvironmental record a very wet landscape of pools at this time (Barber 1986, 86-89; Oldfield *et al*. 1986; Branch and Scaife 1995). This means that accessing the larger sand island and scarp may have been very difficult indeed.

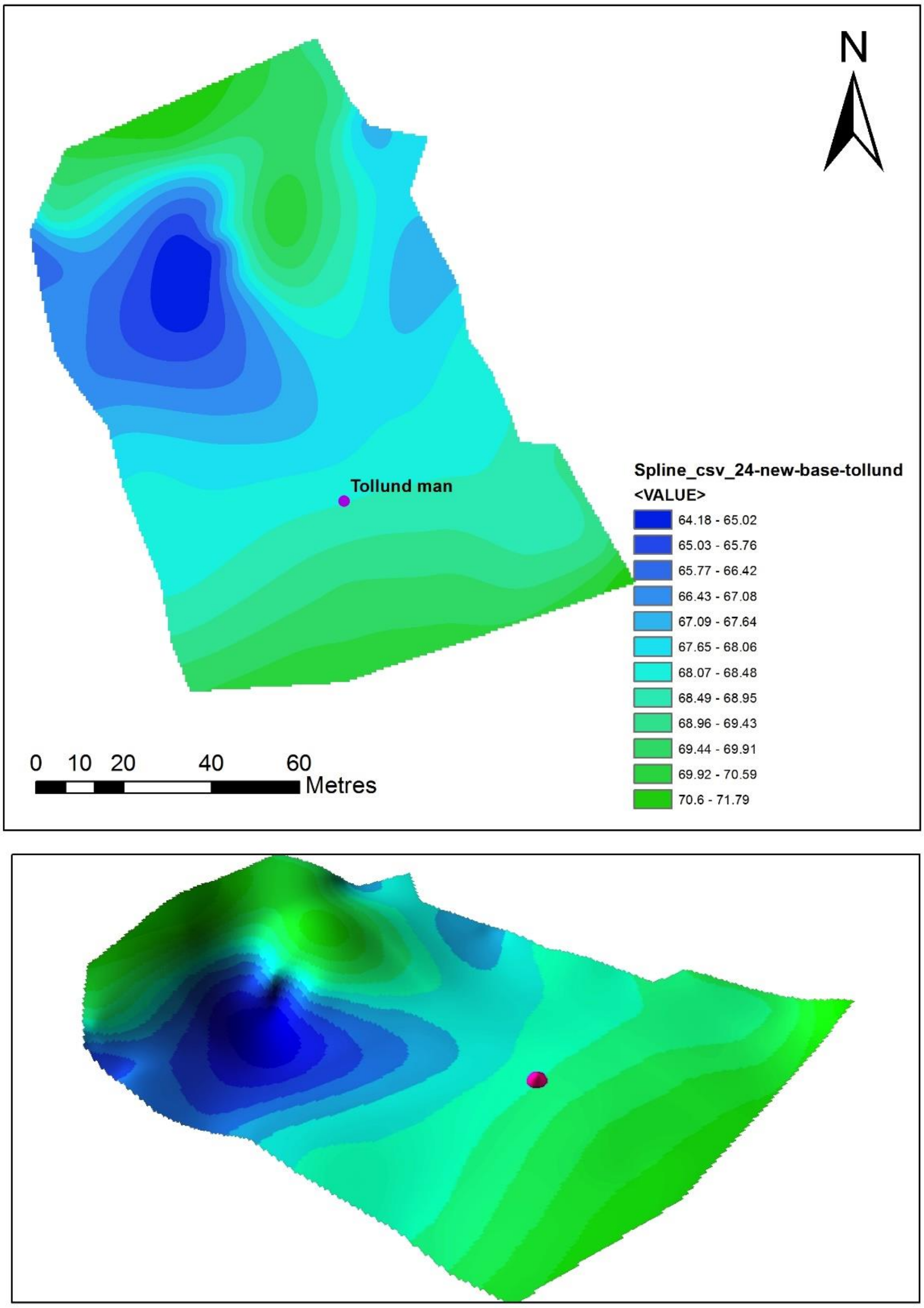
Lindow II and Lindow III seemed to be located in an area of Lindow Moss that would periodically have water flowing from the scarp running through the central area where the bodies were placed towards the channel feature. Perhaps Lindow II and III were deliberately placed where water flows and accumulates because Lindow Moss was a natural landscape, possibly a place that was of special significance (Bradley 2000).

The selection of the location of Lindow Moss for the killing of Lindow II and Lindow III was distinct in that there was no immediate surrounding settlement where there was a focus of daily domestic activities such as, butchery of animals for consumption, disposal of food waste (Van Gennep 1992). Although within the wider landscape surrounding Lindow Moss pollen data indicated cultivation of crops in small areas (Oldfield *et al*. 1986; Branch and Scaife 1995). Furthermore, Lindow II and Lindow III seem to have no direct association to a boundary in their landscape as they are not deposited on known boundaries, unlike bog bodies in Ireland deposited on tribal boundaries (Kelly 2006a; Kelly 2006b). However, it may be possible that Lindow II and Lindow III were deposited in tribal boundaries, but at the moment there is no evidence for this. Additionally, Matthews (2006) argued at the time that bog bodies were deposited on tribal boundaries of the Deceangli.

7.9 Reconstruction of the Shape of the Underlying Bog Basin and the position of Tollund Man and Elling Woman within it

The results from this study have generated new information associated to the location of Tollund Man within his contemporary peatland extent. The DEM below in figure 7.4 shows the underlying bog basin and the position of Tollund Man within it. The position of Tollund Man within the peatland extent at the time of placement in the bog has been established. The elevations of Tollund Man's peatland extent at that time was 69.92-70.79m (figure 7.4). A hypothetical elevation of Tollund Man is now known and is around 70m (Chapman *et al.* 2019).

The elevations for Elling Woman have been based on the data by Fischer (2012, 84) whereby, the elevations range between 67.35-68.43m so the elevation of Elling Woman was likely to be approximately 68m (Chapman *et al*. 2019).



View looking north east- Vertical exggeration x 2

Figure 7.4 Location of Tollund Man contemporary peatland extent 68.48-69.50m.

Estimating the elevation of Tollund Man has been difficult related mainly to the accuracy of the position of the body within the bog and the elevations themselves. Despite these difficulties an estimated height and hypothetical contemporaneous edge of the bog landscape has been postulated.

At the time of Tollund Man's deposition the edge of the peat extended across the bog north to south and was 141m wide. Tollund Man was placed approximately 64m from the southern dryland edge of the bog and 91m from the northern edge. Tollund Man was probably placed further into the central area of his contemporaneous bog.

The information we now know about the position of Tollund Man was that he was a considerable distance from the dryland edges in the north and south of Bjældskovdal bog. Accessibility across the bog area Tollund Man was placed would have been difficult. The importance of this new information is that it means Tollund Man was placed in a location that was selected well away from easier to access edges of dryland. Additionally, disposing of a corpse spontaneously along the dryland edges would suggest an unplanned killing. Getting to the central area of the bog may have been on foot trudging through the wet bog landscape and pools. Alternatively, by using a wooden log boat although there has been no evidence to support this suggestion and it may not have been wet enough.

The development of the bog landscape on Bjældskovdal bog has shown that across the bog was a landscape of predominately acidic bog with open water and pools. Accessibility across the bog was clearly difficult throughout prehistory as demonstrated by the remains of the wooden trackway running across the widest part (van der Plicht *et al*. 2004; Fischer 2012). The precise location of the trackway is unclear. The wooden trackway was dated 780-520 cal BC (GrN-22994 and GrN-23165) was in use at least two centuries prior to the deposition of Tollund Man (van der Plicht 2004; Fischer 2012). If the trackway was still intact and the structure secure enough to use at the time of Tollund Man's deposition; it would have been possible to access the bog by walking across the trackway to the area where he was placed. However, the trackway may not have been in use at the time of Tollund Man's death. It is suggested that the mechanism to access the central area of the bog where Tollund Man was placed, was by walking across the bog landscape through open water and pools. This implies there was familiarity with the bog landscape on Bjældskovdal bog because Tollund Man was placed in an old peat cutting and knowledge of the bog landscape was probably needed to safely walk across the bog. As well as identify the location of the peat cutting to place the body within it.

The location and difficulty in accessing this area of Bjældskovdal bog in order to deposit the body suggests it was chosen as a special place, it was approximately 1.8km away from settlements, domestic activity and burials (Van Gennep 1992; Bradley 2000). On balance the evidence seems to indicate Bjældskovdal bog was a place with special nuances during the Iron Age period as three bog bodies were found here.

In the case of Elling Woman the fieldwork data from this research which has generated the DEM of the pre-peat landscape may not have extended far enough to encompass the approximate findspot. According to the coordinates from Silkeborg Museum the location of the body was in an area of Bjældskovdal bog that was fenced off. The locations of Elling Woman and Tollund Man are not entirely accurate (pers. com. Nielsen 2018).

Digital data files from Silkeborg Museum position Elling Woman 110m east from Tollund Man. Fischer (2012, 18) located Elling Woman 40m from Tollund Man and then Fischer (1979) sites her as 92m east from Tollund Man. However, Nina Helt Nielsen (pers. com. 2018) suggested 70m east.

If the findspot of Elling Woman was between 60-110m east of Tollund Man's place of deposition a hypothetical estimation of the body's position in relation to contemporaneous edges can be postulated with caution. If the elevation of the body was approximately 68m (Chapman *et al.* 2019) the contemporary peatland extent at the time the body was deposited in the bog was 67.65-68.06m. If the body was placed 110m east from Tollund Man, Elling Woman was 50m west and 65m south west of the edges of the bog landscape at the time. If the location was 60m from east of Tollund findspot Elling Woman was 17m south and 16m north west of contemporaneous edges of the bog. At 70m distance from Tollund Man's position Elling Woman was 26m from the south west edge and 47m from the western dryland edge.

All three possible locations of different distances from Tollund Man place Elling Woman approximately equidistant from contemporaneous dryland edges of the bog landscape. This means that the location was potentially difficult to gain access across the bog landscape and indicates that this area of the bog was perhaps chosen for its seclusion rather than randomly disposing of the corpse on the very edge of the bog.

This research has investigated the broader landscape context of Tollund Man and the results have generated new data that is different from previous studies. Chapter 1 and 2 have outlined the lack of wider landscape research on bog bodies. Recent research on Tollund Man has yielded new radiocarbon dates from bone collagen of 405-380 cal BC and information related to diet (Nielsen *et al*. 2018). Whereas, Pollen analysis of the area around Dätgen Man suggested he was deposited in a small pool and no further bog landscape investigation was undertaken (Aletsee 1960). The local landscape context was broadly revealed in the stomach contents of Zweeloo Woman, consisting of different types of cereals and predominately blackberry pips that may have grown within the landscape in which she lived (van Zeist 1956; Holden 1990). These cereals consisted of *Triticum/Secale* commonly known as wheat or rye, *Hordeum* sp. (barley) and *Avena* sp. (oat) flax and *Brassica* (cabbage) and probably grew within the general area surrounding Zweeloo Woman and was consumed before she died (van Zeist 1956; Holden 1990). The information related to Dätgen Man and Zweeloo Woman has mainly focused on the analysis of the body and limited information associated to local landscape and vegetation.

The originality of this thesis is further supported by a study by Burmeister (2013), he has moved away from the local findspot area and investigated the distribution of bog bodies across northern Europe. Burmeister (2013) evaluated the positions of bog bodies in relation to the size of the bogs in which they were deposited and their distances from the edges.

However, the research for this thesis was different because analyses of the locations of bog bodies in relation to their contemporary peatland extent at the time they were deposited in the bog was calculated from elevations of the bodies and peat stratigraphy information. As well as establishing the morphology of the bog basin and evaluation of the surrounding cultural archaeology. Additionally, this thesis has reconstructed the development of the bog landscape through prehistory.

In addition, a recent research study by Van Beek *et al*. (2019) demonstrated that Yde Girl was deposited in a bog that was close to the area she may have lived, she was not placed in a secluded or remote area separate from contemporary settlements (Van Beek *et al*. 2019). Whereas, this research has shown the location chosen to place Tollund Man was in a relatively central area of Bjældskovdal bog well away from the dryland edges in an area that was isolated and difficult to gain access.

On Uchter Moor palaeoenvironmental analysis of the bog in which Moora Girl was found enabled a three dimensional reconstruction of the Iron Age moorland (Bauerochse *et al*. 2018). The extent and height of the peatland spread was significantly reduced at the time of Moora Girl's lifetime compared to when the bog was at its maximum expansion (Bauerochse *et al*. 2018). There was potentially more dryland available surrounding the bog that may have been used as settlement areas (Bauerochse *et al*. 2018). The study by Bauerochse *et al*. (2018) has also carried out new scientific and forensic analysis of the body of Moora Girl to enrich understanding of this bog body. The study carried out by Bauerochse *et al*. (2018) was a rich and detailed multidisciplinary investigation. Whereas, on Bjældskovdal bog palaeoenvironmental analysis of the site is currently being investigated by the University of Birmingham on a small scale. Furthermore, the research carried out on Bjældskovdal bog has generated a three dimensional model of the pre-peat landscape of the bog basin and has determined the positions of Tollund Man and Elling Woman in their extent of peatland at the time of deposition as well as spatial exploration of their distances from dryland edges.

7.10 Cultural Archaeology Within 5km of Lindow Moss

The archaeology that has been identified within a 5km area of the study site is now known. Apart from the Lindow bodies, an iron pin and the remains of a *Bos taurus* jaw (SMR 1472/0/1) found on Lindow Moss very little has been identified. The nearest cultural archaeology was the wooden trackway (SMR 1472/0/2) mentioned by Norbury (1884) no physical evidence of the trackway has been identified to confirm Norbury's (1884) report at this time.

Analysis of records from Lindow Moss has demonstrated there was a paucity of cultural archaeology. If the wooden trackway is not taken into consideration because it has not been securely provenanced. It is suggested that within a 5km radius there was no cultural archaeology surrounding Lindow Moss. Lindow II and Lindow III were placed in a location that was isolated and special (Van Gennep 1992; Bradley 2000). Lindow II and Lindow III may have travelled into the area of Lindow Moss from further afield, but at this time it is unclear how far away this may have been. Strontium analysis of tissue or bone belonging to Lindow II and Lindow III may elucidate more information (Nielsen *et al.* 2018).

In Britain during the Iron Age there were different types of settlements with regional differences, which reflected the increasing population, changes in land use, complex social structure and territorial restructuring (Cunliffe 2005). Hillforts represented a highly organised social group of the area and were later replaced by Oppida (Cunliffe 2005). In the wider Cheshire county within 29km from Lindow Moss different types of settlements have been identified contemporary to Lindow II, Great Woolden Hall, Longley Farm and Eddisbury Hillfort.

Burial rites were diverse across Britain and reflected complex social and cosmological practices and beliefs (Whimster 1981; Cunliffe 2005; Harding 2016). The majority of Iron Age burial rites are difficult to identify in the archaeological record (Whimster 1981; Cunliffe 2005, Carr 2017). Specific burial rites have been identified from excavations; wider common burial practices are unknown at this time for the broader population (Whimster 1981; Cunliffe 2005; Harding 2016, Carr 2017). It is possible that the deposition of Lindow II and Lindow III were one aspect of these complex burial rites identified in Britain at places such as Danebury, Hampshire and represent the intricate practices and cosmological belief systems of Iron Age people.

Weapon hoards and votive deposition of objects were widely practiced in Britain. Within Cheshire 16km from Lindow Moss a rare Bronze strainer probably Late Iron Age in date, (Pers. Comm. J. Farley 2019) was found in Risley Moss and a wooden figurine in Oakhanger Moss 22km away (Coles 1993). These votive objects suggest the wider Cheshire wetlands may have held special significance as a ritual landscape during the Iron Age.

7.11 Cultural Archaeology within 5km of Bjældskovdal Bog

On Bjældskovdal bog cultural archaeology within a 5km area has shown that wooden implements and a wooden trackway have been found on the bog, their findspot locations are approximate (Glob 1969; Fischer 2012; Pers. Comm. N. Nielsen 2017). A wooden post from the trackway has been radiocarbon dated to approximately 780-520 cal BC (GrN-22994, GrN-23165) which was considerably older than the bodies (van der Plicht et al. 2004). The age of the wooden trackway suggested that prior to deposition of Tollund Man the bog landscape was very difficult to cross (Glob 1969; van der Plicht et al. 2004; Fischer 2012).

However, except for the bog bodies and wooden implements within 1.8km radius of Bjældskovdal bog there was a distinct scarcity of cultural archaeology. There was cultural archaeology such as, settlements and evidence of activity and burial that have been investigated by previous excavation and assessment within an area of 1.8-5km from Bjældskovdal bog. Unlike Yde Girl who was placed in bog that was very close to potentially inhabited settlements (Van Beek *et al.* 2019).

Tollund Man and Elling Woman were deposited in the bog which contained archaeology such as wooden implements used for cutting of peat and a wooden trackway, evidence of settlements and burial were 1.8km distance from the bog. Tollund Man and Elling Woman were placed in a remote and distinct site which was separate from settlement areas (Van Gennep 1992; Bradley 2000).

Burials rites in Denmark were mainly cremation and inhumation practiced alongside each other with geographical variations (Hedeager 1992). In Tollund Man's region north Jutland, cemeteries were significantly smaller compared with south Jutland (Fischer 2012). Hedeager (1992) suggests that funerary rituals represented and strengthened regional and local identity, similarities and differences. However, the deposition of Tollund Man reflected a distinct rite which does not correspond with 'normal' burial practices (Glob 1969; Fischer 2012).

By evaluating the surrounding cultural archaeology within 5km of Lindow Moss and Bjældskovdal bog new information has been gained. The locations chosen to deposit Lindow II, Lindow III, Tollund Man and Elling Woman were special places and isolated.

7.12 The Research Successes of a Landscape Approach to Bog Body Investigations

The research successes achieved from the landscape investigation of Lindow II and Tollund Man demonstrated the value of this approach.

The research successes of this thesis were:

- The morphology of both bog basins were identified, analysed and modelled as DEMs, Lindow Moss was a kettle hole bog and Bjældskovdal bog was a valley bog.
- Development of the bog landscape on Lindow Moss and Bjældskovdal bog was established from the peat profiles of the borehole surveys.

- Reconstruction of the shapes of the underlying bog basins of Lindow Moss and Bjældskovdal bog and positions of Lindow II, Lindow III, Tollund Man and Elling Woman within their bog basin were achieved and analysed in relation to their locations from dryland.
- The contemporary extent of peatlands at the time of the deposition of Lindow II, Lindow III, Tollund Man and Elling Woman was attained and modelled in 3D DEM's.
- Analysis of the distances from the contemporary peatland edges showed Lindow II and Lindow III were located in the centre of the bog.
- Spatial analyses of Tollund Man's distances from the edges of his contemporary peatland extent revealed he was placed towards the central area of Bjældskovdal bog.
- Analysis of the cultural archaeology within 5km of Lindow II and Tollund Man have revealed they were placed in remote and special locations that were predominately archaeologically barren.
- Accessibility across Lindow Moss and Bjældskovdal bog to the central areas of the bogs would have potentially been difficult and perilous.
- The implications related to the locations of bog bodies in their contemporary peatlands suggest the mechanisms for emplacement may have involved accessing a wooden trackway, using a wooden log boat, raft or wading through the bog on foot to the central areas to place the bodies. This research has provided a springboard by which to explore different possible interpretations of

the deposition of Lindow II, Lindow III, Tollund Man and Elling Woman which have been generated from this thesis and to further develop by more research in the future.

- Further implications related to locations of bodies away from the dryland edges suggest these were planned and deliberate actions choosing a place that required great effort to reach. The bodies of Lindow II, Lindow III and Tollund Man were not disposed of randomly at the edges of drylands.

The results from this research has demonstrated that by investigating the wider landscape of Lindow II on Lindow Moss and Tollund Man on Bjældskovdal bog it has been possible to successfully reconstruct the bog landscape, identify the morphology of both bog basins and spatially analyse the positions of the corpse's from dryland at the time they were placed in their bogs. Additionally, assessment of surrounding cultural archaeology within 5km of both bogs, these combined data have generated new information which was unknown before. This has moved the research focus away from the forensic and scientific analysis of the body to the broader landscape context in which it was deposited. Furthermore, the work on Lindow Moss and Bjældskovdal bog have provided case studies by which a future framework to approach bog body landscape studies have been outlined (Chapman *et al*. 2019).

The implications for research on other bog bodies means that fresh information can be gained from a combination of archive data, previous archaeological research and borehole surveys of the bog and palaeoenvironmental analysis. Information of shape of the bog basin helps understand the development of bog landscape (Chapman and

Gearey 2013). Factors such as, accessibility across the bog landscape and how wet the bog landscape may have been contributes to how bog bodies may be interpreted in the future (Chapman and Gearey 2013). Especially, from analysis of the location of the bog body within the extent of peatland at the time of deposition and its position in relation to the edges of the peatland has immense value. Cultural archaeology provides context to the placement of bog bodies in their cultural landscape. A landscape approach to bog body research has great significance as demonstrated by the research of this thesis.

7.13 Summary of Chapter 7

In this chapter the results described in chapters 5 and 6 have been discussed in relation to the aim and objectives outlined in chapter 1. The limitations of a landscape investigation of both Lindow Moss and Bjældskovdal bog have been outlined for future reference. The physical and cultural landscapes have been investigated, new data related to the spatial and temporal relationship between the bog bodies and landscape established. The research successes of a wider landscape approach has been stated in relation to the research design of this thesis.

The following chapter 8 outlines the conclusions of the thesis in relation to the aim and objectives in chapter 1.

CHAPTER 8 CONCLUSIONS OF THESIS

Chapter 8 is structured to outline the main conclusions of the research in section 8.1. This follows with section 8.2 which describes the recommendations identified from this research to implement in future studies of bog bodies. Section 8.3 outlines the contributions to knowledge in the area of bog body research this thesis has made.

8.1 Conclusions

The research of this thesis is unique from other studies which have been carried out on bog bodies. It has generated new information that was different to research discussed in chapters 1 and 2. Modern studies on bog bodies have largely concentrated on forensic and scientific analysis of the preserved corpse. Although two studies have examined the findspot, that of Lindow II from Lindow Moss and Oldcroghan Man from Clonearl bog (Barber 1986, 86-89; Oldfield *et al.* 1986; Girling 1986, 90-91; Dayton's 1986; Skidmore 1986, 92; Oldfield *et al.* 1986; Branch and Scaife 1995; Plunkett *et al.* 2009) these studies have provided information about the immediate local landscape surrounding the bog bodies rather than their wider landscape.

Virtually no studies have looked beyond the bog body at their wider landscape context apart from the very recent comprehensive study of the landscape Yde Girl found placed in a bog in the Netherlands (Van Beek *et al*. 2019) and Tumbeagh Bog body in Ireland (Bermingham and Delaney 2006). The originality of this research has shown the value of a broader landscape approach to bog body research and its potential has been valuable.

This study has made an important contribution to the understanding of the landscape archaeology of bog body phenomenon in terms of both methodology and interpretation.

The pre-peat landscapes have shown both Lindow Moss and Bjældskovdal bog are valley type bogs and this has provided the basis by which to further understand the development of the bog landscape and generate new data of which the contemporary peatland landscape was created. A scarp on the north east edge of the basin and the channel feature in the western area on Lindow Moss was identified as distinctive characteristics of the pre-peat landscape. Whilst the nature of the pre-peat landscape on Bjældskovdal bog was shallow and narrow with a slightly deeper area in the north of the basin. The morphology of the pre-peat landscapes of Lindow Moss and Bjældskovdal bog were visualised as a DEM with the positions of Lindow II and Tollund Man position within their respective bog.

Analysis of the peat profiles on Lindow Moss has demonstrated the variations of the development of the bog landscape throughout prehistory and also in terms of location. Formation of the bog landscape in the eastern area began as wood peat, sedge and reed on the edge of the basin this continues for some time in this area. At the centre of the basin (west) a transition to acidic *Sphagnum* bog was demonstrated. Later development of the bog landscape was generally followed by *Eriophorum*. Whilst in other areas in the eastern section of Lindow Moss afterwards there was formation of sedge indicating a shift back to freshwater conditions.

In the south west section of Lindow Moss development of the bog landscape started as acidic *Sphagnum* bog with wood peat on the southern edge of the basin. This continued for some time in this area and generally followed by *Eriophorum*. Afterwards a transition to freshwater conditions with reed peats and bog bean were identified on the north western edge of the basin. Although acidic conditions may have persisted especially as in this area *Sphagnum* was predominate.

On the southern area of Lindow Moss development of the bog landscape started as wood peat on the edge near the modern trackway and acidic bog of *Sphagnum* with reeds. In the area around core T5c2 reed marsh predominated. Approximately 29m from the findspot of Lindow II began as acidic *Sphagnum* bog and wood peat. Generally, afterwards the bog landscape developed *Eriophorum* except on the northern edge of which was heather peat.

Formation of pools and pool muds are demonstrated clustered through the central area east to west from below the scarp out towards the channel feature in the west. Water inundation was probably influenced by the palaeochannels in the north of Lindow Moss, bog topography and general fluctuating water levels. Evidence of burning fen carr within the wider bog landscape was classified by the presence of charcoal.

In comparison, formation of the bog landscape on Bjældskovdal bog indicated it began as predominately acidic bog. However, the peat archive was incomplete, much of the stratigraphy evaluated represented modern peats and development of the modern landscape that was mainly freshwater marsh.

The bog landscape of Bjældskovdal bog has shown that peat accumulation began around 5625-5483 cal BC (UBA-32482) in the eastern area, in the western area peat formed approximately 3636-3504 cal BC, 3428-3381 cal BC (UBA-32485). There was no evidence of fen carr, charcoal or further sequences of pool development in the peat profiles examined. This may have been attributed to the depletion of the peat record from sustained peat cutting of this valley bog.

Spatial analysis of Lindow II in relation to the contemporary peatland extent yielded remarkable results. Lindow II was deposited in the centre of the peatland equal distances from the northern and southern dryland edges. Whilst Lindow III was significant distances from the edges of the peatland at the time of placement in the bog. Analysis of Tollund Man's distance from the extent of peatland at that time clearly demonstrated he was placed towards the central area of Bjældskovdal bog away from the dryland edges. Whilst Elling Woman was deposited approximately equidistant from contemporaneous dryland edges in the north west and south west. However, due to slightly inaccurate documented positions of Tollund Man and Elling Woman, potentially their distances from contemporary peatland edges and within the bog basin may vary slightly from the results of this research.

The implications of the results gained from spatial analysis of Lindow II and Lindow III indicates the locations for the deposition of the bodies was very difficult to access. The bog landscape on Lindow Moss has demonstrated the variations in landscape conditions and the unpredictable nature across the bog. Through this central area of the bog basin where Lindow II and Lindow III were placed formation of pools, scouring of water and water inundation was a feature in this area across the bog through to the channel feature. Access across to the central area of Lindow Moss would have been quite perilous.

Spatial analysis of the location of Tollund Man and Elling Woman have clearly demonstrated that accessibility across these areas furthest from the peatland edges would have been difficult to reach to deposit the corpses. The development of the bog landscape on Bjældskovdal bog has shown that across the bog was a landscape of predominately acidic mire with open water and pools. The presence of a wooden trackway running across the widest part of Bjældskovdal bog indicated accessibility across the bog was very difficult throughout prehistory (van der Plicht 2004; Fischer 2012).

The locations chosen for the deposition of Lindow II, Lindow III, Tollund Man and Elling Woman were an archaeological wilderness. Within a 5km radius surrounding Lindow Moss there was an absence of cultural archaeology. Lindow II and Lindow III were placed in a wetland location that was isolated and special (Van Gennep 1992; Bradley 2000).

The chosen location for Tollund Man and Elling Woman on Bjældskovdal bog of which contained little cultural archaeology. Apart from the bog bodies, wooden implements used for cutting of peat and a wooden trackway, this was a remote and distinct site which was separate from settlement and burial areas (Van Gennep 1992; Hedeager 1992; Bradley 2000; Fischer 2012).

The findings from this research has shown that by moving the investigation beyond the body and contextualising the bog body within its broader landscape generates new data for analysis and interpretation. The study has also demonstrated the potential for employing this methodology to the existing corpus of bog bodies for a refreshing and insightful approach which generates new information that enhances our understanding of bog body deposition in relation to their wider landscape.

8.2 Recommendations

Future research on Lindow Moss would benefit from sampling of the relict peat bulk adjacent to Lindow II findspot. This is to establish the stratigraphic sequence of sediments to assess the development of the bog landscape in this area. This would include palaeoenvironmental analysis of peat samples for testate amoebae to establish the extent of the surface wetness conditions across Lindow Moss. Analysis of peat samples for radiocarbon dates to determine date ranges from base of organics incrementally to upper layers of peat to provide a range of dates from the formation of peat onwards.

An additional borehole survey is recommended to examine the western area of Lindow Moss to fully examine the channel feature and identify further landscape information to integrate with this research. Additionally, further borehole survey in the south of Lindow Moss that is managed by the Cheshire Wildlife Trust as this area has not been investigated.

Palaeoenvironmental analysis of Bjældskovdal bog is necessary to complement the data from this thesis and to provide a full suite of data about the landscape environment which is currently lacking. At this time the palaeoenvironmental analysis of samples taken from a relict peat baulk on Bjældskovdal bog is underway.

On a broader scale future recommendations are to implement a wider landscape investigation of existing bog bodies and compare across each study the potential similarities and differences that are identified.

8.3 Contributions to Knowledge of Bog Body Research

This thesis has addressed the gap identified in bog body research. New data has been obtained from a wider landscape investigation of bog bodies on Lindow Moss and Bjældskovdal bog. The pre-peat landscape and development of the bog landscape has been carried out in areas of both bogs which have not been investigated. The positions of Lindow II and Lindow III on Lindow Moss and Tollund Man and Elling Woman on Bjældskovdal bog within the shape of their bog basin have been achieved. From this spatial exploration of Lindow II, Lindow III, Tollund Man and Elling Woman within their contemporary peatland extent at the time they were placed in their bogs have generated new data to contribute to the bog body debate.

A research framework for the wider investigation of bog bodies has been developed and outlined in an academic article to which the author has contributed (Chapman *et al.* 2019). Future research on Lindow Moss is planned as well as extending this approach to other bog bodies in the future.

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APPENDICES

Lindow Moss Borehole Stratigraphy Table

core	x	y	from	to	lithology
LinT1.c1	382226.3	380815.4	68.4	67.7	sphagnum moss with small wood inclusions
LinT1.c1			67.7	67.4	wood
LinT1.c1			67.4	66.3	sphagnum moss & wood monocot
LinT1.c1			66.3	65.4	phragmites & sphagnum moss
LinT1.c1			65.4	65.07	phragmites & sedge peat
LinT1.c1			65.07	64.9	grey silt clay
LinT1.c1			64.9	64.6	reddish brown sedge peat
LinT1.c1			64.6	64.7	grey silty sand
LinT1.c2	382281.9	380821.6	69.7	68.5	sedge peat & sedge monocot
LinT1.c2			68.5	68.46	charcoal
LinT1.c2			68.46	68.2	silty reed/sedge peat
LinT1.c2			68.2	67.8	sphagnum moss peat
LinT1.c2			67.8	67.7	wood
LinT1.c2			67.7	67.35	wood peat with sedge peat
LinT1.c2			67.35	66.9	phragmites with wood peat
LinT1.c2			66.9	66.33	phragmites
LinT1.c2			66.33	65.7	grey sandy silt
LinT1.c3	382337.5	380830.7	70.13	69.19	sedge peat with birch seeds & sedge monocot
LinT1.c3			69.19	68.93	phragmites
LinT1.c3			68.93	68.73	charcoal lens with wood peat
LinT1.c3			68.73	67.93	silty sedge peat
LinT1.c3			67.93	67.77	grey clay
LinT1.c3			67.77	67.48	medium sand
LinT1.c3			67.48	67.38	clay
LinT1.c4	382388.9	380839.5	70.67	69.97	eriophorum peat
LinT1.c4			69.97	69.34	sedge peat with birch wood inclusions
LinT1.c4			69.34	68.42	sedge peat
LinT1.c4			68.42	68.27	wood peat
LinT1.c4			68.27	67.87	medium sand with 10cm slippage
LinT1c5	382437.6	380848	72.01	71.11	humified peat
LinT1.c5			71.11	70.71	sedge peat with wood inclusions
LinT1.c5			70.71	70.61	eriophorum peat with wood inclusions
LinT1.c5			70.61	70.11	sedge peat with birch inclusions mixed with eriophorum peat
LinT1.c5			70.11	70.01	white sand with wood
LinT2.c1	382488.5	380672.5	70.27	68.67	Eriophorum & wood peat
LinT2.c1			68.67	68.57	wood peat & phragmites
LinT2.c1			68.57	68.26	phragmites
LinT2.c1			68.26	67.93	medium sand
LinT2.c2	382436	380664.4	70.28	69.35	eriophorum peat

LinT2c2			69.35	68.71	phragmites peat
LinT2c2			68.71	68.65	medium grey sand
LinT2c3	382383.9	380656.3	69.81	68.86	eriophorum & wood inclusions
LinT2c3			68.86	68.51	wood material
LinT2c3			68.51	68.11	eriophorum & phragmites peat
LinT2c3			68.11	66.91	phragmites & wood peat
LinT2c3			66.91	66.81	sand
LinT2c4	382334.9	380650	69.61	68.31	eriophorum & birch bark
LinT2c4			68.31	68.01	wood peat
LinT2c4			68.01	66.29	wood peat with phragmites
LinT2c4			66.29	65.71	sandy silty peat
LinT2c4			65.71	65.61	sand
LinT2c5	382275.4	380644.5	68.82	67.02	eriophorum peat with wood peat
LinT2c5			67.02	65.02	phragmites peat
LinT2c5			65.02	64.92	grey silt
LinT2c6	382226.3	380639.6	67.81	63.91	wood peat with phragmites & birch wood inclusions, phragmites denser towards end
LinT2c6			63.91	63.81	sand
LinT2c7	382172.1	380637.7	67.71	63.91	phragmites with wood peat & birch wood inclusions
LinT2c7			63.91	63.66	reed mat & dark humified phragmites
LinT2c7			63.66	63.55	lacustrine dark grey sand
LinT2c7			63.55	63.48	grey sand
LinT2c8	382384.4	380903.1	71.43	69.23	wood peat with wood inclusions
LinT2c8			69.23	69.19	sand
LinT2c9	382342.1	380898.6	70.56	69.56	wood peat with birch inclusions
LinT2c9			69.56	69.16	eriophorum peat
LinT2c9			69.16	67.16	wood peat with phragmites & sphagnum mix
LinT2c9			67.16	66.71	phragmites no wood
LinT2c9			66.71	66.61	sand
LinT2c10	382303.2	380895.3	70.35	68.95	heather peat small phragmites
LinT2c10			68.95	68.6	phragmites & birch wood inclusions
LinT2c10			68.6	66.75	phragmites peat siltier as progresses down
LinT2c10			66.75	66.25	lacustrine clay
LinT2c11	382259.3	380887.2	70.01	69.51	wood peat & wood inclusions & phragmites
LinT2c11			69.51	68.31	heather peat
LinT2c11			68.31	66.11	wood peat losing wood fragments as progresses, phragmites reed mat
LinT2c11			66.11	65.81	wood large, with phragmites
LinT2c11			65.81	65.56	sand

LinT3c1	382513	380662	72.79	72.13	black humified peat
LinT3c1			72.13	71.97	orange heather peat organic stained sandy peat
LinT3c1			71.97	71.01	orange brown mossy peat
LinT3c1			71.01	69.64	eriophorum'cotton grass' peat
LinT3c1			69.64	68.59	well humified wood peat with inclusions concentrated as progresses
LinT3c1			68.59	68.43	band of charcoal
LinT3c1			68.43	68.14	well humified dark brown peat
LinT3c1			68.14	68.04	medium brown sand
LinT3c3	382473	380778	72.04	71.44	black humified peat + roots becoming orange brown sphagnum
LinT3c3			71.44	70.24	orange brown sphagnum peat
LinT3c3			70.24	69.39	eriophorum peat
LinT3c3			69.39	68.79	wood peat with inclusions
LinT3c3			68.79	68.39	degraded mud & wood peat
LinT3c3			68.39	68.24	medium coarse yellow brown sand
LinT3c4	382420	380766	70.63	69.43	eriophorum peat
LinT3c4			69.43	69.19	sphagnum
LinT3c4			69.19	68.97	wood peat
LinT3c4			68.97	68.9	peaty lake mud
LinT3c4			68.9	68.6	pale yellow sand
LinT3c5	382361	380759	70.12	69.79	humified eriophorum peat
LinT3c5			69.79	69.6	wood peat large chunks fine matrix
LinT3c5			69.6	69.39	very degraded brown sphagnum peat
LinT3c5			69.39	68.53	sphagnum reed peat with wood peat
LinT3c5			68.53	68.39	sand
LinT3c6	382302	380751	69.81	69.71	eriophorum peat
LinT3c6			69.71	69.5	wood peat
LinT3c6			69.5	69.46	charcoal band
LinT3c6			69.46	69.36	fine degraded peat
LinT3c6			69.36	69.08	wood peat
LinT3c6			69.08	68.49	reed peat
LinT3c6			68.49	68.31	phragmites narrow lens
LinT3c6			68.31	68.21	pale yellow medium sand
LinT3c7	382243	380735	68.64	68.48	cotton grass
LinT3c7			68.48	67.99	wood peat
LinT3c7			67.99	67.84	eriophorum rich peat
LinT3c7			67.84	67.54	muddy peat
LinT3c7			67.54	67.04	sphagnum
LinT3c7			67.04	66.74	wood peat
LinT3c7			66.74	66.49	reed peat

LinT3c7			66.49	65.29	sphagnum moss & wood inclusions
LinT3c7			65.29	65.14	reedy peat
LinT3c7			65.14	64.69	degraded eriophorum
LinT3c7			64.69	64.49	humified peat with light brown sand
LinT3c7			64.49	63.94	well degraded fibrous peat
LinT3c7			63.94	63.74	green brown organic stained silt
LinT3c7			63.74	63.49	green grey silty clay
LinT3c7			63.49	63.34	pink clay silt
LinT3c8	382431	380955	73.7	72.96	well humified black peat
LinT3c8			72.96	72.86	yellow brown medium coarse sand
LinT4c1	381999	380684	68.21	67.93	black brown humified peat
LinT4c1			67.93	67.69	eriophorum rich brown peat
LinT4c1			67.69	66.76	sphagnum moss peat with birch twigs
LinT4c1			66.76	66.51	wood peat with sphagnum & wood inclusions
LinT4c1			66.51	66.41	phragmites
LinT4c1			66.41	65.51	sphagnum rich wood peat
LinT4c1			65.51	65.31	wood
LinT4c1			65.31	65.11	best preserved sphagnum with phragmites & bog bean
LinT4c1			65.11	64.71	excellent preserved orange sphagnum
LinT4c1			64.71	64.58	wood rich peat desiccated
LinT4c1			64.58	64.57	band light grey silt
LinT4c1			64.57	64.53	humified dark brown wood peat
LinT4c1			64.53	64.51	medium light grey medium sand
LinT4c2	382001	380714	68.61	68.51	dark brown humified peat
LinT4c2			68.51	68.21	sphagnum rich eriophorum phragmites mix
LinT4c2			68.21	67.81	heather peat
LinT4c2			67.81	66.51	wood peat & inclusions
LinT4c2			66.51	65.71	phragmites
LinT4c2			65.71	65.61	sphagnum rich wood peat
LinT4c2			65.61	65.41	degraded wood peat large wood chunk
LinT4c2			65.41	65.06	sphagnum rich matrix with wood inclusions
LinT4c2			65.06	64.91	light grey medium sand
LinT4c3	382000	380737	69.33	68.18	humified wood peat with inclusions
LinT4c3			68.18	67.67	organic mud well degraded occasional phragmites
LinT4c3			67.67	67.07	sphagnum peat occasional wood inclusion
LinT4c3			67.07	66.83	wood peat
LinT4c3			66.83	66.73	light grey medium sand
LinT4c4	381916	380465	67.19	66.89	black humified peat
LinT4c4			66.89	66.69	black humified peat with eriophorum

LinT4c4			66.69	66.39	eriophorum rich sphagnum peat dark brown
LinT4c4			66.39	66.19	sphagnum rich wood peat
LinT4c4			66.19	65.79	eriophorum rich peat orange sphagnum below
LinT4c4			65.79	64.17	sphagnum large lump of wood
LinT4c4			64.17	64.07	wood peat
LinT4c4			64.07	63.94	light grey yellow medium sand
LinT4c5	381877	380500	67.4	66.7	well humified black eriophorum
LinT4c5			66.7	65.6	eriophorum
LinT4c5			65.6	63.65	sphagnum with wood inclusions with phragmites to base
LinT4c5			63.65	63.45	grey yellow medium sand
LinT4c6	381837	380548	69.05	68.55	humified eriophorum peat
LinT4c6			68.55	67.85	sphagnum peat
LinT4c6			67.85	67.75	lump of wood
LinT4c6			67.75	67.3	sphagnum moss
LinT4c6			67.3	66.15	wood lumps & sphagnum moss
LinT4c6			66.15	66.05	yellow grey medium coarse sand
LinT4c7	381819	380589	68.44	67.72	eriophorum peat occasional twigs
LinT4c7			67.72	67.35	woody sphagnum peat
LinT4c7			67.35	67.14	very fine grain organic mud
LinT4c7			67.14	66.89	sphagnum
LinT4c7			66.89	65.69	large chunk of wood sphagnum moss
LinT4c7			65.69	65.64	phragmites & bog bean
LinT4c7			65.64	65.01	sphagnum peat
LinT4c7			65.01	64.83	light yellow silty marl Lake deposit
LinT4c7			64.83	64.7	light yellow silty marl & phragmites
LinT4c7			64.7	64.19	degraded sphagnum & bog bean
LinT4c7			64.19	63.94	light olive grey silt
LinT4c7			63.94	63.64	olive grey silty clay
LinT4c7			63.64	63.52	sphagnum
LinT4c7			63.52	63.14	medium coarse light olive grey sand upper 5cm organic stained clay rich
LinT4c8	381910	380666	68.24	68.14	disturbed peat
LinT4c8			68.14	68.04	degraded sphagnum peat
LinT4c8			68.04	67.94	woody sphagnum peat
LinT4c8			67.94	67.82	phragmites
LinT4c8			67.82	67.77	eriophorum
LinT4c8			67.77	65.74	wood rich sphagnum
LinT4c8			65.74	67.64	sand not seen
LinT4c9	381883	380656	68.33	68.23	degraded peat

LinT4c9			68.23	67.93	eriophorum rich black peat poorly preserved
LinT4c9			67.93	66.98	wood peat sphagnum matrix occasional wood inclusions
LinT4c9			66.98	65.46	wood chunk, sphagnum moss & bog bean
LinT4c9			65.46	65.27	large wood
LinT4c9			65.27	65.19	dark grey organic stained medium coarse sand
LinT4c10	381852	380648	68.26	68.11	degraded black peat
LinT4c10			68.11	67.56	eriophorum rich sphagnum peat
LinT4c10			67.56	65.76	sphagnum & bog bean well humified & wood inclusions
LinT4c10			65.76	65.01	sphagnum with wood inclusions
LinT4c10			65.01	64.23	large chunk of wood
LinT4c10			64.23	64.06	medium coarse grey sand
LinT5c1	382003	380634	67.44	66.01	sphagnum & eriophorum peat & wood twigs
LinT5c1			66.01	65.19	wood peat & inclusions sphagnum rich peat
LinT5c1			65.19	64.88	phragmites & wood peat
LinT5c1			64.88	64.16	increase in phragmites & sphagnum humified peats
LinT5c1			64.16	63.6	phragmites
LinT5c1			63.6	63.19	grey clay (bottomed hit hard rock)
LinT5c2	382000	380610	67.5	67.2	Top-soil disturbance
LinT5c2			67.2	66.16	eriophorum peat cotton grass heather
LinT5c2			66.16	65.85	sphagnum moss & phragmites with wood inclusions
LinT5c2			65.85	62.9	phragmites & bog bean with wood inclusions sphagnum at base
LinT5c2			62.9	62.85	black organic clay & bog bean
LinT5c2			62.85	62.68	olive green silty clay limestone inclusions in clay at base
LinT5c3	381996	380591	67.53	66.28	cotton grass with heather stems
LinT5c3			66.28	66.23	charcoal burning
LinT5c3			66.23	65.93	cotton grass decreasing wood peat & birch wood inclusions
LinT5c3			65.93	63.07	wood peat with sphagnum increase & bog bean
LinT5c3			63.07	62.87	black silty clay, sphagnum & bog bean
LinT5c3			62.87	62.77	grey olive clay

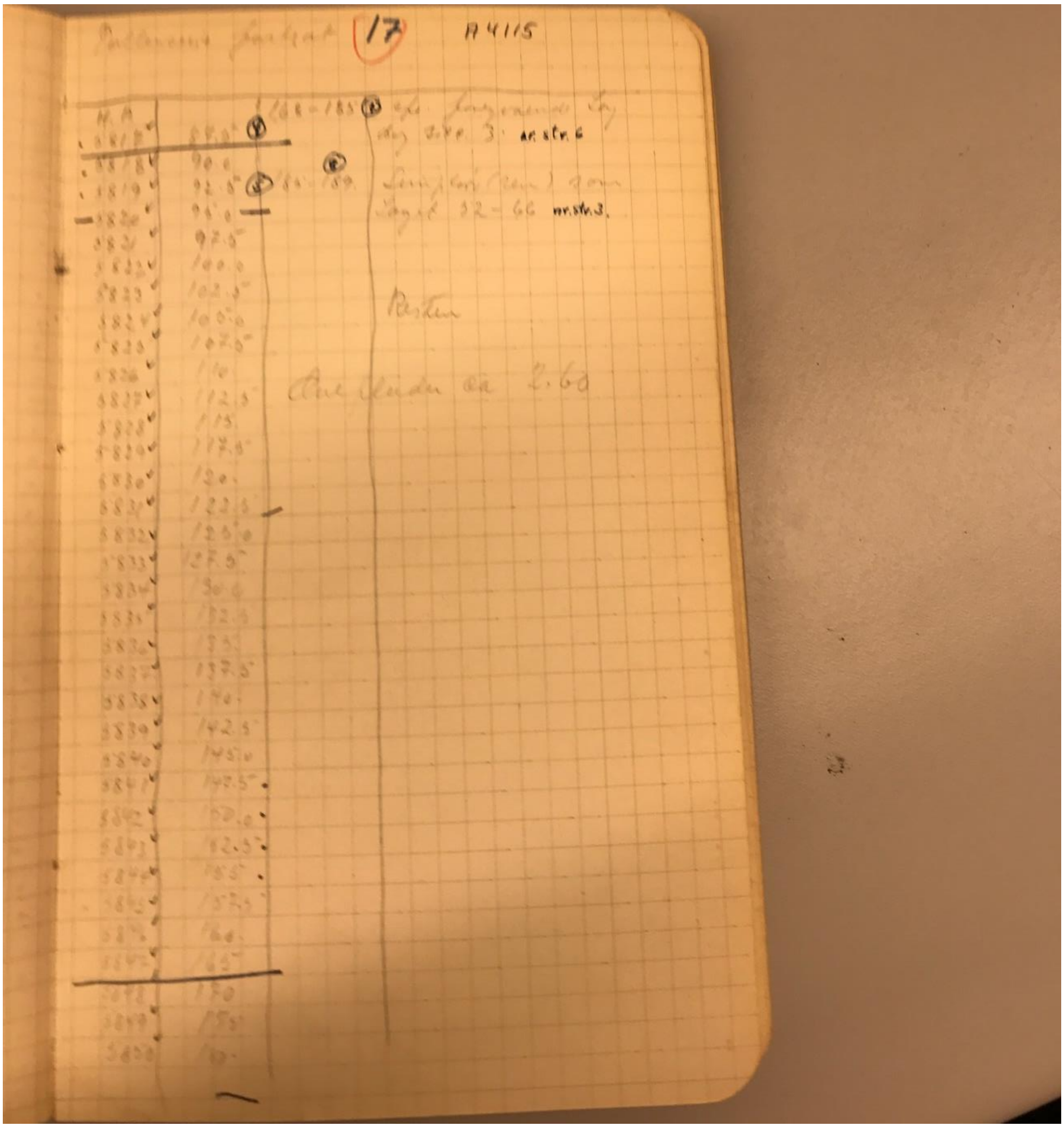
Bjældskovdal Bog Borehole Stratigraphy Table

core	from	to	lithology
Tollund1c1	67.65	67.49	water
Tollund1c1	67.49	67.35	well humified sedge-rich red brown peat
T1c1	67.35	67.25	well humified black silty peat
T1c1	67.25	67.21	medium sand with mid brown humified peat
T1c1	67.21	66.99	organic stained sand
T1c2	67.78	67.56	modern fibrous peat
T1c2	67.56	67.4	darker peat
T1c2	67.4	66.92	red fibrous sphagnum peat
T1c2	66.92	66.18	black organic stained medium sand
T1c2	66.18	67.06	orange brown medium sand
T1c3	67.7	67.48	water
T1c3	67.48	67.18	modern wet peat
T1c3	67.18	66.2	orange brown sphagnum peat becoming darker at 86cm
T1c3	66.2	65.98	light yellow grey medium sand
T1c4	68.23	67.81	orange humified rooty sphagnum peat
T1c4	67.81	67.21	silty peat orange brown
T1c4	67.21	67.11	blacker humified silty peat
T1c4	67.11	66.9	medium coarse light grey organic stained sand
T1c5	68.62	68.42	black humified reedy peat
T1c5	68.42	68.37	black stained medium grey sand
T1c6	70.38	70.15	black brown peat with roots
T1c6	70.15	70.13	well humified black peat
T1c6	70.13	70.11	organic stained light grey sand
T1c7	67.7	67.46	water
T1c7	67.46	67.38	sphagnum peat upper more recent
T1c7	67.38	67.19	organic stained medium coarse sand
T1c8	67.71	67.37	loose sphagnum peat
T1c8	67.37	67.35	brown organic stained medium coarse sand
T1c9	68.1	67.76	heather rich peat
T1c9	67.76	66.69	brown organic stained medium sand
T1c10	68.56	68.34	peat with bilberry bush roots
T1c10	68.34	68.24	grey medium sand
T1c11	69.31	69.19	modern forest peat
T1c11	69.19	68.86	very humified peat
T1c11	68.86	68.76	organic stained medium grey sand
T1c12	69.63	69.48	rooty peaty soil
T1c12	69.48	69.37	sand (69.48 - 69.41 black organic stained sand. 69.41 - 69.37 grey organic sand)
T1c13	70	69.8	root peat
T1c13	69.8	69.03	grey organic stained medium coarse sand

Tollund1c14	70.42	70.27	rooty peat
T1c14	70.27	70.06	organic stained grey medium coarse sand
T1c15	67.73	67.37	loose peat
T1c15	67.37	67.29	black brown humified peat
T1c15	67.29	67.2	brown medium sand
T1c16	67.7	67.45	water
T1c16	67.45	67	modern root peat
T1c16	67	66.92	black brown humified peat
T1c16	66.92	66.74	brown coarse sand
T2c1	69.81	69.76	sandy peaty soil
T2c1	69.76	69.65	light black, light grey stained sand
T2c2	69.06	68.81	soil unobserved
T2c2	68.81	68.61	orange sand
T2c3	68	67.9	peaty soil
T2c3	67.9	67.7	black stained light grey sand
T2c4	68.16	67.96	modern peat
T2c4	67.96	67.82	humified black peat
T2c4	67.82	67.76	orange brown medium sand
T2c5	68.32	68.12	modern peat
T2c5	68.12	67.97	sphagnum peat
T2c5	67.97	67.86	well humified black peat
T2c5	67.86	67.78	orange sand
T2c6	67.81	67.59	well humified peat with sand
T2c6	67.59	67.47	orange brown silty sand
T2c6	67.47	67.43	orange sand
T2c7	67.68	67.46	modern peaty soil with jancus rush
T2c7	67.46	67.38	brown medium sand
T2c8	67.7	67.35	modern rush peat
T2c8	67.35	67.25	sand
T2c9	67.98	67.78	grey humified peat
T2c9	67.78	67.68	medium sand
T2c10	68.22	68.06	modern peaty soil
T2c10	68.06	67.98	well humified peat
T2c10	67.98	67.89	medium sand
T2c11	68.63	68.43	peaty soil
T2c11	68.43	68.35	orange brown medium sand
T2c12	68.88	68.58	modern sphagnum
T2c12	68.58	68.42	degraded silty peat
T2c12	68.42	68.3	brown silty sand
T2c12	68.3	68.23	medium sand
T2c13	69.57	68.67	sphagnum peat
T2c13	68.67	68.47	black well humified peat

Tollund2c13	68.47	68.37	brown stained medium sand
T2c14	69.5	69.06	sphagnum peat
T2c14	69.06	68.98	sphagnum peat and eriophorium
T2c14	68.98	68.81	silty humified peat
T2c14	68.81	68.73	medium sand
T2.c15	69.62	69.39	modern peat
T2.c15	69.39	69	well humified peat
T2.c15	69	68.84	organic stained sand medium
T2c16	69.72	69.57	modern peat
T2c16	69.57	69.47	well humified silty peat
T2c16	69.47	69.39	brown stained medium sand
T2c17	71.01	70.73	peaty silt
T2c17	70.73	69.67	sand
T3.c1	69.99	69.87	reed mat
T3.c1	69.87	69.76	sand light grey patches of organic staining
T3.c2	68.24	68.06	reed mat
T3.c2	68.06	67.82	sand
T3.c2	67.82	67.55	dark stained medium sand
T3.c3	67.81	67.65	upper reed mat
T3.c3	67.65	67.35	sphagnum well preserved
T3.c3	67.35	67.28	medium coarse sand
T3.c4	67.65	66.1	sphagnum peat
T3.c4	66.1	66.01	sand
T3.c5	67.7	67.35	reed mat
T3.c5	67.35	66.81	sphagnum peat dark brown well humified
T3.c5	66.81	66.74	eriophorum rich peat at top very humified silty black peat
T3.c5	66.74	66.53	light brown medium sand
T3.c6	67.63	67.43	modern sedge mat
T3.c6	67.43	66.78	sphagnum peat
T3.c6	66.78	66.73	black humified silty sphagnum peat
T3.c6	66.73	66.63	medium grey sand
T3.c7	68.38	66.68	sphagnum peat
T3.c7	66.68	66.63	silty peat
T3.c7	66.63	66.45	light brown medium sand
T3.c8	67.71	67.53	modern peat
T3.c8	67.53	67.45	silty brown peat
T3.c8	67.45	67.41	medium sand
T3.c9	68.91	68.22	sand with lenses of organics
T3.c9	68.22	68.11	silty sphagnum peat
T3.c9	68.11	67.85	black humified peat with medium sand
T3.c9	67.85	67.74	brown sand

Tollund3.c11	68.68	68.47	humified soil peat and medium sand
T3.c11	68.47	68.35	orange brown sphagnum peat
T3.c11	68.35	68.3	medium sand
T3.c12	69.06	68.71	peaty soil
T3.c12	68.71	68.6	peaty soil with lots of sand
T3.c12	68.6	68.54	medium sand
T3.c13	69.45	69.01	modern peaty soil
T3.c13	69.01	68.95	light brown medium sand
T3.c14	69.88	69.74	sandy peaty soil
T3.c14	69.74	69.55	light brown sand upper part organic stained
T3.c15	69.56	69.46	heather modern intrusion
T3.c15	69.46	68.96	humified dried out heather peat
T3.c15	68.96	68.13	sphagnum peat preserved
T3.c15	68.13	67.73	sphagnum continues black humified peat, blacker peat at base becomes sandy
T3.c15	67.73	67.66	sand grey basal



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168–185 (9) nr. str. 6

(8) 85–189 nr. str. 3.

H.A.	
5817	88.0
5818	90.0
5819	92.5
5820	95.0
5821	97.5
5822	100.0
5823	102.5
5824	105.0
5825	107.5
5826	110
5827	112.5
5828	115
5829	117.5
5830	120.
5831	122.5
5832	125.0
5833	127.5
5834	130.0
5835	132.5
5836	135
5837	137.5
5838	140.
5839	142.5
5840	145.0
5841	147.5
5842	150.0
5843	152.5
5844	155
5845	157.5
5846	160.
5847	165
5848	170
5849	175
5850	180

Resten

ca 2.60

Tollund "Bjelskovdal" (18) Mose d. 21/11 52 NM VIII A 4020

Fjell = ÷ 0,62 1-5/54

"Detailprofilbeskrivelse" N. 20. 0 = Niv 2,77

cm nedre	
0 - 2.5 (25)	Humuslag sandet, m. Sumptørv mj (3)-4 sfe.0 vis al. 0 sice 2 lim saps. 2 color: sort sorte brun S. hum. 2, D^2 1, N 1, lodrette Ynde Rødder, helt Rodfilt. Kvartskornene hvide
2.5 - 12. (26)	Sand humøst m. Sumptørv mj 3, sfe.0 vis al. 0 sice 2 lim saps 2 color: mørk rødbrun sortagtigt S. hum 1,-2, D^2 1 N. 1-2 ellers som foregaaende
12 - 13. (27)	"Blegsandlag" mj 2. sfe. 0 vis al 0 sice 2. lim saps 1 color en Tone lysere end foregaaende mere graalig brun S. hum (0)-1. D^2 1 N 2-(3) ojensynlig et Blegsandlag
13 - 27 (28)	Allag (Humusal) mj 3 sfe 0 vis al. 0 sice 2-3 lim saps 1. color rødbrun haard og fast brokker i skarpkantede Stykker. Fe 2. N 3, S hum 1 D^2 0-1.
27 - 38 (29)	Sand jernholdigt mj 2 sfe 0 vis al 0 sice 2-3 lim saps 1, color: rødgullig. Fe 1, D^2 0-1. N 4 Mørkheden aftager gradvis nedefter fra mer 2 til Lodrette Rødder (Lyng?) I^1 0-1
38 - 55 (30)	Sand gulbrunt med Lyngrødder? mj 1 sfe. 0 vis al 0 sice 3, color lys gulbrun Fe 0-1 N 4 I^1 0-1
55 - 62 (31)	Sand som foregaaende, men Fe 1 og mj 2 color: brunrød gullig
62 - 85 (32)	Sand gulligt mj (0)-1 sfe. 0 - vis al. 0 sice 2 color graagullig lysere og mere graalig nedad Fe 0-1 N 4 Rødderne døer ned i dette Lag (Lyng mj.)
85 - 90 (33)	Sand. (Finsand) mj 0 sfe. 0 vis al 0 sice 2-3 color graabrunligt Fe (0)-1 M 2, N 2,
90 - 91 (34)	som foregaaende. Fe dog 1 color rødbrun mj 2

(19) A4020 21/11 52

Farlsat $Fixp = \div 0{,}62$

$0 = Niv\ 2{,}77$ T-5/50.3

cm under 0 91 – 101. 35	Striber vekselvis af Sand og Finsand Mj 0-1 Skalerne er centimetertykke og bestaar af Finsan og sandholdige Finsand Striber i disse fyest. Mj veksler mellem (0) og ~~...~~ 0 Color hvidgul de mørke Striber mere graalige Sammensat Mj kendsholdsvis M4 og M2 N2 i begge Fe O
101 – ? 36	Sand hvidgult Sand Mj 0 – (1) M4. Fe O

Pollen cent. A4020 (20) Bjelskovdal Mose 21/11 52

"Tollund" manden T-s /Sv.J.

" N = 20.0 o=Niv 2.77. Fixp= ÷0.62

H.P	cm under o
4967✓	1.5
4968✓	5.0
4969✓	7.5
4970✓	10.0
4971✓	12.5
4972✓	15.0
4973✓	20.0
4974✓	25.0
4975✓	30.0
4976✓	35.0
4977✓	40.0
4978✓	45.0
4979✓	50.0
4980✓	53.0
4981✓	57.0
4982✓	60.0
4983✓	65.0
4984✓	70.0
4985✓	75.0
4986✓	80.0
5310	83.0 ÷83.0
5311✓	87.0 ÷87.0
5312✓	91.0
5313✓	93.0
5314✓	97.0
5315✓	105.0
5316✓	110.0

1 humifierat Sphagnum-tuv
mg 3 stfo o, risel. 0-1, crac 2. Lmitegi 1 A 2-3, B 1-2 D o-(1)

2 hum. Tuv mg 3. A 2-(3) B (1)-2, D. (Empetrum) 0-(1) C (Cal.) 0-(1)

3 mg 2-(3) risel. 0-1 crac. 2 A 2; B 2 C (Cal) o-(1)

4 mg 3. stfo. 0 risel 0-1 crac. 2 A (2)-3, B 1-(2) C (Cal) 0-(1)

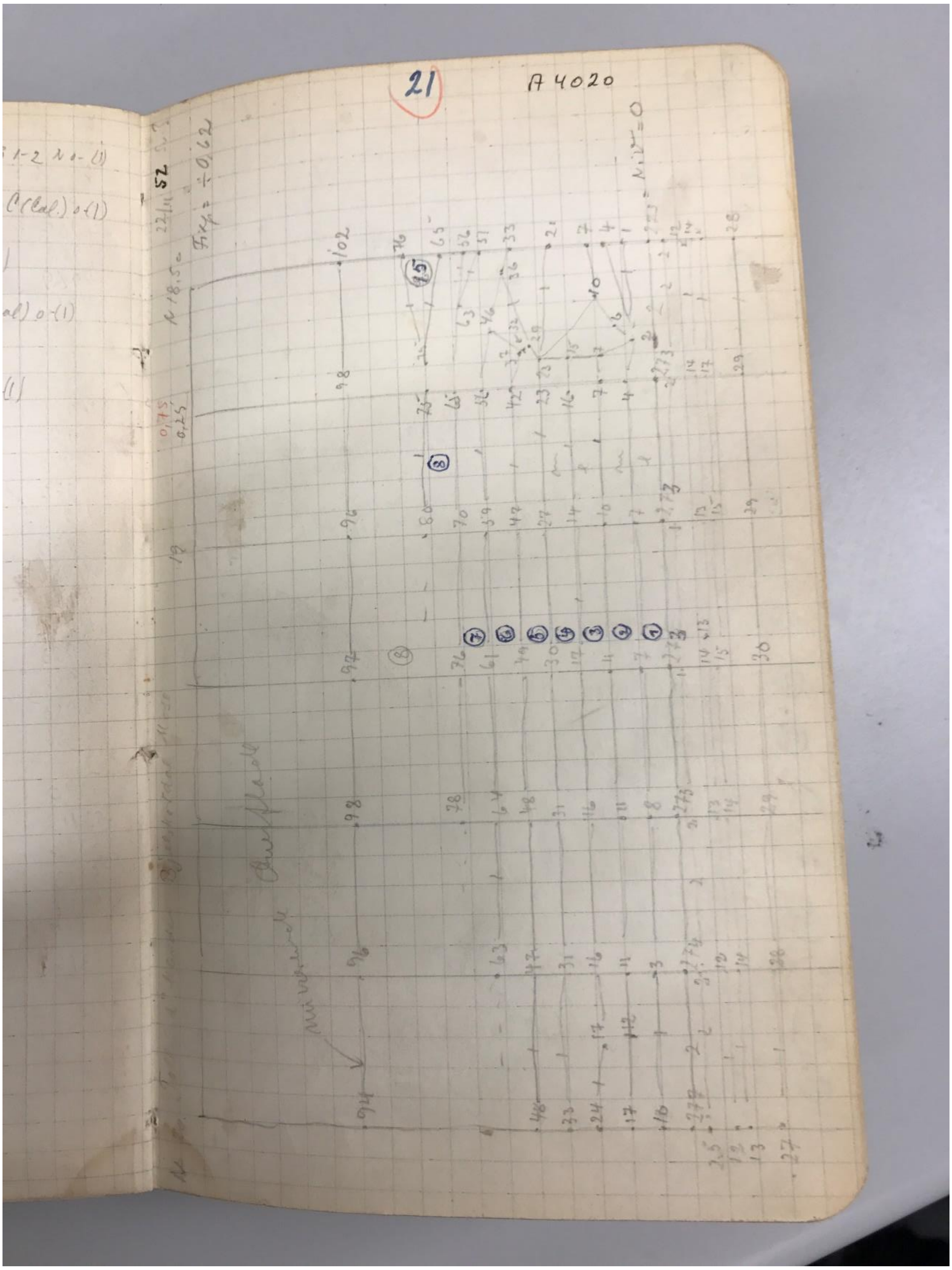
5 do + D o-(1) Empetrum

6 do. A 2-(3), B (1)-2 D (Empetrum) 0-1 C. 0-(1)

7 Sphagnum-tuv mg 2. stfo. 1. risel. 1 crac 2.
A (1)-2, B 2-(3) D o-(1) Empetrum

8 Sphagnum-tuv A 1, B 3 D o-(1)

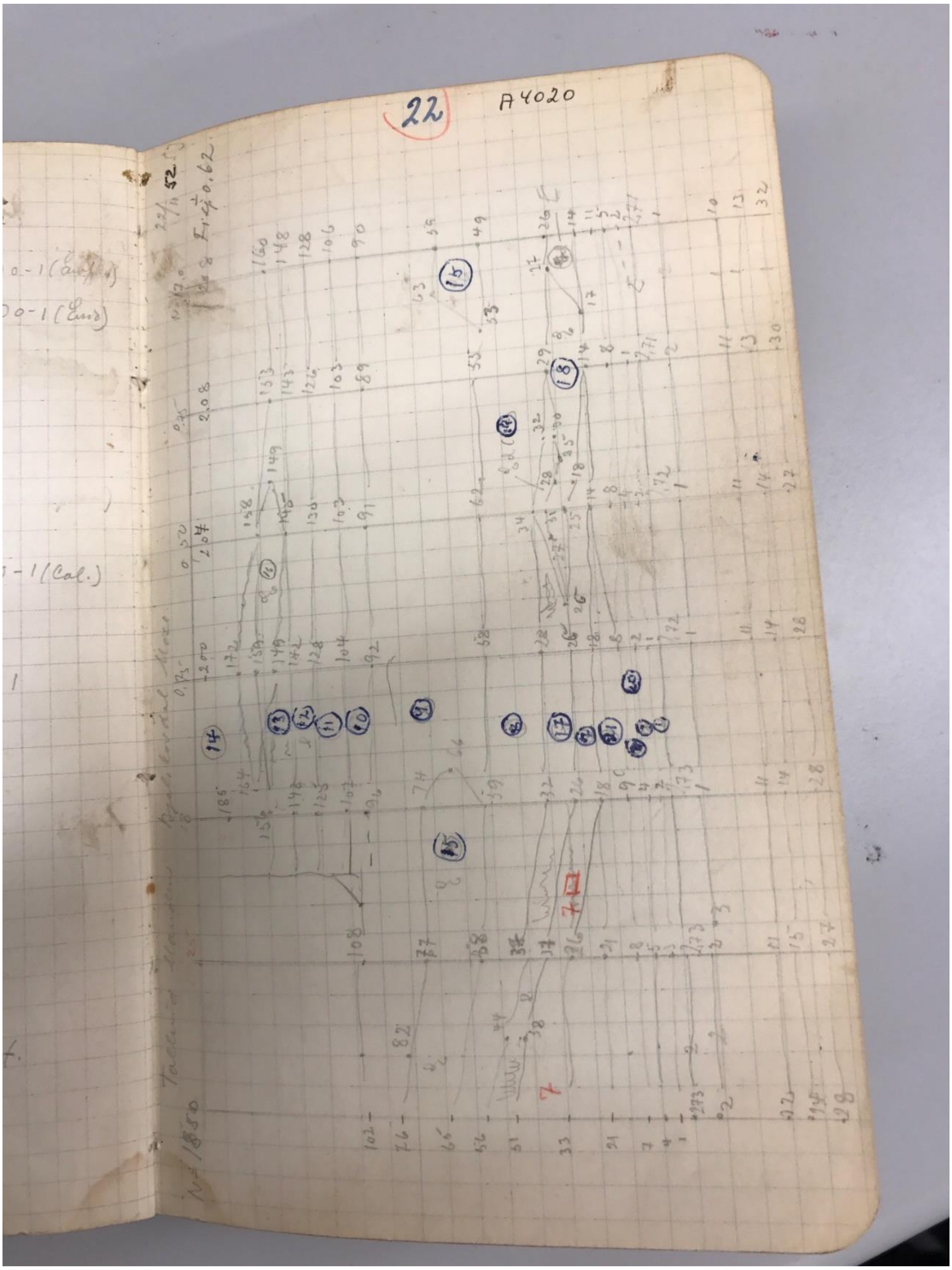
22/11 52
A 18,50
Fix = ÷ 0,62
0,75
0,25
19


21
A 4020

1 efr Lag a i N. 6,25 ÷ 1
2 " " b i "
20 Sphagnumtørv mig 1-2 elfs 1 bis el. 1 rise 2
A. 1 B 3.
21 Sphagnumtørv mig 1 A 0-1 B 3-4 C (Cal) 0-1 D 0-1 (Erioph)
4 " A (0)-2 B 2-(3) ——— 1 D 0-1 (Erio)
18 Eriophorumtørv A 2 D 2 (Erioph) mig 3-4

Flintafslag? ved 43 (lille Sten)
17 A 1, B 3 Erioph. 0-1 mig 2

15 Sphagnumtørv A 1 - B 3 mig 2
9 Sphagnumtørv mig 3 A 2, B 2 D 0-1 C 0-1 (Cal.)
10 " mig 2 A 1 B 3 C 0-1 (Cal)
11 mig 3 bis el. sure 2-3 A 2, B 2, C 0-1
12 mig 2-3 A 1, B 3 C 0-1
13 efr Lag 10
16 Eriophorum tørv A 1 Eriophorum 3 D 3
14 mig 1 A 0-1, B 3-4 C 0-1
19 Eriophorum Tørv mig 2 A 1, D 3, Erioph.
22 mig 2. A 1, B 3 C 0-1
23 mig 1 B 4 A 0-(1) hst gult porøst.
24 mig 2 A 2 B 2 løst og fleret.


22
A4020

Tollund Manden (23) A4020 10/4 52
"Bjelskovdal Mose" T-5/54
N. 79.25 0 = Niv. 272
Fixp =

H.P.	cm over 0
5317	1.0
5318	3.0
5319	5.0
5320	7.50
5321	10.0
5322	12.5
5323	15.0
5324	17.5
5325	20.0
5326	22.5
5327	25.0
5328	27.5
5329	30.0
5330	32.5
5331	35.0
5332	37.5
5333	40.0
5334	42.5
5335	45.0
5336	47.5
5337	50.0
5338	52.5
5339	udgår
5340	55.0
5341	57.5
5342	60.0
5343	62.5
5344	65.0
5345	67.5
5346	70.0
5347	72.5
5348	75.0
5349	77.5

Tollund Manden 24 A 4020 22/11 52

"Bjelskovdal Mose T-s/Sv.?

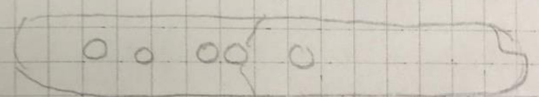
A = 19.25 0 = Niv 272 (fartsaf) Fixp=

H.P.	cm under 0
5350 ✓	1.0
5351 ✓	3.0
5352 ✓	5.0
5353 ✓	7.5
5354 ✓	10.0
5355 ✓	12.5
5356 ✓	15.0
5357 ✓	17.5
5358 ✓	20.0
5359 ✓	22.5
5360 ✓	25.0
5361 ✓	27.5
5362 ✓	30.0
5363 ✓	32.5

25 A4115

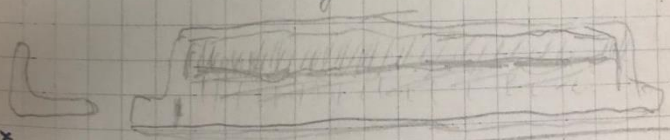
Vedprøver fra Barre Pá (Baad) taget paa Nationalmuseets Konserveringsanstalt d. 14/1 53

H.P.684 Prøve fra fladt Stykke Træ 58 cm langt, 8 cm bredt og 2 cm tykt. gennemboret af 5 Huller m. Diameter ca 2,5 cm



Bøg

H.P.693 "Agestolen" Træ? Bredstykke
Totallængden 71 cm. Største Bredde 19 cm Højden 4 cm

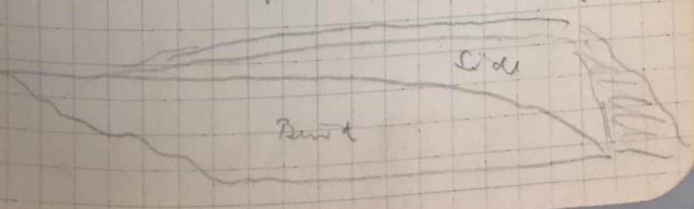


Eg

H.P.694

Stykke af Baad

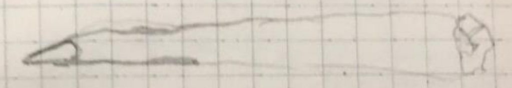
Eg



26 A4115 .. "

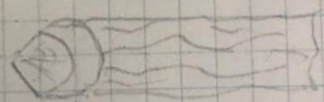
Vedprøver fra „Bood Barn" så fortsat.

H.P.695ᵛ. Tilspidset Pæl af Bøgetræ
38 cm lang 6 cm tyk



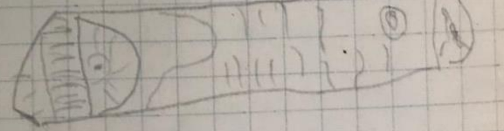
x

HP.1323ᵛ Stump af afhugget Gren
med meget mørk Bark
Længde 27 cm Tykkelse 7 cm



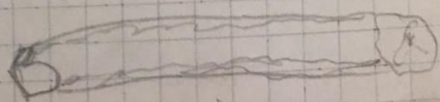
x

H.P.1322ᵛ Tilspidset Gren af Birk
Længde 32 cm Tykkelse 7 cm



x

H.P.1321ᵛ. Tilhugget Grenstump uden Bark
25 cm lang 4 cm tyk
ret Langt afskaaret

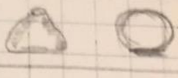


x

27 A 4115

Vedprøver fra Bood Barre Sø fortsat

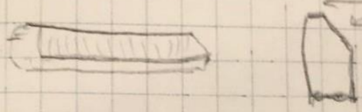
H.P. 1320 ✓ "Pülseren" konisk tilskaaret Træstykke 7 cm



7 cm

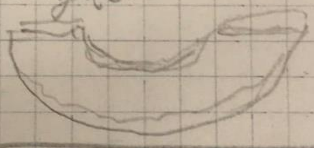
x

H.P. 700 ✓ lille tildannet Stykke Træ. 10 × 4 × 2,5 cm



x

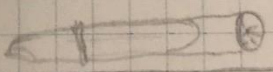
H.P. 699 ✓ Rester af gennemboret Hjul el. Skive 18 cm i Diameter 4 cm tykt.



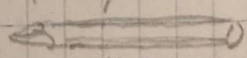
x

H.P. 698 ✓ Stump af lille tilspidset afglattet Pind Længde 20 cm Diameter 2.5 cm

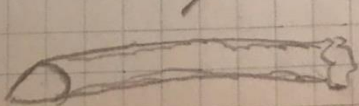
x



H.P. 697 ✓ Prøve fra lille tilspidset Pind



H.P. 696 ✓ Prøve fra afhugget Gren 23 cm lang 3 cm tyk



A 4020 ✓

Tallund Manden 28 Pollenserie v. N. 17.75 T-S
o = N. v: 2,73 = (173) 16/4 63 15u.5
"Bjelskovdal" Mose Fix:

H.P.	cm. o.n.o	Grænse
5389 ✓	1.0	+ 1
5390 ✓	4.0	+
5391 ✓	6.5	+
5392 ✓	9.0	
5393 ✓	12.5	
5394 ✓	15.0	
5395 ✓	18.0	
5396 ✓	22.0	
5397 ✓	26.0	
5398 ✓	29.0	
5399 ✓	32.0	
5400 ✓	35.0	
5401 ✓	38.0	
5402 ✓	41.0	
5403 ✓	44.0	
5404 ✓	47.0	
5405 ✓	50.0	
5406 ✓	53.0	
5407 ✓	56.0	
5408 ✓	59.0	
5409 ✓	62.0	
5410 ✓	65.0	
5411 ✓	68.0	
5412 ✓	71.0	
5413	74.0	
5414 ✓	77.0	
5415 ✓	80.0	
5416 ✓	83.0	
5417 ✓	86.0	
5418 ✓	89.0	
5419 ✓	92.0	
5420 ✓	95.0	
5421 ✓	98.0	
5422 ✓	101.0	
5423 ✓	104.0	

Pollenserie fortsat **29** fra Side 28 A 4020

o. NIV 273 = (173)

M
1433

Fig. =

H.P.	cm over 0			
5424 ✓	107.0			
5425 ✓	110.0			
5426 ✓	113.0			
5427 ✓	115.0			
5428 ✓	118.0			
5429 ✓	121.0			
5430 ✓	124.0	[illegible]		
5431 ✓	124.0			
5432 ✓	127.0	128 — +		
5433 ✓	130			

Serien slut [illegible] og følgende Side

49
40 N. 17.25
21
67 - 0 Laggrenset.
82 ÷ 15

[illegible] } fortsat fra side 37.
Detaljprofil }

32

A 4020

16/4 53
7-5/5

H.P.	cm over 0	
7020 ✓	82.5	
N.	B.	
7081 ✓	85.0	
7082 ✓	87.5	
7083 ✓	90.0	
7084 ✓	92.5	
7085 ✓	95.0	
7086 ✓	97.5	
7087 ✓	100.0	
7088 ✓	102.5	
7089 ✓	105.0	
7090 ✓	107.5	
7091 ✓	110.0	
7092 ✓	112.5	
7093 ✓	115.0	
7094 ✓	117.5	
7095 ✓	120.0	-50
7096 ✓	122.5	
7097 ✓	125.0	
7098 ✓	127.5	
7099 ✓	130.0	
7100 ✓	132.5	
7101 ✓	135.0	
7102 ✓	137.5	
7103 ✓	140.0	
7104 ✓	142.5	
7105 ✓	145.0	
7106 ✓	147.5	
7107 ✓	150.0	
7108 ✓	152.5	
7109 ✓	155.0	
7110 ✓	157.5	
7111 ✓	160.0	
7112 ✓	162.5	
7113 ✓	165.0	

33 AY020 [illegible]

[illegible] } [illegible] 22

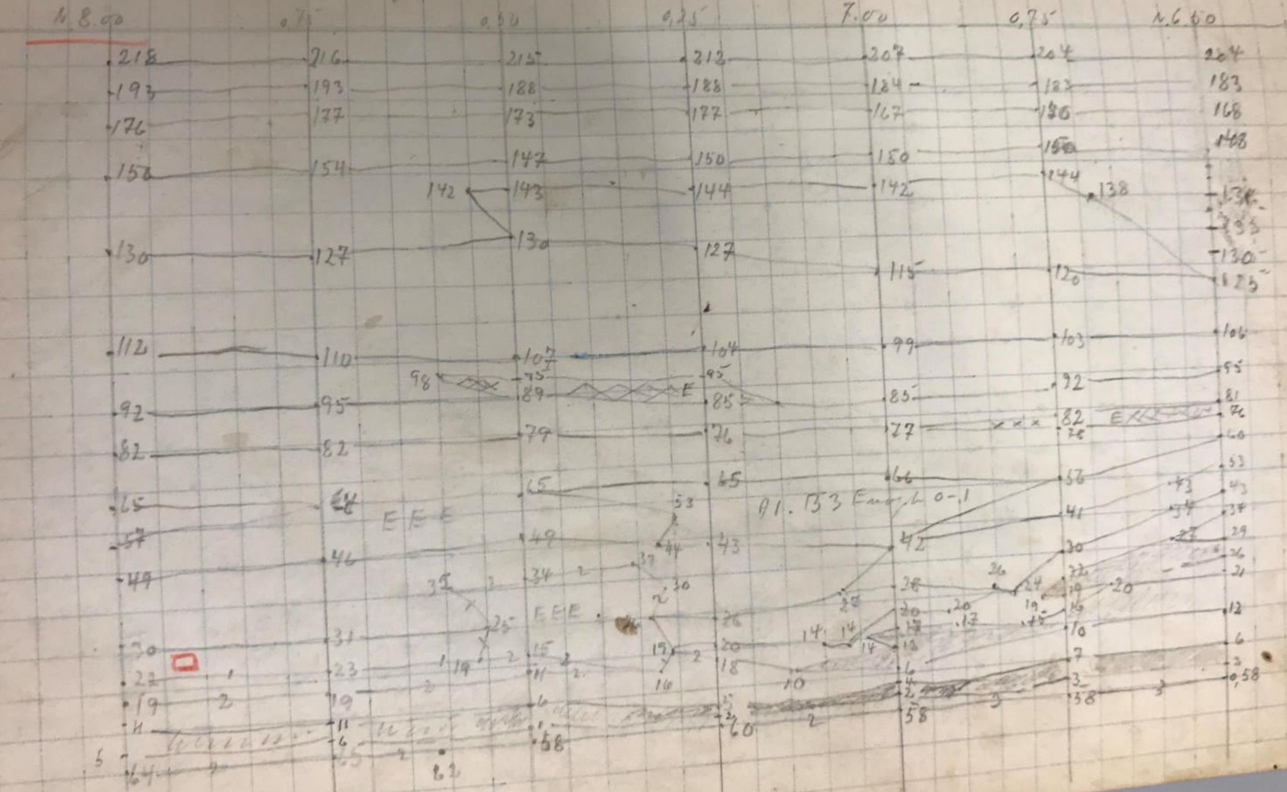
[illegible]	[illegible]
7114	167.5
7115	[illegible]
[illegible]	172.5
7117	175.0
7118	177.5
7119	180.0
7120	182.5
7121	185.0

[illegible]

3Y

A 4020

Tolland Handen, Bjelskovdal Mose. 17/4 53 Su.S. Fixp = ÷ 1.62.



a. brun stærkt humificeret Tørv H_{0-1} Substantiv Humora 3 lidt uteagtige Rødder nogen Klumper af Stav i Sphagnum B^{2}, 1 my 2-3

b) mørkt brun stærkt humificeret Tørv med fedtet Grundmasse S.H 3-4 Rester af uteagtige Rødder D^{3}0-1 enkelte fine Kvartskorn my 3

c) som a en Anelse mere gulbrun hist og her Totter af Eriophorum S.H. 3 D^{3}1 pletvis SH 2 D^{2}2 my 2-3

x) Tue af Eriophorum med sortgullig Farve S.H. 2 D^{2}2 my 3

d) mørkt brunt. stærkt humificeret Tørv. S.H. 3 D^{3}1. Paa Brudfladen ses mange Huller efter lodrette uteagtige Rødder en Del er endnu bevaret. overalt i Laget ses Rester af skarpt omdannede Lyngrødder, hist og her enkelte Pletter med lidt fint Sand, særlig hvor der er Totter af Eriophorum; Sandet er meget my 3

e) Stribe af stærkt humificeret Tørv S H 2 D^{3}2 en del Eriophorum gennem hele Laget. color mørkt rødbrun my 2-3

f) stærk Humificeret Tørv SH 2-3 D^{3}1 Laget mørkere end my 3 foregaaende men mere lit, da kun Eriophorum er bevaret

g) lysere Lag som e men karakteriseret ved mange Lyngrødder SH 2 D^{3}2 Rødder 1. my 2-3

h) tynd meget mørk, næsten sort Stribe SH 4 D^{3}0-1 my 3-4

i) = e

j) = f

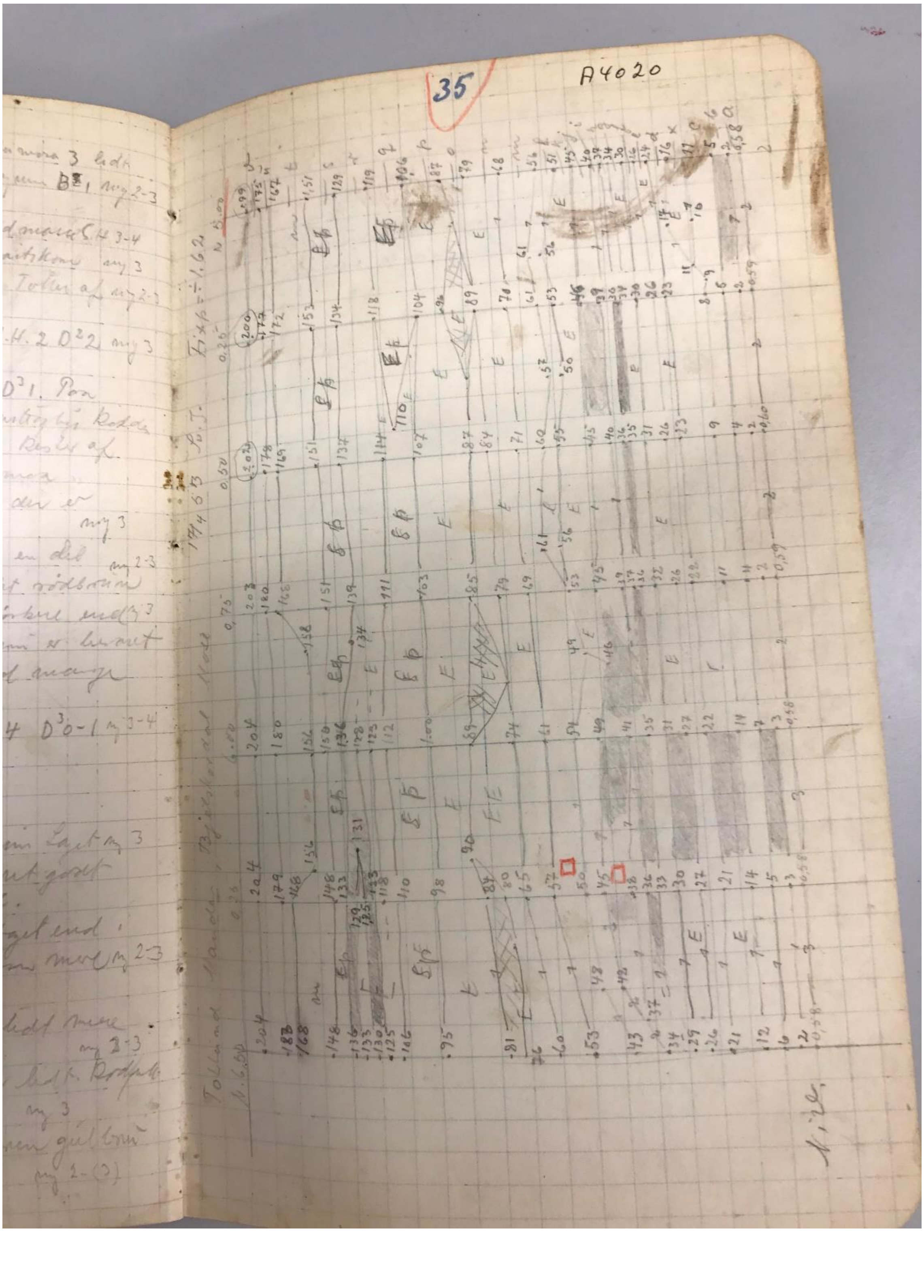
k.) humificeret Tørv S.H 2 D^{2}2 hist og her Eriophorum Laget my 3 mest løst og smuldrende end foregaaende mange uteagtige levende Rødder og Rodfilt. Farven mørkt brunt.

l) humificeret Tørv SH 2 D^{2}3. Rødderne mere medtaget end i foregaaende Lag Farven lysere brun konsistens mere my 2-3 smuldrende

m) som foregaaende – en Anelse mørkere lidt mere glat. my 2-3

n) mørkt Lag SH. 2 D^{2}2 næsten udelukkende Eriophorum lidt Rodfilt sort Grundmasse med sejge Bladskeder my 3

o) stærk destrueret Lyngtørv D^{3}3 SH 1. Farven gulbrun Konsistens filtet, men lydelig let. my 2-(3)


35
A4020

A4020

p) dekomponeret Eriophorum Tørv som brun Faser brun Grundmasse med mange Rødder Stængelstykker og Bødfilt. D²3 SH 1. my 2-3

q) Meget Lag der blev lysere ved Tørring; Lagt bestaar overvejende af Eriophorum Tørv en Del amorf brun Mellemmasse findes. D³1 SH1. my 2

r) omtrent ret kompakt Tørv my 2-3. Kun lidt Eriophorum men mange Rødder og Bødfilt (Carex) D²2-3 SH 1-2

s) Eriophorum Tørv lys meget fillet (Sphagnum) D¹3 SH 1. Farve lyst brun my 1½-2

t) som r. lidt mere løs og en Smule lysere en Del Lyngrødder

u) som t men mange Lyngrødder

v) Lyngskjold

39

A4020

0.47
2.33
Sm 924

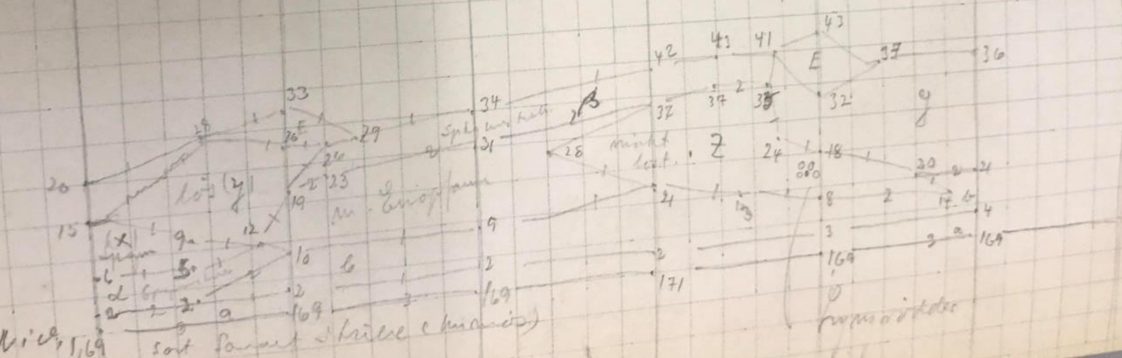
÷1.62

d Sten, der
Vejen, der
lige Dalside
for den
dalen
ed Manden

Tollund Manden Bjelskovdal Mose. 18/4 ...

2.13 0.75 0.50 0.25 2.14 O = Nia ÷ 1.62

y = my 1. A 0-1 B 4 Stfe. 0
x = my 1.2 A 0-1 B 4 mere kompakt end foregaaende Stf 2
α: my 1. Stfe 3 A(0)-1, B 3-(4)
Z my 3-4 D (Eriophorum) A 2 - B 1
β my 2 A 2(÷) B 2(4)



Nic. 1,69 sort Sand Striber (humus)

40 A 4020

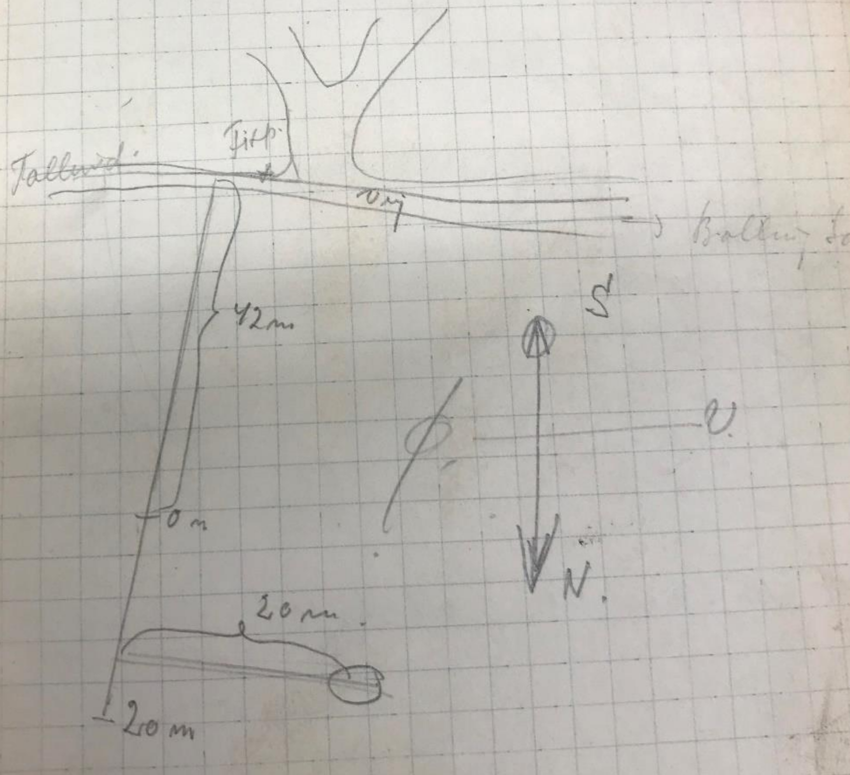
"Tollund Manden" Bjælskærdal Mose
"Prøver til C14. 18/4 53 F-5/5.

N. 8,00 - 8,25; Prøve I formentlig Samt. m. Tollund Manden
fra Lag (22 - 30) Pag 34 denne Bog.

N. 6,25, fra Lag (38-45) Prøve II ældre end T. Manden. Pag 35 denne Bog

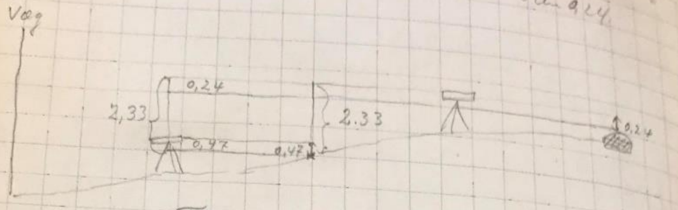
N. 6,25-6,50 fra Lag (50 - 57) Prøve III formentlig Samt. m. Tollund Mand

N 18,25 fra Lag (27-31) Prøve IV. Pag 22 denne Bog
samtidig m. T. Manden.



Fixp. Tollund Manden
Bjelskovdal Mose.

0,47
2,33
Sten 0,24



$$Fixp = \div 2.33 + (0,24 + 0,47) = \div 1.62$$

Fixp. = en stor, net flad Sten, der ligger knap 1 Meter syd for Vejen, der gaar langs Bjelskovdals sydlige Dalside. Stenen ligger tæt (ca 5 m) Øst for den Slugt, der munder ud i Hoveddalen ud for Findstedet af Tollund Manden.

Se Maalebords blad.

Radiocarbon Dates: Bjældskovdal Bog

UBANo	Sample ID	Material Type	^{14}C Age	±	F14C	±
UBA-32481	sample 1, core 2		1963	30	0.7832	0.0030
UBA-32482	sample 2, core 15		6615	51	0.4389	0.0028
UBA-32483	sample 3		2723	27	0.7125	0.0024
UBA-32484	sample 4, core 1, 60-70cm		1126	29	0.8692	0.0031
UBA-32485	sample 5, core 1, 1.70-1.80		4743	30	0.5541	0.0021

England

Northern Ireland

VAT No. GB729856187
Customer No. 2310432

Radiocarbon Date Certificate

Laboratory Identification: UBA-32481
Date of Measurement: 2018-04-30
Site: Bjaeldskordal Bog
Sample ID: sample 1, core 2
Material Dated: peat,sediment (humin fraction)
Pre-treatment: Humin Extraction
Submitted by: Henry Chapman

Conventional ^{14}C	
Age:	1963±30 BP
using AMS	
Fraction corrected δ^{13}C	

England

Northern Ireland

VAT No. GB729856187
Customer No. 2310432

Radiocarbon Date Certificate

Laboratory Identification: UBA-32482
Date of Measurement: 2018-04-30
Site: Bjaeldskordal Bog
Sample ID: sample 2, core 15
Material Dated: peat, sediment (humin fraction)
Pre-treatment: Humin Extraction
Submitted by: Henry Chapman

Conventional ^{14}C	
Age:	6615±51 BP
using AMS	
Fraction corrected $\delta^{13}C$	

England

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VAT No. GB729856187
Customer No. 2310432

Radiocarbon Date Certificate

Laboratory Identification: UBA-32483
Date of Measurement: 2018-04-30
Site: Bjaeldskordal Bog
Sample ID: sample 3
Material Dated: peat, sediment (humin fraction)
Pre-treatment: Humin Extraction
Submitted by: Henry Chapman

Conventional ^{14}C	
Age:	2723±27 BP
using AMS Fraction corrected $\delta^{13}C$	

England

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VAT No. GB729856187
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Radiocarbon Date Certificate

Laboratory Identification: UBA-32484
Date of Measurement: 2018-04-30
Site: Bjaeldskordal Bog
Sample ID: sample 4, core 1, 60-70cm
Material Dated: peat, sediment (humin fraction)
Pre-treatment: Humin Extraction
Submitted by: Henry Chapman

Conventional ^{14}C	
Age:	1126±29 BP
using AMS	
Fraction corrected δ^{13}C	

England

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VAT No. GB729856187
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Radiocarbon Date Certificate

Laboratory Identification: UBA-32485

Date of Measurement: 2018-05-04

Site: Bjaeldskordal Bog

Sample ID: sample 5, core 1, 1.70-1.80

Material Dated: peat, sediment (humin fraction)

Pre-treatment: Humin Extraction

Submitted by: Henry Chapman

Conventional ^{14}C	
Age:	4743±30 BP
using AMS	
Fraction corrected $\delta^{13}C$	

Information about radiocarbon calibration

RADIOCARBON CALIBRATION PROGRAM*

CALIB REV7.0.0

*To be used in conjunction with:

Stuiver, M., and Reimer, P.J., 1993, Radiocarbon, 35, 215-230.

Annotated results (text) - -

Export file - c14res.csv

32481

UBA-32481

Radiocarbon Age BP 1963 +/- 30

Calibration data set: intcal13.14c # Reimer et al. 2013 % area enclosed cal AD age ranges relative area under probability distribution 68.3 (1 sigma) cal AD 5- 70 1.000 95.4 (2 sigma) cal BC 41- cal AD 86 0.978 cal AD 107- 118 0.022

32482

UBA-32482

Radiocarbon Age BP 6615 +/- 51

Calibration data set: intcal13.14c # Reimer et al. 2013 % area enclosed cal AD age ranges relative area under probability distribution 68.3 (1 sigma) cal BC 5616- 5583 0.367 5572- 5516 0.633

95.4 (2 sigma) cal BC 5624- 5484 1.000

32483

UBA-32483

Radiocarbon Age BP 2723 +/- 27

Calibration data set: intcal13.14c # Reimer et al. 2013 % area enclosed cal AD age ranges relative area under probability distribution 68.3 (1 sigma) cal BC 895- 835 1.000 95.4 (2 sigma) cal BC 915- 815 1.000

32484

UBA-32484

Radiocarbon Age BP 1126 +/- 29

Calibration data set: intcal13.14c # Reimer et al. 2013 % area enclosed cal AD age ranges relative area under probability distribution 68.3 (1 sigma) cal AD 891- 907 0.225 914- 968 0.775

95.4 (2 sigma) cal AD 778- 790 0.023 808- 817 0.011

825- 841 0.020

862- 990 0.947

32485

UBA-32485

Radiocarbon Age BP 4743 +/- 30

Calibration data set: intcal13.14c # Reimer et al. 2013 % area enclosed cal AD age ranges relative area under probability distribution 68.3 (1 sigma) cal BC 3632- 3560 0.758

3537- 3518 0.203 3393- 3388 0.039

95.4 (2 sigma) cal BC 3635- 3503 0.816 3428- 3381 0.184

References for calibration datasets:

Reimer PJ, Bard E, Bayliss A, Beck JW, Blackwell PG, Bronk Ramsey C, Buck CE

Cheng H, Edwards RL, Friedrich M, Grootes PM, Guilderson TP, Haflidason H,

Hajdas I, HattÃ© C, Heaton TJ, Hogg AG, Hughen KA, Kaiser KF, Kromer B, Manning SW, Niu M, Reimer RW, Richards DA, Scott EM, Southon JR, Turney CSM, van der Plicht J. IntCal13 and MARINE13 radiocarbon age calibration curves 0-50000 years calBP Radiocarbon 55(4). DOI: 10.2458/azu_js_rc.55.16947

Comments:

* This standard deviation (error) includes a lab error multiplier.

** 1 sigma = square root of (sample std. dev.^2 + curve std. dev.^2) ** 2 sigma = 2 x square root of (sample std. dev.^2 + curve std. dev.^2) where ^2 = quantity squared. [ ] = calibrated range impinges on end of calibration data set

0* represents a "negative" age BP

1955* or 1960* denote influence of nuclear testing C-14

NOTE: Cal ages and ranges are rounded to the nearest year which may be too precise in many instances. Users are advised to round results to the nearest 10 yr for samples with standard deviation in the radiocarbon age greater than 50 yr.
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