Entangled Conquest: A Study of Cultural Hybridization and Change in Norman Ireland

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ENTANGLED CONQUEST:
A STUDY OF CULTURAL HYBRIDIZATION AND CHANGE
IN NORMAN IRELAND

by
Sean E. McConnel

A Dissertation Submitted in
Partial Fulfillment of the
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ABSTRACT

ENTANGLED CONQUEST: A STUDY OF CULTURAL HYBRIDIZATION AND CHANGE IN NORMAN IRELAND

by

Sean E. McConnel

The University of Wisconsin-Milwaukee, 2023
Under the Supervision of Professor Bettina Arnold

This thesis employs entanglement theory and new geophysical macro-analytical methods to examine the spread of Norman culture in late medieval Ireland. The traditional theories of Anglo-Norman conquest by mass migration, by military conquest, and by political conquest are reviewed and compared to a more nuanced theory of Normanization, which highlights how genetically Irish people, who spoke Irish, practiced Irish law, and pursued Irish interests may have been responsible for most of what is considered “Norman" material culture on the island. This dissertation uses a case study in County Roscommon to test the idea that allegiance to the English crown was a necessary and expedient action on the part of Irish lords that has been largely misunderstood by later generations. Medieval Irish people participated in the changing social dynamics seen throughout the Christian world at the time, including participation in the Crusades, cereal agriculture, and military adherence to a recognized Papal authority, ultimately resulting in the adoption of behaviors and allegiances that mirrored their English and Welsh counterparts. The model of an English invasion of Ireland during the medieval period is challenged based on a case study at Ballintober, County Roscommon.
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Chapter I: Background and Purpose

This thesis was designed to explore the process by which much of Ireland became “Norman.” The case study chosen for this project is located in Ballintober, County Roscommon, a site that has been the focus of traditional research and excavation as well as geophysical analysis, including the data set presented here. This thesis applied a theoretical approach known as entanglement as it has been applied in archaeology (Hodder 2011) to analyze the interactions between foreign and native cultures and highlight the ways in which the new and the old ways were combined in the course of the mixing that occurred between them. By identifying the behaviors and strategies adopted in these blended communities, inferences can be drawn regarding the power dynamics and social changes at play in Ireland during the Norman phase of the late medieval era, which is traditionally given the dates 1150-1400 AD (Duffy 1997).

The term “Norman,” even in medieval contexts, has been applied to everything from pagan invaders from Scandinavia into France in the tenth and eleventh centuries to the later medieval Christian movements that radiated throughout Europe, the Mediterranean, and most of Russia (Bates et al. 2017). In the context of Ireland, Normans are traditionally and perhaps inaccurately equated with English migrants and soldiers, with the presumption that they were primarily engaged in conquering and supplanting the native Gaelic population. This study aims to unravel some of the complexity of Norman ethnic and social boundaries and make sense of the movement of that material culture across the medieval Irish landscape.
1.1 Research Questions and Project Goals

This project was designed to test the nature of the medieval Norman expansion across Ireland, emphasizing behaviors and practices visible on the very edge of Norman influence in the case study of Ballintober, Co. Roscommon to generate hypotheses that can be tested in other parts of Ireland during the late medieval era. It is hoped that a more nuanced understanding of the response of the rural Irish people, who likely constituted most of the population of Ireland at the time, will illuminate the processes of cultural and social development that characterized this period of social change. The investigation makes use of the entanglement approach, wherein populations that differ from their parent cultures are analyzed as a distinctive group (see Hodder 2011; Stockhamer 2012). Choices made regarding which behaviors of the parent cultures are kept, discarded, or modified shed light on the social dynamics that were in play. In this study, the entangled Norman populations of Ireland are compared to the pre-Norman indigenous cultures and the populations that immigrated to Ireland from England and Wales.

Naturally, within the categories of native, migrant, and entangled cultures one would expect to see a degree of variability; the idea of perfect representatives or pure cultures is dated and has been disproven by the last half century of anthropological investigation. Regardless, all cultures are defined by sense of themselves (Jones 1997; Orser 2001) that is differentially represented at archaeological sites by the material record. Archaeological features have been described as the “crystalized” evidence of the behavior of humans in the past (Binford 1962). Thus, it is normal, and perhaps unavoidable, for archaeologists to discuss identity and ethnicity in material terms, even though both are necessarily fluid concepts which are not easily subjected to empirical definition or direct testing.
The method applied in this project was to engage in direct testing of a large sample area using non-invasive technologies, and then apply those findings to other archaeological data sources and theories from across late medieval Ireland in order to address the larger topic of how life changed in Ireland in the twelfth to mid fourteenth centuries. The entanglement approach allows inferences to be made about ethnicity and the development of socio-political structures, and the connections of the ethnic boundaries and social structures associated with contemporary groups in England are used to investigate the so-called “Norman Conquest” of medieval Ireland.

It has long been argued by historians and archaeologists that Norman architecture and influence can be identified across most of the island, even though the historical record is unclear at best about the level of authority and adherence to the English crown (Curtis 1919; Duffy 1997). Ultimately this project aims to improve our understanding of the Norman era cultural transformations, in particular the character of the so-called English invasion when examined using an archaeological approach to entanglement in an area of Ireland that has so far not been subjected to this kind of analysis.

1.2 History and Historiography of the Norman Invasion

The late medieval period in Ireland is generally considered to begin when the first Norman forces landed in Ireland in 1169. The event itself is often called the “Norman Invasion,” but “invasion” is a loaded term that implies a one-way movement of influence and control. When viewed holistically, there are many counterpoints to the idea of a centralized English based authority structure. Right from the beginning, there were indications that native authority figures were acting in their own best interest and did not necessarily see all Norman populations as simple foreign aggressors. In fact, the first Norman to land on the island is recorded to have done so at
the behest of an Irish king whose daughter was subsequently married to the Norman leader. According to the written record, Dairmaid mac Murchada, the deposed Irish king of Leinster, arranged to have the famous Norman-Welsh crusader Richard de Clare (known as “Strongbow”) help him retake his throne. In return King Diarmaid awarded Strongbow with titles of Irish nobility and married the adventurer to his own daughter. Although Strongbow’s landing is often cited as the beginning of the “invasion,” he might more accurately be considered a powerful Welsh mercenary than a functionary of English expansion (Duffy 1997).

This means that the Norman era began with a pull from Ireland, as opposed to a push from England, and in many ways that dynamic can be seen throughout the Norman period. The end of the Norman era, however, is less easily defined. It is commonly acknowledged that the early 1300s saw a steep decline in English authority, followed by a movement called the “Gaelic Resurgence”, during which time the English King’s authority was challenged across most of Ireland in the mid-14th century. At the same time, the habit of noble families and whole ethnic groups throughout the island referring to themselves as “Norman” persisted, such that the term was still popular when Henry Tudor (Henry VII) returned an English military force to the island in the sixteenth century, and in many cases was used to differentiate Catholics (Normans) from the English invaders (Morley et al. 1994; Nualláin 1994; Nicholls 1972, 1987). The ethnic label “Norman” included groups that were indifferent to, or even opposed to, the King of England and English hegemony more generally (Duffy 2015; O’Conor 2000; O’Keeffe 2004). Recent scholarship has even highlighted the fact that feuding among Norman lords was not only tolerated by the English crown but appears to have been at times instigated by the English King himself, as a means of keeping Irish Normans from becoming a rival power (Duffy 1997:22).
There has been a great deal of discussion about the nature of the process by which Norman influence came to dominate the island for almost two centuries. Until recently the Norman conquest of Ireland was mainly defined based on Norman style structures, particularly durable stone buildings that are often still visible on the landscape today. Historians and archaeologists theorized that the spread of Norman style castles and churches across the landscape directly coincided with the conquest and in-migration of a foreign ethnic group. Considering that simplistic view, scholars concluded that English forces had invaded from the southeast, and in a few generations had conquered their way across almost the whole island. Many old history books are lavishly illustrated with images of armies of Norman invaders, followed by mass migrations of settlers, conquering and killing the Irish as they pushed ever westward (O’Doherty 1938:157) (Figure 1).

![Figure 1. The Marriage of Strongbow and Aoife, a painting by Daniel Maclise (1854).](image-url)
However, archaeologists in other contexts have long ago learned that interpreting the migration of individuals in terms of cultures and ethnicities (formerly races) based on a single aspect of material culture is dubious, at best (see Anthony 1990). Regarding the evidence of the built environment in particular; architects and masons are not a good sample population, as they are frequently non-local, and are usually only temporary residents in the areas where the structures were built (Rapaport 1987:93). Thus, both defensive and religious structures were often constructed by a small subset of individuals who were often foreign and unrelated to the surrounding population. Traditional migration theories also presumed that castles and other Norman architecture were excellent culture markers, as they believed that the Gaelic (native Irish) population could not have built such structures. More recent scholarship has begun to question whether some castles could be reliably differentiated as being built by Gaels or Normans, based on their physical structure alone (Barry 2008; Brady 2009; O’Keeffe 1990; O’Keeffe 2019).

Apart from political authority, it has long been recognized that the populations of medieval Ireland identified in the written record as Norman still favored the Gaelic language for daily use, secular texts, and even laws (Curtis 1919; Hambro 2015; O’Keeffe 2001). Within the religious sphere Irish Normans, also referred to as “Hiberno Normans,” are clearly distinct from their English counterparts (Hambro 2015:97). Much has been made of the “monastic double step” whereby clerical communities would simultaneously acknowledge the lordship of the English King in Ireland and ignore him when convenient (see Müller 2007).

The primary research goal of this project was to develop a way to identify the process of Normanization and what it meant to be a “Norman” in medieval Ireland using a non-invasive system of mapping landscape features and structures as a proxy for culture change. Understanding this process has the potential to fundamentally change how archaeologists view the logic of
authority and power in the Late Medieval period and provides a baseline for comparison with other landscapes of the period.

1.3 Topography, Landscape, and Climate

Ballintober is a small village in Roscommon Co., Ireland with a population of around 300 people (Figure 2). The topography in this part of Ireland is characterized by low hills, and the ever-present rainy weather means that countless ditches and drainage features are visible across the landscape. It is thought that many of the ditches and boundaries visible in Ireland today are medieval or even pre-medieval features (Finan 2016; O’Keeffe 2010) and the modern landscape features a nearly homogeneous distribution of small settlements surrounded by pastureland. The landscape around Ballintober and the rest of County Roscommon is dotted by small circular ruins broadly classified as “ringforts”; the National Monument Service’s “Historic Environment Viewer” records over 50,000 of such sites in county Roscommon alone. Ballintober itself is an inland site surrounded by the ruins of countless ringforts which are commonly thought to mark the Early Medieval era and are usually considered a characteristic feature of Gaelic culture.
Climate

The climate of Ireland today, and for most of its human history, consists of famously rainy, foggy weather rarely punctuated by snow or sunny days. The warm, wet winds of the Atlantic Ocean blow in from the west coast and create a remarkably homogenous year-round weather pattern, not unlike Seattle, Washington or Anchorage, Alaska, which share a western coastal situation and remarkably warm temperatures despite their northern latitudes. This weather pattern has allowed the growth of thick, green grass that provides excellent pasturage for animal
husbandry. Cattle, horses, sheep, and pigs are raised frequently today, as they have been since the Neolithic, and in many respects the patterns of land use are very similar to those of the past.

It is not a coincidence that the Norman era corresponded to a short-lived period during which Ireland was much warmer and drier than today. Records in the form of Annals are preserved for Ireland dating back to the early medieval era, with the earliest dates in the seventh century AD, and the tradition was continued well into the 1700s. Archaeologists have found that comparing events such as famines and droughts recorded in the Annals to dendrochronological evidence can provide insight into historic weather patterns across the island (Lyons 1989; Cantwell 2000; Campbell and Ludlow 2020). It has been found that climate shifts such as the much debated “mini-Ice Age” that occurred in central Europe were not experienced the same way in Ireland, which appears to have had had distinctive climatic shifts of its own (Cantwell 2000: 132), although climate-related plagues and diseases made their way from the mainland to Ireland regardless (Campbell and Ludlow 2020: 242).

Ireland’s weather was at times distinct even from nearby Britain, particularly from about 1270-1350 AD, and there is little or even negative correlation between years with good growing conditions visible in the width of Irish and English oak trees rings, where fat rings correspond to good years (Campbell and Ludlow 2020: 89) (Figure 3).
Ireland itself was clearly in an unusually warm period during the main period of Norman occupation, which is evident from the fact that cereal agriculture was widely successful in places where it is not feasible today (Brady 1993, 2019). It has been hypothesized that the collapse of English control on the island in the fourteenth century corresponded to a collapse in grain agriculture, and that this climatic shift may have been the primary driver of that change, as opposed to political or social competition (Nicholls 1987: 413-415). However, more recent research tends to place less emphasis on the collapse of Norman, urbanized populations in Ireland being caused by mass famine than by plague (Dove 2014: 18, Campbell and Ludlow 2020: 84). The collapse of populations is clearly based on the expansion of woodland into what had been cultivated landscapes in Ireland and Europe more generally (Campbell 2016: 227-230), and even in mainland Asia (Kausrud et al. 2010).
What can be said with relative certainty about the climate of late medieval Ireland as a whole, and Ballintober in particular, is that grain agriculture was apparently successful enough to support tremendous population growth in places where such productivity would not have been possible for most of Ireland’s history, including today. It is reasonable to conclude that this warmer, drier period made the urbanization of large areas of Ireland possible and contributed to the social restructuring evident during this period, perhaps as a prerequisite if not a cause. In terms of the Norman implosion in the fourteenth century, it is not known when exactly the return to wetter seasonal weather patterns occurred, but there are clear signs of population collapse, and the historic Annals record in detail the devastation of the Black Plagues that depopulated most of Europe and Asia partly as a result of this change. The link between plague and climate in late medieval Ireland will certainly be a productive area for future research.

1.4 Settlement and Castle at Ballintober, Co. Roscommon

Modern Ballintober is a small settlement, located immediately adjacent to the large ruins of a stone castle. The town today houses a small population of several hundred people, being of appropriate scale for two pubs and a church, which some have teasingly referred to as “the minimum requirements for Irish township.”

At the north end of Ballintober lie the ruins of a large castle, assumed to have been built during the thirteenth century. The location of the settlement is historically significant as it is on a frontier, perhaps the utmost edge of land ever held by the Anglo-Norman forces, in this case represented by the de Burgh family, against the native Irish (Brady 2014a). One of the goals of the Discovery Programme’s Rural Settlement project, coordinated by the Centre for Archaeology and Innovation Ireland (https://discoveryprogramme.ie/projects/mrsp/) is to investigate the ethnic
identities at play in this settlement to determine who built the castle, which is not clear from the surviving historical record, and what its role was in the surrounding landscape (Brady 2006). This thesis contributes to that effort.

The viewshed from Ballintober castle extends down a low hill with gentle slopes to patches of wetland in the low places and many small streams that feed the Suck River. Most of the open ground is used for grazing livestock, with gray stones from the shallow limestone bedrock visible at intervals. Unsurprisingly, the local architecture is generally made of this locally available gray limestone material while slate is used for roofs. The stone architectural tradition ages well and makes dating structures around town difficult. The heavy stone block construction of Garvey’s Pub, for example, may indicate an early modern or possibly even medieval origin, but the structure sees habitation and use to this day (Figure 4).
An excellent survey of the castle and what is known of its history was conducted by Dr. Niall Brady for the Castle Studies Trust (2014), which ultimately informed the Castles in Communities program and served as the starting point for this dissertation. In 2008 and 2009 geophysical explorations of the castle were carried out that revealed some features within the walls (Nicholls 2008, 2009). Laser scanning and topographic surveys were completed on site to help with both analytical and preservation efforts, and a full review of historical documents and photographs was carried out (Brady 2014). The castle is privately owned and under the care of the descendants of its medieval occupants, the O’Conors of Connacht.
Based on the available historical evidence, the castle was most likely built at the start of the 14th century for the Earl of Ulster, Richard de Burgh. Only a few decades later, the O’Conors of Connacht are known to have taken the fortress, and its ownership stayed in the O’Conor family during Ireland's turbulent post-medieval history into the modern day. The structure is thought to have been inhabited into the 17th century, but the exact date and reasons for its abandonment are not known.

While entries in the *Annals of Connacht* (1224-1544) do not record the construction of Ballintober castle, it is occasionally mentioned in the records of significant events. For example, in 1311 a mercenary named Seonac Mac Uidilin accepted money from the Norman lord William de Burgh to betray and kill his employer, Aedg Brefnech O’Conor, a claimant to the kingship of Connacht. Although the plot succeeded, the mercenary was killed a year later in Ballintober. In 1315 the major castles of Connacht were attacked by the O’Conor forces, which were supported by the invasion of Ireland from Scotland by Robert the Bruce and his followers, and numerous towns including Ballintober were burned down. It is believed that the Normans were able to retake the lands lost during those attacks and hold them for perhaps a couple of decades longer before being pushed out of the area completely.

Another record that sheds light on the castle is an *Inquisition Post Mortem* from 1333 AD, a document assessing the value of the castle and its lands for the purposes of taxes and inheritance. Ballintober castle was stated to control 300 medieval acres of arable land at the time, which reflects both an enthusiastic tallying of farmland in the area and the significantly warmer climate that prevailed during this period. The township was expected to pay more than £84 in annual taxes, although records after 1333 AD. show only about £10 paid for the “five townships” including Ballintober, which indicates either a wild miscalculation on the value of the property or simply the
steep collapse of Norman control. The paucity of historical records that mention Ballintober, except as a background against which violence sometimes took place and taxes were extracted, has led to the perception of Ballintober as a frontier fortress, as opposed to a regional capital, despite its grand size (Brady 2014: 12).

The map below (Figure 5) illustrates the political situation of Ballintober’s location in the late medieval period. The site was on the northwest frontier of Norman settlements and further inland than most Norman castles of the period. As is common, the map highlights the areas held by native Irish people versus Normans. These sorts of images reproduce the simple “native versus colonist” approach that is endemic in historical approaches. While they are perhaps useful for outlining changes in material culture across the landscape (Norman architecture, for example), such images oversimplify medieval politics and society by perpetuating a dichotomous “us versus them” approach.
1.5 CICASS Program and Related Studies

The Castles in Communities Archaeological Survey School, hereafter referred to as “Castles in Communities" or simply “CIC,” is a collaborative program between Columbia University and Foothill College of Los Altos Hills, California. At its core, Castles in Communities is a field school for archaeology and anthropology students who spend several weeks learning to excavate while living in an Irish community (https://sites.google.com/view/irelandcastlesincommunities/home).
The history of archaeological investigation in Ireland has tended to focus on the major urban centers while relatively little is known about the development of the rural areas that constitute most of Ireland’s landscape and population (Brady 2019; O’Conor 1998; Simms 1983). The Castles in Communities project is focused on investigating these overlooked rural settlements and their inhabitants.

Since 2015 the program has employed geophysical survey tools including a magnetic gradiometer, ground-penetrating radar equipment, GPS systems, and a full complement of personnel trained in the usage of those technologies. This thesis includes a summary of the macro-analysis of geophysical data collected over five field seasons, which were supported by excavations and conducted by the program, as well as an exhaustive review of historical material by Dr. Niall Brady (2014).

Some of the key personnel involved in the project are Dr. Lawrence Conyers of Denver University, a leading expert in ground-penetrating radar; Dr. Daniel Cearley and Dr. Samuel Connell of Foothill College, California; and Dr. Chad Gifford of Columbia University in New York City. The last three manage the American students and provide the GPR equipment. Dr. Niall Brady is responsible for arranging the Irish interests and securing permits and is the mastermind behind the strategic approach used at this site and elsewhere for the Discovery Programme. Together with a variety of field directors the team manages several dozen students each field season in and around Ballintober. I was introduced to the program as a PhD candidate in need of a dissertation topic in 2015 and was appointed as a volunteer field director to be trained on the GPR equipment by Dr. Conyers. My role during the four seasons of field school explorations included in this thesis was to manage geophysical data collection, with the explicit intention of incorporating the results into a dissertation. As one of the charges of the field school, every student
was taught basic data collection using every available technique and system in the program, so over the course of four field seasons, I have taught probably more than 200 students the “quickstart” version of how to use a GSSI SIR 3000 GPR. A Bartington 601 gradiometer was also deployed by a counterpart team.

The 2015 season initially yielded relatively few useful GPR results and the team was unable to collect much data with the gradiometer due to technical difficulties. It was not until the end of the 2016 season that the CIC team was finally able to project data they had collected over the medieval landscape, culminating in the identification of a settlement whose existence had not previously been confirmed. The next two field seasons were spent improving field collection techniques for better location accuracy and faster data collection, with an emphasis on covering as much of the landscape as possible. At least six hectares of collected data are presented in this document, which represents an exceptionally large area of geophysical investigation in an archaeological context.

Excavations and survey in Ballintober were paused during the COVID-19 pandemic and resumed with the 2022 field season. The macro-analysis presented here is the most up-to-date compilation of the extensive geophysical data sets collected during the 2015 to 2019 seasons and will provide the basis for future research both in this community and elsewhere in Ireland using non-invasive techniques to map ancient landscapes.
Chapter II Methods and Theory

2.1 Research Goals

The two primary goals of this research project were: 1) to investigate the cultural transformation processes that occurred during the Late Medieval period in Ireland as a result of English and Norman influences and 2) to develop more effective ways of approaching what the term “Norman” meant to medieval Irish people. The theoretical approach employed here is based on an archaeological take on “entanglement theory,” which compares a given culture to the cultures from which it is derived and other sources of influence around it. One of the key revelations of that framework has been the epiphany that influence is neither one-way nor linear; determining which cultural practices were reproduced and which were ignored can shed light on the relationships between culture groups, and in this case reveal a great deal of how late medieval Irish populations organized and defined themselves and their relationships with surrounding populations, including Norman incomers.

2.2 Theoretical Framework: Entanglement Approach

Entanglement theory is popular in anthropology for addressing changes visible among cultures as it allows an analyst to make inferences about the character of influences from surrounding culture groups. Entanglement theory exists at an intersection between hybridization theory (see Stockhammer 2007) and a materialist tradition stemming from “thing theory,” which was originally conceived to approach the very complex relationships between humans and objects (Latour 1996; Webmoor and Whitmore 2008). The materialist use of entanglement theory focuses on dependencies between humans and their artifacts and features they create to approach pathways
of societal evolution (Hodder 2006; Joyce and Gillespie 2000). The theoretical approach has expanded to include not only how human beings are affected by their dependencies to objects (and vice versa, as objects require maintenance) but also plants, animals and even social relationships among humans (Hodder 2011). Ian Hodder describes that as much as objects often require human action to create, maintain, or destroy them so too do social relationships, which can often be viewed with a similarly materialistic approach (Hodder 2011:182).

For example, advancing a particular technology can provide new possibilities, but remove other options for the culture involved. In the case of Norman Ireland, I will later (chapter 4) detail how switching from pastoral to cereal agriculture allows urbanization and population growth, however that relationship is entangled, and forces changes down a particular path; in this example strategies for moving livestock to protect it from raiding are no longer viable; cereal crops must be defended as opposed to moved protect from raiding. Thus, the change to cereal agriculture, regardless of the intended motive, forces societal change down a different pathway that is more conducive to castles and urbanization, even if those were not the intended outcome. The agricultural technology would thus be entangled to major changes in the built environment and defensive strategies, power hierarchies, and ultimately even ethnicity. The key is directionality that is caused by entangled changes, which can have much broader implications than their direct and intended benefit (more food, in this case).

When new traditions, objects, or social interactions are reproduced within a human population, it changes their options for other associated objects, behaviors, and groups in complicated ways. To understand the pathways that changes have occurred over time (evolution), it is necessary to understand the network of relationships, or “entanglements,” that guided what would have been acceptable options to human agents at every stage along the way. The materialist
use of the entanglement approach fits well for the intended goals of this research project, as examining the networks of technologies and features that are visible in the material record can allow inferences about other relationships that are not directly preserved, such as ethnicity and power dynamics. More directly, however, this work uses the term closer to how it is typically used in hybridization theory as a means of understanding observed changes radiating out of points of culture contact.

The entanglement approach often blends heavily into hybridization theory, which was popularized in anthropology by Homi Bhabha (Bhabha 1994). Hybridization is an observed phenomenon wherein cultures in contact with each other exchange ideas and behaviors, thus generating variations of cultures that are new (Bhabha, 1994; Stockhammer, 2012 Furholt and Stockhammer 2007). This behavior is so pervasive in inter-cultural interactions worldwide that it has been noted that the idea of a pure culture that does not derive from multiple parent cultures does not exist; all cultures are a mishmash creation of previous cultures and existing influences (Lévi-Strauss 1996:32).

Perhaps as critical as the notion that all cultures are a composite of surrounding influences is the observation that such interactions are two-way (Bartlett 1993; Nicholas 1991; Thomas 1991). Colonialism, particularly, was traditionally interpreted as a top-down process whereby the powerful influence the weak, whereas archaeological theory now recognizes that transmission occurs between the colonizer and the native in two directions, with a “third space” developing at the nodes of intersection (Balco 2012; Kalua 2009).

In historical and archaeological circles, the term hybridity is often used with strong negative connotations in colonial and imperial contexts (see Wengrow 2007), but it can be observed in the absence of colonialism as well; the process is not always a subaltern strategy.
Voskos and Knapp have demonstrated this idea in their study of aspects of Hellenization in the Greek world, particularly for Iron Age Cyprus (Voskos and Knapp 2008). Likewise recent research into Iron Age Sicily has revealed that hybridization can be a tool for understanding how native cultures can respond to colonial forces, generating wealth and effective political resistance at the same time (Balco 2012; McConnel and Kolb 2012).

In the realm of archaeological theory specifically, the term hybridization has been largely colored by biology and colonial theory (Furholt and Stockhammer 2007), so the concepts of entanglement and its German equivalent “Geflecht/Verflechtung” have become popular in the scientific community in general (Nicholas 1991), and archaeology in particular (Dietler 1998; Stockhammer 2012). Alternative terms for hybridization include culture borrowing, melting pot, stew, creolization, syncretism, cultural mixing, globalization, and cultural translation (Burke 2009). Appropriation and cultural translation imply conscious action, while entanglement, hybridization and creolization are perceived as reflecting a more passive process of culture change and are generally used when the processes involved are assumed not to be intentional.

For this project the mixing and entanglement of cultures is key to understanding foreign influences in Norman Ireland. Entanglement can be a source of native empowerment, as opposed to forced assimilation. A good example of entanglement that proved advantageous to native cultures is represented by a metallurgical study of nails used in ship building in East Africa. Local populations learned to create advanced nautical vessels previously thought to have been beyond their ability to produce by selecting which parts of colonial culture they needed to adopt and adapt to do so (Kusimba 2009:74). In another case study, White used hybrid theory to investigate a French colony in the Great Lakes area of the United States and found the “middle ground approach” --which is to say identification of a third type of community that was neither colonial
nor native—was the most effective way to explain how cultures “melted at the edges and merged” (White 1991), ultimately leading French soldiers under La Salle to choose their hybrid counterparts over the colonial power because of the greater freedom and agency they experienced among the Algonquin people. The famous epithet “we are all savages” (White 1991:58) mirrors the attitudes of the Norman Irish in their rejection of the English Common Law and the “King of All Ireland,” choosing local authorities and traditional Irish legal practice instead (Gale 2004:3).

The genius of entanglement theory is that it addresses the oversimplification of cultural boundaries common in historical thinking. It acknowledges the layers upon layers of social boundaries that separate and bind communities and views the prioritization of these boundaries as fluid and dependent on context (Chambers 1996). In terms of material culture specifically, stylistic choices that occur in artifacts of all types, ceramics being perhaps the best example, provide a direct line of evidence for the dynamics of entanglement. Stylistic choices are both assertive, in that they demonstrate the choices and agency of the creator, and emblematic, in that they demonstrate relationships to groups who chose to purchase and use those items (Balco 2012:267). The choices made by native cultures to import or reproduce foreign ceramic traditions have been used to track the dynamics of social power and cultural assimilation versus resistance (Antonaccio 2010; Balco 2009, 2012).

In this thesis entanglement theory is used to examine the choices that Hiberno-Norman populations made, specifically the choices to emulate elements of English cultural identity, versus other strategies that might cause material culture to be reproduced by hybridized Irish culture. The data collected for this project will be tested against previous interpretations of Norman interactions with the native Irish and compared to other archaeological data and findings in the discussion session. In the conclusion chapter the different social strategies that could have
been employed during the Norman conquest provide a way to model the behavior pattern that best fits the observed findings. Entanglement is viewed in this context as a heuristic device rather than a theoretical framework, given that the evidence available is still too incomplete for more theoretically robust applications of this concept to be applied in this context.

2.3 Targets of Analysis: Culture Groups and Ethnicity

Types sites, as defined in this study, have long been recognized as an imperfect approach to identifying cultures (Childe 1956:95). Material culture is never an exact proxy for social configurations or ideologies. In the past archaeologists have often struggled when trying to differentiate ethnic groups based on material culture. Until the 1950s there had been few effective challenges to the pseudo-scientific search for a history of races that was endemic to culture historical thought in the aftermath of 19th century nationalist movements in Europe and during the two world wars that followed (Arnold 1999, 2006, 2013). In the decades after World War II much of academia threw out not only the search for an archaeological basis for race, a fictive construct in any case, but the concepts of ethnicity and migration as a mechanism of culture change as well (Anthony 1990; Arnold 2006).

To scientists and social scientists, the term “race,” a word stemming from the French word for “breed,” is meaningless as an analytical unit because human genetic and social groups fail to conform to categories derived from descriptions of purebred livestock. The constant blending of cultures and genetics visible in all but the rarest contexts prevent any meaningful identification of an archaeology of race (Arnold 2013; Lévi-Strauss 1996). Thus, in an analysis of medieval Ireland it is important to remember that natives and hybrid groups would in time mix to become what is now known as “Irish,” and thus neither group has a more direct claim to the history of the Irish
people. Despite the rejection of the term “race” as a unit for meaningful analysis, racial thinking and racism as phenomena are unlikely to ever disappear, as the habit of explaining behaviors based on the good and bad breeding of humans is itself an ancient and durable cultural practice (Orser 2001).

Beyond the concept of races, the term “culture” is also an artificial construct, better considered as an analytical unit than a reality. Stephen Shennan outlined the real relationships that are visible in material culture distributions, despite archaeology’s predisposition toward the analysis of cultures when he argued;

“There are no such entities as ‘cultures,’ simply the contingent interrelations of different distributions produced by different factors." (Shennan 1989:13).

It is important when analyzing identity, ethnicity, culture, or any other social construct to remember that these are non-real entities; they do not exist in the physical sense although they may be expressed in physical form. They are imaginary concepts (Jones 1997:109). As is the case with politics, authority or any aspect of society, scientists who study culture are forever analyzing something that is only “real” in the sense that it exists in human minds and directs human actions in the real world. It is the material manifestation of those actions that are partially preserved in the archaeological record, which is itself subject to Taphonomic selection processes that impact what is available for analysis. Thus, when discussing cultural groups in medieval Ireland, we are necessarily attempting to recreate the motivations of those individuals, to identify social boundaries and dynamics as they understood them. Surprisingly, a great amount of evidence for social identity, perhaps even the majority of said evidence, comes from trash pits (Willey et al. 1956: 9; Voss 2005: 200); this is largely because humans engage in repetitive action that shapes
cultural identity, foremost among which is acquiring, preparing, consuming and discarding food. Settlement archaeology is thus one of the best sources of information of actual human behavior largely unfiltered by self-conscious manipulation, largely by the creation and distribution of refuse materials (see Binford 1962; Gartski et al. 2015; Kvamme 2003).

It is important to consider that while a perfect understanding of any human mind, much less the minds of those who are long since dead, is impossible, it is the purpose of anthropology to find ways to approach the seemingly unattainable goal of understanding humanity (Arnold and Jeske 2013). Thus, archaeologists are given no reprieve; given that social constructs such as culture, identity and ethnicity existed in the past and guided human behavior, we are obliged to study them as a means of understanding those behaviors.

Culture and ethnicity are both frequently invoked, if evasive, targets of study in anthropology, as both are major components of how humans organize and understand the world around them. Archaeologists are naturally more prone to favor culture, as we are intellectually married to the physical record, which we call material culture or artifacts. However, in some contexts “ethnicity” is a better option, as the term connotes identities as living subjects would have recognized them. Social scientists have made significant strides in understanding the ways that humans understand and use ethnicity in their daily lives. Ethnic groups do not exist in isolation, but rather are competitive between groups (Freedman and Barth 1970). Ethnicity consists of a series of shifting, subjective, situational relationships constantly undergoing transformation and occasionally discontinuation (Jones 1997:13).

For archaeologists, the way in which ethnic identities are tied to physical practice is a critical consideration. Perhaps the best description of how social identity/ethnicity is tied to behavior (and thus the material record) was outlined by Pierre Bourdieu in his famous 1977
publication. He coined the term “habitus” as a means of understanding the human actions involved in performing ethnicity. Rooted firmly in “practice theory,” Bourdieu explains that what binds people together and forces them apart is produced by quotidian physical experiences. The way in which everyday objects are understood and used necessarily produces a sense of familiarity with those practices, while alternative objects and behaviors produce a sense of foreignness. Individuals share experiences with and membership in more than one group, each with its own habitus, and thus a sense of togetherness with those members is created, and a sense of foreignness with alternatives is also produced (Bourdieu 1977, 1990).

Thus, ethnicity can be considered as layered, as a person may identify with groups engaged in behavior that is both close and more distant from their particular habitus (Jones 1997:90). The migrant, native, and entangled culture groups in medieval Ireland would all have identified as Christian and European, for example. They would have shared some ethnic spatial boundaries because of a shared habitus (church, farm work, etc.), yet have been separated by other aspects of daily practice, such as clothing, language, and politics. Questions about the identity of medieval Gaels were explored by historians and archaeologists in the 1990s (O’Conor 1998, 2000), and this continues to be a productive lens of research today (Brady 2006; Gillingham 2007). In more recent scholarship, ethnic identity can be seen clearly shaping the residential patterning and settlement design of Irish diasporic communities in America well into the 20th century (Farley 2015).

When addressing ethnicity as reflected in cultural “traditions” and patterns in material culture, several types of evidence are most commonly employed by archaeologists: ceramics, evidence for subsistence (tools as well as faunal/floral remains), and settlement patterns (Jeske 1990: 221; Emberling 1997: 300), all of which were applied to this project. It is worth noting that mortuary evidence is also an important source of evidence for identifying ethnicity (see Arnold
and Jeske 2013), however no medieval burials have yet been excavated in Ballintober. Broader genetic studies in Ireland have recently addressed the question of how various presumed migration episodes have marked the modern population, and it is this evidence that will be used in this study. A review of the archaeology of death in Norman Ireland would certainly be a productive topic of future study if sufficient evidence is available for study.

When considering questions about social boundaries and ethnicity in North American contexts, archaeologists have been able to use physical evidence to study ethnicity and identity in late Woodland and Mississippian sites (Custer 1987; Jeske 1988a, 1988b) which are of similar age as the Norman sites that are the focus of this study in Ireland but have little to no historical record to lean on. In those cases, ceramics studies based on stylistic variation (Betts 2006), chemical composition (Richards and Clauter 2009), and testable residues (Hart et al. 2012) have proven to be tremendously useful for highlighting changes in ethnic and cultural traditions. Archaeologists have been able to make deep inferences into the social organization of complex societies around the world based on pottery evidence (see Emberling 1997), and it should be noted that geophysical analysis of the kind applied to the Ballintober case study can be a tremendously useful tool for archaeologists because of its propensity for finding trash pits filled with ceramics. Ground-truthing the various features identified using the geophysical approaches applied at Ballintober has the potential to resolve at least some of the questions that still surround the establishment, life history and abandonment of the castle and its surrounding landscape.

2.4 Geophysical Methods in Archaeology

Geophysical exploration is a relatively new tool for archaeologists, having been the source of experimentation since the 1990’s with some success (Conyers 2004, 2006). About a decade ago
computer modeling and GIS software became sufficiently sophisticated that archaeologists began to be able to combine multiple layers of such information into their analysis with much greater accuracy and degrees of certainty. Likewise, software platforms capable of processing and projecting GPR data have emerged, and AI generated features have been successfully though rarely applied for over a decade (Figure 6).

The combination of magnetic data - flux gradiometry, magnetic susceptibility, or electrical/magnetic induction - with ground-penetrating radar could be used to identify the presence and depth of features as well as enough of their physical characteristics to make usable maps of likely archaeological features (Conyers 2012; Goodman 2013; Novo 2009). The technique of combined GPR and magnetic survey was especially successful at identifying stone foundations and other large scale buried features that are different than the surrounding soil context in both moisture level and how electromagnetic currents flow through them. In more recent years,
advances in computer modeling and ground-penetrating radar resolution have even allowed geophysical tools to detect decomposed organic signatures such as human burials and wooden structures with a high degree of accuracy (Bigman et al. 2021; Conyers 2018). Likewise, magnetic gradiometry has been utilized to cover large areas and even whole settlements for a productive landscape analysis (see Wendling 2023). Large scale geophysics can produce maps of settlements and predictive models for artifact collection that can even be superior to extensive trench excavations, as shown below (Figure 7).
Figure 7. Kernel density maps from excavations in Norway, showing a tighter correlation from GPR than test trenches (Gustavsen et al. 2020: 18).
This dissertation expands on the legacy of geophysical survey in archaeology, presenting a nuanced approach to the GPR analytical technique. Unlike previous surveys that typically surveyed large areas with magnetics and only sample locations with GPR, the geophysical exploration at Ballintober took a novel approach by covering all 6.4 hectares of area using both sets of instrumentation.

The reason that process has not seen wide scale application previously has little to do with the ability to collect that amount of data, or access to the equipment needed, but rather the sheer volume of radiographic data that needed to be analyzed by a human technician. To date, AI programs are still in their infancy with respect to detecting subsurface features in GPR datasets on their own. Although products like the AI Maps plugin from IDS Georadar are emerging onto the market, these programs are targeted specifically to utilities, and remain experimental even in that context. To date, locating and drawing archaeological features in GPR are almost always done entirely by human analysts, and the process is slow, relatively speaking, such that multi-hectare archaeological surveys are relatively uncommon, and rarely successful. The section that follows presents an overview of how it was possible to generate such large and high-resolution geophysical imagery, and more importantly, the techniques by which that volume of data could be analyzed and features of archaeological concern highlighted.
2.5 Data Collection and Survey Design

Ground-Penetrating Radar

Ground-penetrating radar survey for this project began in 2015 under the direction of Dr. Samuel Connell of Foothill College in consultation with Dr. Lawrence Conyers of Denver University. The equipment used was a 400 MHz antenna manufactured by Geophysical Survey Systems Inc. (GSSI), and their SIR 3000 data logger. The antenna was attached to an aftermarket survey wheel and pulled along transects that were delineated using rope lines. The locations of the rope lines were based on grids whose corners were marked using GPS or a total station, depending on the year of the survey.

All GPR grids were gathered using the survey wheel technique (alternating transect direction) with 50cm between transects. Field collection found that using the “autogain” function to make radar profiles visible during fieldwork could be problematic, as setting the gains in an area with weak responses could cause areas with stronger signatures to experience “clipping,” a phenomenon that impacts the recording of data and can make areas unreadable. The approach used after several initial attempts was to set weak gains and rely on later processing to view profile images correctly.

Geographic Positioning System

An RTK corrected GPS was used to collect topographical data and to locate points. The GPS used to collect the data used in this report was collected by two different Trimble models. The GPS consisted of a base station, a rover, and a controller. The base station was set up first, and then the rover and controller were set up on a survey rod and used to locate points and record new points, using the functions "STAKEOUT" and "TOPO." The "STAKEOUT" function used a
point or selection of points from an uploaded file and displayed directions to the point on the display. "TOPO" allowed the rover to record a point in three-dimensional space. The "AUTOTOPO" function also recorded points, but on a time-based interval, to allow for faster recording. The points created by GPS were used to create a topographical map and were also used to align GPR profiles to identify features under uneven ground.

**Magnetic Gradiometry**

The magnetic gradiometry data analyzed in this thesis was collected in field seasons 2016-2019 by the Castles in Communities Archaeological Field School. The machine used was a Barrington Grad 601 Single Axis Magnetic field gradiometer that was generously lent to the program by the National University of Ireland, Galway’s School of Geography, Archaeology, and Irish Studies. The survey was conducted in 20m x 20m square grids laid out by a LEICA Total Station and Trimble GPS. Transects were walked along rope lines laid out at set intervals which gathered the data that was then processed in Sniffer before being projected by GIS software.

**Satellite Imagery Review**

Satellite imagery is available from a variety of free services, including Bing Maps (Microsoft) and Google Earth. These satellite images were reviewed, targeting the Ballintober Townland directly, and the areas around it. Many of Ireland’s archaeological remains are visible on the surface in satellite imagery, and by using the GIS software described in the next section it is possible to highlight and outline visible features in different sets of satellite imagery collected in different years and seasons. This method allowed features that were camouflaged by vegetation and other factors to be highlighted and drawn onto the same images and compared to historical maps for a holistic understanding of the surface features around Ballintober.
2.6 Analytics & Software

To guide future research, it is important that the workflow used in the project be provided to enable future studies. This sub-section describes each individual program that was used and for what kind of tasks, and then presents the workflow that was found to be most productive. Although large geophysical analysis has been conducted for decades in the world of mineral and oil exploration, the relative costs and complexity of that equipment and software have made it a poor fit for archaeological investigations until much more recently. The cost and complexity of geophysical investigations have been reduced drastically in recent years however, so macro-analytical projects like the one presented here are likely to become much more common.

The survey data presented in this thesis were generated by employing a variety of software packages available for processing and analyzing GPR and gradiometric data and projecting them onto both satellite imagery and georeferenced historic maps, which are provided free online by the National Monument Service. An outline describing the use of software for this analysis is presented below.

Software Packages

Data processing: Snuffler, GPR Viewer, GPR-Process, GPR_SLICE

Digital Maps: National Monument Service application (Geohive), Google Earth Pro, Bing Maps

Geographic Information Systems (GIS): ESRI ArcMap and QGIS

Initial processing was performed using GPR_Viewer and GPR-Process, which are both available as free software on Dr. Lawrence Conyers’s website www.gpr-archaeology.com. The profiles included in this report were mostly recorded with GPR_Viewer, however, all the slices
(plan-view images) and topographically adjusted profiles were created using GPR_SLICE rather than the older GPR-Process.

**GPR Processing**

Radar profiles were corrected for relative dielectric permittivity (velocity) using the hyperbola fitting method, and it was found that wetter, cloudier weather was more conducive to finding decomposed structures and organic signatures. Higher moisture levels in the ground appear to amplify the very minute differences in soil properties, an observation made by Lawrence Conyers over many years (Conyers 2004, 2012, 2018) that has been generally overlooked by geophysicists.

Slice maps were based on profiles that were individually adjusted for “time zero,” which is to say the point where a signal from the antenna first encountered the ground beneath it. Profiles were then migrated; a software program was used to find hyperbola shapes that result from the way radar survey is performed, and these signatures were then adjusted so that features in profile better demonstrated their real-world shapes and locations. A Kirchhoff type migration was used, and then the profile images were treated to a Hilbert transform, which is a process used to prepare the vertical profiles for making optimal horizontal slices (Conyers 2012, 2018; Goodman and Nishimura 2000; Goodman et al. 2006).

Slice images were generated at 8ns thicknesses, with a 20% overlap. That thickness was chosen based on a trial-and-error process conducted early in the processing stages, which found that range to be thick enough to find floors on minor slopes, but thin enough to prevent “averaging out” the weak signatures with too much surrounding context. Appropriate slice thicknesses will vary by site location, so to use the composite grid functions properly in GPR_SLICE, a standard
thickness must be used across all the grids within a single survey analysis. The 8ns slices were found to be effective in the soil conditions present at this site.

**Analytics & Workflow**

The image below shows how information was collected, and the steps required to get data from the field to a single master dataset that could be used for analysis (Figure 8).

![Figure 8. A flow chart of data movement across software platforms in this project.](image)

In the final analysis, it was found that magnetic gradiometry was the most effective way to identify structures and provided the clearest boundaries, as hearths were especially clearly indicated, and very thin walls could often be found by zooming in on likely hearths. Once identified in magnetics, these features were analyzed in GPR profile to determine depth, whether the structure was likely stone, and if the signature was strong enough to indicate a good state of preservation. This analytical technique was implemented by Dr. Lawrence Conyers at the site, and an initial
analysis using this method was performed by Andrew Bair in 2019, who contributed significantly to this project in various ways.

Conversely, a smaller number of enclosures and more property boundaries and roads were found using slice analysis, utilizing techniques developed by Dr. Dean Goodman (Goodman and Piro 2013). While lacking the resolution and precision that vertical profiles provide for individual features, slice analysis was much better suited to the 130 linear kilometers of radar profile that had been collected on site, which was simply too much data for a time-intensive direct profile analysis. By converting each survey grid into a handful of slices and then merging 29 radar grids into a single map using the “composite grid” menu, I was able to perform a macro-analysis of the landscape. Possible features identified in the large-scale radar and magnetic maps were then tested with selective profile analysis, intensely reviewing only a small portion of collected radar profiles. The analytical technique I developed for this thesis was surprisingly fast and generated highly detailed interpretive maps of the multi-phase archaeological settlement. A screenshot of GPR_SLICE composite menu showing 6ha of grids being adjusted simultaneously is shown below (Figure 9).
The geophysical exploration of Ballintober generated a highly effective macro-analytical technique capable of mapping features that often elude geophysical archaeology. Even dirt roads, minor drainage features, decomposed wooden structures, and what were likely animal pens were located. Each feature was individually recorded within the “results” imagery archive, which is presented in the appendices of this document. Every feature was granted a “confidence value,” which is a 1-5 scale that describes how clearly a feature could be observed in the geophysical analysis and thus the likelihood that an excavation would match the interpretation. The main road and two other structures were partially excavated during this project to “ground truth” the geophysics. In each example, the observed profiles and plan images were found to have a high degree of correlation with the later excavations, including feature locations and depths.

To provide a location for each feature, the survey area at Ballintober was split into nine sections (Table 1); the contents of each section were recorded individually. The Appendices of this
thesis were designed to present the level of detail and completeness possible with this methodology, without requiring uncommon software licenses or special training. Each identified feature is shown on all the available geophysical imagery, with and without the interpretations highlighted (Figure 10).

Figure 10. The nine areas surveyed for this project, on a Google Earth background.
Table 1. Dimensions of Survey Area

<table>
<thead>
<tr>
<th>Area</th>
<th>GPR (ha)</th>
<th>MAG (ha)</th>
<th>TSA* (ha)</th>
</tr>
</thead>
<tbody>
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<td>0.65</td>
<td>1.46</td>
</tr>
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<td>-</td>
<td>0.56</td>
</tr>
<tr>
<td>Total</td>
<td>6.41</td>
<td>6.93</td>
<td>13.34</td>
</tr>
</tbody>
</table>

*TSA - Total Surveyed Area: combined area surveyed by magnetometry and ground penetrating radar.

**Data Synthesis and Theoretical Analysis**

The goal of this project was to reveal the process of entanglement and cultural transformation experienced by the rural populations of Ireland in the late Medieval period. The Ballintober case study was chosen to test the feasibility of landscape archaeology as a proxy for cultural entanglement in Ireland in a region that until now has been relatively understudied during the period of Norman incursions. The resulting review of available historic records excavated finds, and in particular geophysical macro analysis can yield powerful insights into the life of medieval Irish people. The geophysical component of this investigation was conducted in hopes
of developing a way of investigating phases of habitation and periods of change, perhaps even social structure, which are normal targets of archaeological landscape survey (Jones 2006; Page 2006; Kvamme 2003; Schramm 2011; Shackel 2003).

The geophysical macro-analysis was conducted during the data gathering and testing phases of this investigation, whose results are outlined in Chapter III. The geophysical results are then synthesized with other existing data sets and archaeological theories in the discussion section (Chapter IV), and finally the broader research topics are summarily addressed in Chapter V, the conclusion.
Chapter III Analysis and Results

This chapter summarizes the analysis of geophysical data collected during five seasons of archaeological survey by the Castles in Communities field school in Ballintober, Ireland. Geophysical data collection was performed under the auspices of the Castles in Communities Archaeological Survey School, which has produced several internal reports of project results (Brady and Connell 2018; Conyers 2018). The project is also discussed in the Master’s thesis of Andrew Bair (Bair 2019), which he completed at Denver University under the supervision of Dr. Lawrence Conyers. I designed and carried out the geophysical macro-analysis presented in this chapter in my role as Principal Investigator on the Castles in Communities project.

The data processing stage that resulted in the creation of imagery, as distinct from analysis, was carried out with the help of two volunteer analysts from the CIC field school. Valerie Watson identified locations of magnetic anomalies present in the gradiometer results while Bryce Beasley contributed to identifying features based on satellite imagery and historic maps. The macro-analysis component of the project was completed by the author and is the basis of this PhD thesis.

Although GPR has become a common tool for archaeologists, this project is unusually extensive in scale. Most archaeological surveys using GPR cover small sample areas, rarely approaching even ¼ acre area, although a handful of notable exceptions exist (Clark and de Biran 2007; Conyers 2006; Goodman and Nishimura 2000; Maki and Fields 2010; Masters and Whittaker 2009). Even in those cases, the area covered is a fraction of what was performed for this project, which is, to the best of my knowledge, the first archaeological use of GPR large enough to focus on landscape and settlement pattern analysis at a scale sufficient to address the kinds of questions posed by this thesis. It is hoped that this project can serve as a guide for archaeologists
interested in conducting non-invasive mapping techniques over large areas, which is a critical component of both preservation and sampling designs.

3.1 Previous Research

Excavations at Ballintober under the aegis of the Castles in Communities project began in 2015 following the publication of a review of historical research in the form of a background study (Brady 2014a). An annual report of each field season’s finding has been made available through the CIC website and elsewhere, but results have not been formally published. The castle complex was first examined in the late 1800s by Charles O’Conor Don and an initial survey was conducted in 2008 and 2009 by the Ballintober Development Association (funded by the Heritage Council). A rapid survey was also conducted by the Discovery Programme in 2009 followed by a topographic study of the castle in 2014 with funding provided by the Castle Studies Trust (see Brady 2014). Some excellent geophysical analysis was also performed at the castle prior to the Castles in Communities project by Thomas Nicholas (2008 and 2009). He was successful in mapping several structures inside the castle courtyard (Figure 11).
During the Castles in Communities project a few preliminary reports were compiled that served as the basis of the macro-analysis presented in this thesis. In particular, the annual field
reports (Brady and Connell 2018) which include geophysics, an article combining GPR and magnetic gradiometry at the site by Conyers (Conyers 2018) and a report generated in 2019 as part of Andrew Bair’s Master’s thesis focusing on ground-penetrating radar expanded on the Conyers publication (Bair 2019). In his thesis, *The Medieval Borderland: Geophysical Analysis of a Later Medieval Deserted Settlement and Cultural Landscape from Western Ireland*, Andrew Bair investigated the results of geophysical survey done at Ballintober from 2015-2018, utilizing the same data set analyzed for this report (apart from the 2019 data set). In his report, Bair defined a total of 12 building features in the geophysical data utilizing both magnetometry and GPR profile analysis. The 2019 results and my analysis are in agreement with Bair’s results when it comes to the existence of the majority of observed structures, designated here as A1S1, A1S2, A2S9, A3S2, A3S3, A3S5, A3S6, A3S9, A3S10, and A5S6. Of the possible structures recorded by Bair, the only noticeable disagreement noted in the current project is the shape of structure at A3S4, which Bair identified as rectangular, but in the analysis presented here is designated as T-shaped.

Bair also identified a building directly adjacent to A5S7, where there is a large magnetic signature at 572861 meters north, 774702 meters east (Irenet Transverse Mercator) that the macro-analysis presented here does not mark. Upon further examination of the signature, I concluded that if there was a structure at that location, the feature may have been mostly destroyed during the construction of Road F. The magnetic signature that remains is more indicative of a trash pit or disturbance than a structure. Aside from that one discontinuity, however, every feature identified by Bair was confirmed in the analysis presented here.
3.2 Feature Types

There are many types of features visible in magnetic gradiometry and ground-penetrating radar, though some are only observable in one type of survey, and others in neither (Conyers 2013). Shown above are the most frequent types of anomalies observed and the archaeological features to which they generally correspond (Figure 12).
Plot boundaries in both early and late medieval Ireland generally involved the simple movement of dirt to create a ditch and berm (Figure 13). This was an efficient use of resources as little to no stone or wood needed to be gathered, and both berms and ditches could serve to control the flow of water, an omnipresent problem in the constantly rainy environment. In the case of larger defensive structures such as raths and ringforts, the ditch and berm could be quite large and a palisade wall, fence or even stone wall could be added atop the berm (Brady 2009; Keeley 2007; McSparron and Williams 2009). In the case of the humble plot boundaries between houses, however, the boundaries were likely little more than gutters and small berms that might have had hedgerows planted on them. Plot boundaries were much more complex than the features they leave behind, and the use of hedges was a clever precursor to barbed wire; capable of keeping wandering
animals and neighbors out of one’s yard while providing a degree of visual privacy. It is also worth noting that many hedgerows produce berries, seeds, tea ingredients, medicines, and firewood while serving as a habitat for small animals and birds, which are also edible (Doogue 2006). These virtues are still lauded by Irish hedge enthusiasts today, and surviving traditional hedges are excellent physical and visual barriers, as much as they are attractive and productive. The importance of hedges as an agricultural technology is discussed in section 4.4 of this document, and their role as a cultural identifier is considered in section 5.1.

In terms of geophysics, the practice of putting plants on top of the berms is thought to be the reason that plot boundaries remain so visible in magnetic gradiometry; decayed organic material can produce a magnetic signature and would likely erode into the adjacent ditch/gutter. An even stronger signature would be created in the event of a fire generating a similar situation with ash, which has very strong magnetic properties. In terms of ground-penetrating radar, the ditches and berms are both generally visible in profile, and the ditches themselves show up cleanly in slice maps, due to the way water running through ditches removes the soluble soils and leaves behind a slick clay that holds water even when buried, thus creating a linear wet/dry surface change that generates a refraction signature outlining the ditch in GPR readouts. This signature is relatively easy to pick up, even for shallow gutters and plot boundaries.

**Hearth**

Irish medieval hearths were generally located in the center of structures, as is seen in many of the probable structure signatures identified in this analysis. These stone features were built directly into the floor, and thus when they remain in situ they are highly visible in GPR profile and noticeable in radar slices. Likewise in magnetic gradiometry hearths show up as dramatic dark
spots, a condition created by the magnetism of the ash when it is left in situ. It is worth pointing out that magnetic signatures that rely on ash can be unpredictable, as a handful of structures that were located on slopes in Area 5 have what appear to be hearths identifiable in radar survey that do not have magnetic signatures. Our interpretation is that running water may have washed out the ash after the building’s abandonment, but without ground truthing (excavation) there can only be a low degree of confidence in such interpretations. For many houses and other structures identified in this analysis, however, the clear dark magnetic signature of a hearth was the first indication for the presence of a possible structure. Figure 14 shows a composite image of the hearth found in structure A2S2, which was confirmed by excavation; it is clearly visible in interpretation, magnetic return, GPR slice, and GPR profile.
Figure 14. Archived imagery example, Feature A3S2.
Trash pits

In medieval Ireland and most of human history in general, people dug holes in the ground that generally end up filled with trash and are then covered over or filled in. The hole itself can be created for any number of reasons originally, including as barrow/borrow pits to get clay for making daub, small quarry operations, latrines, various agricultural processing, storage features, and so on, but sooner or later all these features typically become a place to put garbage. The popular term “never waste a perfectly good hole in the ground” prevails in most preindustrial settlements as the act of digging holes to bury garbage was laborious but necessary for hygiene. Thus, holes dug within preindustrial inhabited areas uniformly end up filled with garbage, mostly food refuse and ash, and were then covered with dirt. These are marked on the Ballintobe analytical maps not only because such features are often visible in geophysics, but because of the archaeological value of excavating refuse, which generally contains broken ceramics and food waste, key elements for addressing questions related to ethnicity, chronology, and subsistence patterns. Many of the artifactual finds that are reviewed in the discussion section (Chapter IV) came from trash pits, and thus the probable trash pit locations found in geophysical analysis indicate excellent targets for future excavation (Figure 15).
In magnetic gradiometry, the omnipresence of ash in food waste, as well as the nature of decomposed foods themselves, typically provide strong magnetic signatures. These show up in magnetic maps as clearly defined black shapes, occasionally with a secondary white outline, which is a mark of a very strong magnetic signature. Trash pits are often indistinguishable from hearths in geophysical surveys, which is understandable given their similarity in size and material composition. In terms of radar survey, however, trash pits are visible for a different reason; any sort of anthropogenic ground disturbance tends to result in an unnatural mixing of soil compositions, and thus water retention, which has been found to be the primary distinguishing characteristic in radar returns (Conyers 2004, 2018). In this analysis, the trash pits and hearths observed in the magnetic survey data are separated from each other based on location; magnetic hole shaped features inside a house are classified as hearths, while those outside a structure are...
labeled as trash pits. Like hearths, trash pits are clearly visible on radar slice, so much so that they can overwhelm otherwise useful slice maps because of the countless garbage and sewage features that can accumulate around residential structures, especially with higher population densities in settlements that lack sewers. In areas V and VI particularly, there are so many signatures visible on radar slice that there is little to be gained in trying to identify all of them. Only the trash pits with the strongest magnetic signatures occurring near a structure were recorded.

Figure 16. The ten roads identified in geophysical analysis, shown in dark brown where they are observed, and in light brown where they are inferred to have existed.

On radar surveys roads that are stone-lined show up dramatically, as Roads A and B demonstrate in Figure 16; they are hard to miss in slice maps and too big to ignore in even the most cursory profile analysis. Unfortunately, stone robbing by post-medieval inhabitants of
Ballintober often removed such clear signatures, and all that remains are long, thin compacted surfaces. That compacted soil, otherwise identical to its surrounding context, can be detected at all in a radar survey is a testament to how sensitive the equipment is. In many cases, the compaction can be eroded or destroyed by plowing, but generally, enough of a road is visible on a slice map that its existence can be verified. For this analysis we chose to distinguish between places where a road is clearly visible on radar versus the places where it is merely calculated to have been by using two different colors, aptly named in the legend “Roads (Observed)” and “Roads (Theoretical).”

**Structures and Enclosures**

This category is the most diverse, and perhaps the most important for guiding future excavation of the site. Like their modern counterparts, medieval Irish people were known to build not only a variety of dwelling types but an assortment of sheds, specialized craft buildings (forges, kilns, etc.) and enclosures for livestock and workspaces. It can be difficult to differentiate between these features, but the key aspects to look at are the position of the feature in its plot, its orientation relative to the road and plot boundaries, and the associated trash pits and hearth features. In Anglo-Norman settlement patterns in England, and to a lesser degree in deserted medieval settlements in Ireland, there are clear patterns of settlement design in which houses are built at the front of the plot, a short distance from the road and running either parallel or perpendicular to it (Brady 2019; Graham 1975, 1985a, 1985b; O’Keeffe 2004, 2019). Finally, the location of a hearth, typically in the center of a structure, and trash pits immediately near it, signal the presence of a residential structure. Out of 58 probable structures identified in this analysis, 33 have probable hearths, and at least 18 have trash pits immediately adjacent. This finding indicates a remarkable level of
urbanization at the settlement, but also attests to the accuracy of the geophysical survey, as the remaining 25 structures without hearths likely did not serve as housing, but as outbuildings. The relationship between outbuildings, trash pits, and houses is key to understanding the individual plots themselves and reconstructing life in the abandoned settlement, however far more physical sampling will need to be done before a good grasp of the role of outbuildings in Ballintober will be feasible. For now, they are simply counted as probable structures, and shown on a map. The density of structures in particular parallels what one would expect to find in coastal settlements and Viking towns but is nearly unheard of in rural medieval Ireland, particularly in the west (Barry 2003, 1988; Brady 2019; O’Keeffe 2010). This is one of the indications revealed by this thesis project that the Norman presence at Ballintober did have an impact on land use and the configuration of the built environment and illustrates how geophysical approaches can contribute to discussions of cultural entanglement even when there has been limited ground-truthing via excavation.

Perhaps the clearest example of this phenomenon is structure A3S2, which was chosen for excavation in 2018 (Figure 17). The location of walls and floors and the central feature that was identified as a hearth were all exactly as shown in geophysics, save for the fact that the large hearth signature was found to be such an extensive feature in excavation that it is thought to be a kiln or other controlled firing device, as opposed to a strictly residential hearth (Brady and Connell 2018).
Aside from residential structures, 25 other enclosures were detected. Some of these, such as A3S4, had a rectangular compacted dirt floor, and no other indications that would suggest the presence of a superstructure. These could simply be animal enclosures where cows, sheep, or horses were kept whose hooves compacted the soil when in use, or perhaps some other sort of outdoor workspace. Lastly, it is possible that these structures had walls and a roof made from organic materials, such as a shed or storage warehouse, but without a hearth, and the other features failed to generate a magnetic signature. Geophysical exploration is sufficient to identify the locations of these features, if not their original purpose. A summary table of the structures located by the project is available at the beginning of the structure analysis section (Chapter 3.5). The table includes the GPS locations and types of imagery in which each probable structure is identified, as well as a “confidence interval” that is designed to express the relative certainty with which the feature is identified, on a scale of 1-5.
Finally, there are a pair of enclosures, A2S12 and A4S1, that had unusually strong magnetic structures and atypical profiles. Most likely these structures are physically different than the others in the survey area; A2S12 is too small to be a house yet has thick walls that appear to be made of stone, and A4S1 might well be a pre-Norman structure with an associated (collapsed) souterrain or underground storage cellar.

Roads

Roads in medieval Ireland were occasionally stone paved, but there are many examples where they were either left unpaved or were robbed of their stone after being abandoned. For example, the main road through town (Road A) was a substantial eight-meter-wide roadway consisting of two parallel stone lanes with three drainage ditches along both sides and between them. Smaller paths and alleyways (like Road G) were also found, which have clear compacted dirt centers with small ditches (gutters) on both sides, indicating they were simple routes that people used for residential access but were likely not primary thoroughfares. Magnetic gradiometry does not pick up stone or dirt roads directly, however the technique works remarkably well for finding them within a settlement; roads appear as a homogenous blank space located between plot boundaries. Such features are easily missed when the data are not reviewed carefully, especially when they are later additions to a settlement and built over previous ditches that also appear on magnetic imagery. This analysis found that being skeptical of any absurdly thin plots, say three meters wide or so, often triggered a profile analysis that then found evidence of a road, likely made by reducing plot sizes to accommodate more traffic as population increased (Figure 16).
Ten roads were detected during geophysical macro-analysis; their locations are indicated in Figure 18. The main road through the settlement, Road A, and its perpendicular counterpart, Road B, show evidence of having been stone lined, although perhaps robbed of most of their paving later. The habitation phases discussed previously are particularly evident in the way that larger plots appear to have been cut down to add additional roads, which would then provide access allowing plots to be subdivided into denser layouts. Each road is detailed individually in the section below.

Figure 18. A map of the possible roads identified during macro-analysis, Google Earth Background.
Road A

Road A is the designation for the main road through the settlement found during this survey. It is largely visible in satellite imagery today; the two-lane road and matching ditches (both sides and in places a central ditch) were sufficiently deep to have avoided being filled in completely by post-medieval agriculture, although today they are shallow enough to be difficult to detect when standing on the ground surface. The Castles in Communities project first detected Road A in 2016 using magnetic gradiometry and then shortly thereafter ground penetrating radar. In 2017 the field school excavated a small portion of the road and found that the investigation supported the interpretation of radar profiles over the same location. This excavation is recorded in the CICASS reports (Brady and Connell 2018) and discussed in greater detail in a thesis by Andrew Bair (2019).

The layout of the road is surprisingly complex; the excavation clearly showed the existence of a ditch on the downhill side of the road and a shallow ditch (gutter) between the two separate lanes. The finds in situ showed that only one of the lanes was stone paved but the broader GPR slices show that patches of the road’s stones were likely robbed for later construction. Given that the roads existed side by side and were paved for much of the settlement’s occupation, it is reasonable to think that the roads were both in use contemporaneously, and both were paved with stones at the time.

The combined observations derived from magnetic gradiometry, ground-penetrating radar, and excavation results indicate that the most likely situation for Road A was a single lane paved road with plot boundaries located immediately along it on both sides, and that the road was at some point resurfaced, with an additional lane added to the south, resulting in widened plot boundaries. It is worth emphasizing that widening a road that runs through so many properties is a labor-intensive upgrade to a settlement that reduces habitable land in all the affected plots but is done to
allow much greater traffic flow. The widening of the road allows two important observations to be made: A) Ballintober had a centralized authority sufficient to adjust many properties at once, in ways that reduced the size of the holdings of the plot inhabitants and B) Ballintober generated sufficient traffic to need a very broad (8m wide) paved road. Whether this is an indication that the Norman lords instigated a road widening project or whether this was done before the arrival of the de Burgh at the site remains unknown.

Road B

Road B is a northbound road that leads directly away from the center of Road A. It shows up very clearly in the shallower GPR slices (1 and 2) and is highly visible in some satellite maps, particularly the current Bing Maps image. Its presence is detectable enough that it can be seen when standing on the ground and appears to be used by current inhabitants as a track to drive equipment along near the edge of the seasonal wetland to the east.

What obscures Road B, yet provides key insight to its creation, is that it appears to have been ignored during the placing of plot boundaries and perhaps even structures observable via magnetic gradiometry. This phenomenon at first led me to believe that the route was post-medieval in nature, and perhaps a completely modern feature associated with changes in wetland management. Closer inspection in macro-analysis however, showed that the road itself occurred at the same depth as medieval structures and plot boundaries along it, and that in places it appears stone lined (greatly increasing its signature in GPR). The profiles in GPR G27P39 both detect the road and its gutters quite clearly, and examples are shown in the appendix section labeled “Road B.”

With this observation in mind, a closer review of the magnetic gradiometry does show that
Road B ran immediately along a (pre-existing) plot boundary, and at its southern terminus it appears to cross weaker (Phase I) plot boundaries, yet the orientation seems to match rather well the expanded Phase II boundaries, which curved at the intersection, providing extra space to allow wagons to turn more easily. What these signatures indicate is that Road B probably did not exist during the initial settlement layout but was added sometime during or shortly after the expansion of the main road through the settlement. The obvious conclusion is that once again plots were reduced in size and in some places removed completely to accommodate the increased traffic flow through the heart of the settlement during the urbanization process.

Road C

Road C runs along the turlough (seasonal wetland) edge and has clearly been resurfaced in recent times by modern equipment to maximize use of the area’s pastureland. The current property owners gave a good account of the previous alterations to the turlough, however enough decades have passed without a surviving map of such activity that it is unclear precisely where earth was moved to and from within the wetland. Upon initial survey the sharpness of the eastern bank of this feature led researchers to conclude that although the berm has been used as a vehicle track, it must have been created primarily as a water boundary and in very recent history. This idea is supported by the way the feature cuts across plot boundaries visible in the magnetic gradiometry, which would seem like an unnatural curved separation cutting through otherwise orderly rectangular blocks of plots. It is fair to say that Road C does not at all fit with the initial layout of the medieval settlement.

Upon closer inspection, however, there are reasons to believe that this feature is most likely a medieval road. The first observation is that the feature occurs neatly at depth with other medieval
finds on its west side (outside the turlough) and is followed by matching ditch/gutter features that are consistent with the other medieval roads in the settlement, but not required for constructing a wetland boundary. This phenomenon is particularly noticeable on the western most third of its length, no longer along the edge of the turlough or in a location that would make sense for wetland control. GPR G39P81 shows that the route continued westward (uphill), occurred at the same depth as the medieval plot boundaries, in a blank space between plot boundaries, and that the feature is a wide flat compaction, not a typical rounded top berm or dike. Finally, the profile shows what appears to be a homogenous fill occurs above the feature, indicating that it is most likely in situ at least as it runs west of Road B (Figure 19).

Figure 19. A GPR Profile showing a cross-section of a planar response identified here as “Road C,” occurring between two plot boundaries and beneath a homogenous fill.

Likewise, to the east the route continues and is clearly visible in radar, although unpaved roads appear as little more than empty spaces on magnetic gradiometry. The existence of a post-medieval agricultural field, marked by plow scars, is marked clearly in both sets of imagery, cut through both the main road through the settlement (A) and this possible route. That Road C was partially destroyed by the creation of the long extinct field strongly indicates that Road C is older than that field, and thus very likely medieval (Figures 20 and 21).
While it is impossible to date a roadway based on geophysics alone, the western section of this route has all the hallmarks of a normal medieval roadway; it occurs at depth and in between plot boundaries and is flanked by shallow ditches (gutters). There is no indication of modern re-use of that section. East of Road B the route has clearly been retouched with modern equipment, likely re-using the existing medieval road as a berm to contain the wetland. However, radar slices show that it was truncated by a long extinct field, which indicates that the feature is much older.
than the modern resurfacing. Given the data available, Road C is most likely a medieval feature that has been partially disturbed in recent history.

Road D

Road D was surveyed via several small samples at four locations for this project. The samples were so small and far apart that they eluded the initial identification by geophysicists on site. However, while processing imagery, Bryce Beasley noticed a road, perhaps a humble footpath, that was recorded in those locations on the six-inch Cassini maps provided by the Irish National Monument Service. Once layered and georeferenced into space, the road seen on the survey map matched the small signatures that had been sampled in four different grids. Upon review, the medieval plot boundaries observed in magnetics confirmed the requirement for a route to provide access to a second row of plot boundaries (Figure 22). Although only sampled in four locations, the road appears quite narrow and unpaved. Road D was most likely a secondary access route for some residential plots but was clearly not a primary thoroughfare.
Figure 22. The National Monument Service six-inch Cassini map and Road D delineation in the Geophysical results Map. Notice that the western end of the road does not match the later Cassini maps, which likely reflect a later change. Microsoft Bing Maps Satellite imagery.

In radar profile Road D itself is barely visible, however the small ditches/gutters that run along it are observable and located exactly where they should be if flanking a dirt road. It is fair to say that dirt roads are difficult to see in geophysics, as they tend to match their surrounding soil
context closely, however the ditches along them develop a different signature due to the way soluble soils in ditches dissolve and wash away, leaving a slick clay layer in a U or V shape lining the ditch. It is likely that the compacted soil surface of this road eroded away due to exposure to rain, was disturbed by deep plowing episodes, or may have been stone lined but was robbed of stones for later construction. The road recorded in the Cassini maps was almost certainly in use during the medieval occupation of Ballintober, based on the observed gaps in plot boundaries, existing shallow ditches/gutters, and the need for access in many of the observed plots. There is no clear indication whether this road was created during Phase I or Phase II of the settlement’s occupation.

**Road E**

Road E appears to be a small connecting road between the main road (A) and the turlough edge (Road C) (Figure 23). Like other dirt roads (or roads that were robbed of their paving) this feature has almost no signature on magnetic gradiometry, save for a conspicuous blank space between plot boundaries on both sides of it. Likewise on radar slice this roadway is difficult to discern; only a small portion of its northern end was identified by radar survey, and the context around it is noisy enough to obscure the naturally faint signature of a dirt road. What led me to suspect the location of a route here was the presence of a conspicuous 3.5-meter-wide gap between plot boundaries and the fact that the plot to the immediate west of this location appears to have been subdivided; inhabitants would have needed access to the smaller plots. Following the normal logic of medieval settlement patterns, the length of a block of plots between two parallel roads (A and C) is also problematic. It would be strange not to find at least a small connecting alley between them over such a distance, given the other indications of urban density.
Upon closer analysis of the radar profiles, a section of the sampled area was found to clearly indicate the existence of a flat compacted surface between shallow ditches. This appears at the same depth as the other medieval features around it. Road E appears cleanly on radar profile, but like Road B this road seems to cut through a medieval plot boundary. This indicates that the earlier Phase I habitation did not utilize this alleyway/connecting road, but it was added sometime later as the settlement urbanized. This access route allowed the sections along it to be further subdivided into house plots that were far too small for subsistence farming, but instead indicate that inhabitants farmed land external to the settlement or relied on a specialized labor for income. The creation of Road E subdivides sections of the settlement into something that could be described as “city blocks.”
Road F

Road F lines up with Road B, which is very clear in all forms of survey, however Road F has only faint signatures in all geophysical data sets (Figure 24). On magnetic gradiometry there is a conspicuous 6-meter gap between plot boundaries, and it lacks a clear boundary at the north and south ends, which further reinforces the idea that this gap is not a residential plot. On radar slice the roadway is obscured by heavy plowing. This plowing only occurred south of the main road, so it is not surprising that Road F is much less visible on radar slice than its counterpart on the northern side. What the radar slices indicate is the unfortunate reality that features in Area 5 are not nearly as well preserved as those on the other side of the main road. Likewise radar profile analysis shows that for Road F a disturbed flat compacted surface is visible, along with two much more easily identifiable ditches on either side (Figure 25).

Figure 24. Road F highlighted on the geophysical map and drawn on the magnetic imagery. Notice the lack of plot boundaries at the ends, indicating it is not a thin residential plot.
Figure 25. Road F in GPR profile. Notice the very weak responses, these are likely a result of soil homogenization through plowing.

Given the way the Road F meets with Road B to form an intersection across the main road, it is likely that the two were produced at the same time during the Phase II habitation. This idea is supported by the way that slice 2 of the radar maps shows the ends of these roads widening at the intersection, presumably to allow easier turning by horse-drawn vehicles (Figure 26).
Figure 26. A close up of the intersection of road F (from the south) to the main road.
Road G

Road G is a small alley that was likely created to allow plots along the main road to be subdivided as urbanization increased. This roadway is small and disturbed by deep plowing, as evidenced by the plow scars seen in slice 2, however it still provides enough of a return signature to be identified with some confidence (Figure 27).

Figure 27. Road G in annotation and in GPR profile. The alley appears wider because the profile is not perpendicular.

In magnetic gradiometry roads themselves are not particularly visible, however this alleyway is visible near its intersection with Road F, where the plot boundaries clearly show a 2.5-meter gap between boundaries, in a location that would not be logical for a berm or other wide
earthen feature. When exposed to radar profile analysis, that gap shows clearly both sets of plot boundaries and the flat, compacted earth one would expect from a dirt road.

Road G was almost certainly a later addition during Phase II habitation of the medieval settlement, as its only purpose was to allow the long, farmable residential plots to be divided into numerous smaller plots. Road G likewise divides the settlement into blocks that mirror the size and orientation of those observed on the northern side of the main road, where preservation is better and geophysical returns are clearer.

Road H

Road H is the furthest east of the roads found in this survey, in an area that has been frequently washed out by the seasonal wetland resulting in greatly reduced magnetic viability (Figure 28). Like other roads at this site, Road H appears to violate older, thinner plot boundaries but is nicely framed by those of the later Phase II medieval period occupation, as indicated by heavier magnetic signatures and tolerance of the widened main road. In this case it appears the road was added to connect the main road to a raised mound still visible today, perhaps serving as an access route to a specialized work zone or religious structure. Part of that raised platform was excavated in 2019 as excavation T1 (Brady and Connel 2019). The excavation uncovered a stone structure that yielded artifacts ranging from late medieval to early modern, as well as charcoal and ash features suggesting it may have had a corn drying kiln.
Based on its location it is most likely that Road H was built during the later Phase II medieval occupation of the settlement, to provide cargo (wagon) access to what was probably a new corn (wheat) drying kiln. The road’s southern end is visible as a compacted surface in radar slices and was mapped easily, however the northern end appears to have been obscured by the seasonal flooding episodes that may have eroded the road surface. The compactions visible on radar profile in the south, however, were strong and clearly denoted the familiar two-lane construction similar to the main road in the settlement (Road A). However, the northern profile signatures, while present, were too weak to annotate clearly. The road interpretation was mapped as a relatively thin feature on the northern end, where it is clearly still visible in radar profile, but it is most likely the case that the whole route was a two-lane road, which would have been necessary for wagon (cargo) traffic to a corn drying kiln.
The road signature ends at a long linear drainage canal, which is most visible in the Google maps images that were taken during the winter, when it was full of water. The age of the drainage feature, and its nearly parallel counterpart to the north, is not known for certain; this is discussed in the site interpretation section. Suffice to say however, that there is some possibility that the use of those canals and Road H could have been related, or that the canals could be a modern disturbance that destroyed much of Road H (Figure 29).

Figure 29. The two linear aquatic features north of Road H, highlighted in purple. Google Earth Background.
Road I

Road I was missed by initial geophysical inspection because it occurs in an area that was riddled with post-medieval features, thus masking the already ephemeral dirt road signature in magnetic gradiometry. Likewise, slice maps pick up part of the road, but only at its northern end, further from the later disturbances. In profile however, the two-meter-wide compacted surface is clearly visible and spaced evenly between residential plot boundaries (Figure 30).

Figure 30. Road I in an annotated satellite map and GPR profile. Google Earth Satellite Image.
Similar to Roads E and F, Road I appears to have been added as an access route between the main road and a parallel byway. It is thus likely a feature created during the medieval Phase II occupation, when the settlement saw expansion of the main road and creation of smaller byways to allow large plots to be subdivided.

**Road J**

Road J occurs in Area 7 of the survey, which is detached from the rest of the settlement and not preserved as well but serves the important task of helping determine the settlement’s concentration and boundaries. The western end of Area 7 is much better preserved than the eastern half, and it is there that strong indications of a road are seen. On magnetic gradiometry the dirt road shows up as one would expect as a conspicuous blank space between blocks of house plots. In radar however, the compaction of the dirt road is much more evident. Unfortunately, the radar profiles in grid 47 ran nearly parallel to the road, so while it is visible on radar profile the cross section is at such an angle as to make the road difficult to annotate in profile. On slice map 2 however, the overall shape of the compacted dirt road is plainly visible and easily outlined (Figure 31).
Figure 31. Road J in annotated satellite map and GPR Slice.

3.3 Survey Areas

The analysis of the geophysical data has been divided into nine geographic areas to simplify the interpretation of the data and to provide a usable nomenclature for describing features by their location (Figure 32).

Figure 32. Survey areas analyzed in this report on a Microsoft Bing satellite background.
There is evidence to support three different temporal phases at the site in the geophysical returns, visible through the shifting of plot boundaries and roads. The two medieval phases at Ballintober exist in such proximity that it is difficult to determine which came first; however, it is likely that the main road through the settlement was enlarged during the late medieval habitation, which indicates a phase of expansion. The features that appear to align with the larger road are therefore interpreted as belonging to the later phase. Without excavations providing material evidence to better establish the dates of occupation, however, the labeling of Medieval I Phase (Figure 33) and Medieval II Phase (Figure 34) must remain conjecture.

Figure 33. Phase I Medieval feature map, with fewer plots along a main road, Google Earth background.
Area 1

Area 1 covered the castle and its remaining open field around it to the north, east, and west. The southern wall of the castle has had modern construction occur up to the moat of the castle, and the field to the east was likewise terraced in living memory in the course of being turned into a park. A handball court was built from castle rubble against the eastern wall, but otherwise the ruins appear to have been largely left in place, resulting in a remarkably uneven interior courtyard.

Gradiometry was far more successful for detecting features outside the castle, as the plow zone has apparently obliterated many features in those areas. Within the castle however, the GPR was able to clearly delineate structures that were quite large, having most likely been made of stone. The northern structure presents a signature that looks like buttresses and is thus most likely
a chapel or ecclesiastic structure of some kind. Some footprints of a gatehouse were mapped on the eastern wall, however the lack of a GPS survey and uneven terrain there made drawing images difficult and detecting ruins amid the fallen wall debris had reduced effectiveness (Figure 35).

![Figure 35](image_url)  
Figure 35. Area 1 interpretations of likely medieval features drawn onto a Google Earth satellite map.

**Area 2**

The investigation of Area 2 found many probable structures and trash pits located along the main road (Road A), although the center of the area was largely obscured by post medieval farming and housing, which left very strong magnetic signatures and obscured the surroundings. The narrow plots, particularly on the eastern side of the area, are indicative of a high degree of urbanization, or highly partitioned farming activity, which are both common features of Norman settlements discussed in Chapter 4 (Figure 36).
Figure 36. Area 2 annotated medieval features on a satellite map and gradiometry returns, Google Earth background.
Area 3

Area 3 had the clearest signal returns of any of the areas of investigation. The plowing on the north side of the road was less intense or perhaps shallower, and the topography here had less slope that would cause runoff of magnetic residues during decomposition. The edge of a recently modified turlough (seasonal wetland) was apparent, although there is evidence that the turlough edge reused a medieval road, which is discussed in section 3.5 of this document. There are some plot boundaries evident just on the far side of the turlough edge, however the seasonal wetland appears to have leached magnetic signatures heading into the wetland. Given what is visible in GPR, there is reason to think that those remains are intact, and that Norman habitation may have pushed up against the pair of ditches that are still evident in the turlough today (Figure 37).
Figure 37 Area 3 medieval annotations and gradiometry returns.
Area 4

Area 4 was the northeastern most area of investigation, and among other things detected a probable structure located atop a low earthen feature. This feature was sampled in the 2019 field season, and excavation confirmed that it was a stone structure of the same size and orientation as shown in GPR results. The location of the raised structure immediately along an irrigation feature suggests that it may have been a specialized feature in some way (Figure 38).
Figure 38. Area 4 annotated for medieval features and in gradiometric returns. The northernmost structure was sampled in 2019.
Area 5

This area of investigation was near town, and slightly uphill of the rest of the deserted medieval settlement. Along the southeastern edge of the survey area a gravel pit is visible, which was clearly cut into the deserted settlement, but features immediately outside of the quarry appear intact. In both gradiometry and GPR there is evidence of heavy plowing, which obscured the GPR signatures considerably, but caused only minor issue for the magnetics. This location shows very narrow plots and numerous structures and trash pits, indicating that it was particularly densely populated compared to the rest of the settlement (Figure 39).
Figure 39. Area 5 with medieval features annotated and in gradiometry, Google Earth Background.
Area 6

Area 6 was located south of the main road, on the eastern side of the settlement. Finds were dense in this location, however like in Area 5 heavy plowing was evident and resulted in noisier GPR returns, but still yielded clear magnetic responses. Some of the plots in this area appear incredibly narrow, and the southern row of plot boundaries do not line up exactly with their northern counterparts, which indicates that they were separate housing plots, not divided single family units (like English croft and toft, for example). For the southern road to be separate plots people would have needed access to them, which would have required a road along the southern boundary. A review of historic maps found that such a road did indeed exist, and that it was just barely tagged in several corners of GPR grids, but enough to confirm its existence. This road and is discussed in section 3.5 (Figure 40).
Figure 40. Area 6 with annotated medieval features and in gradiometry.
Area 7

This area of investigation was located immediately next to the Catholic church that is currently in use but is clearly not medieval (Figure 41). The access route for the quarry runs through this area and unsurprisingly cuts through many of the medieval features. Likewise, the eastern half of the area is full of very strong magnetic signatures that are most likely modern in origin, as their orientation is a poor fit for the nearby medieval plots but matches the current church yard. Enough data survived, however, to indicate that the area was full of densely packed little plots, and excavations in this area would likely recover ample artifacts. Topographically this area is high ground next to the modern settlement, but far from the castle. The density of plots here suggests that the whole 60-acre townland of Ballintober may have been filled with such plots, in a proto-urban or town level of occupation. This idea is discussed further in section 3.8, where satellite imagery and old maps are reviewed in more detail.
Figure 41. Area 7 annotated medieval features and gradiometry.
Area 8

This area consisted of a small sample collected immediately across from the castle in hopes of determining whether archaeological remains on that side of the road had been preserved or disturbed by modern construction (Figure 42). The sample area was relatively small, and not exposed to magnetic gradiometry, and the results were inconclusive. A feature that resembles a medieval road was detected that is further from the castle than the modern road. The modern road is too close to the castle to have been medieval, so it is possible that this feature is an older road, or perhaps just modern terracing related to flattening the slope for development.

Figure 42. Area 8 annotated
Area 9

Area 9 is immediately east of the castle just outside the gatehouse (Figure 43). This area was unfortunately scarred by many archaeological trenches, and although the National Monument service records an investigation and report for the survey (Read 2008), no map of those excavations was available to the project during this analysis. Any surviving artifacts collected during that investigation are unknown to this project.

The gradiometry data collected over this field was unfortunately unusable due to user error, and improper equipment settings. The GPR data however, detected numerous linear features, and it is possible to distinguish medieval plot boundaries as opposed to excavation trenches, based on whether they appear at depth or if the soil disturbance can be originating down from the modern soil surface. An attempt to differentiate those features is annotated below.
Figure 43. Area 9 annotated and Slice 3 of GPR
3.4 Habitation Phases

Perhaps the most significant finding of the macro-analysis was evidence of at least two distinct phases of medieval habitation. This was discovered when using GPR slices to complement and complete the plots visible in the magnetic gradiometry, which revealed the presence of two sets of plot boundaries next to each other laid out in a way that could not have existed simultaneously. The most likely solution is that the plot boundaries had been moved at some point, across many plots at once.

Upon review, it was realized that the main road through the settlement (Road A) also appears to have been built in phases. In shallow slices a wide two-lane road is visible, but deeper slices detected only the northern lane, and a smaller one at that (Figure 44). This indicates a situation where a small single lane road was resurfaced and made larger, with a second lane placed alongside, almost certainly indicating a settlement expansion and substantial public investment. Figure 10 (below) shows the difference in Road A as seen in radar slice 2 (40 cm below surface) and slice 3 (60 cm below surface).
Figure 44. Road A in GPR slices. The shallower (more recent) surface is above, and the older signature is below.

Delineating the plot boundaries relative to the road revealed that the set of boundaries closer to the road could only have been used during the earlier road phase, meaning that when the road was widened so much new land was required that plots on both sides of the road were pushed back a short distance.
Aside from the evidence of phases shown with the main road, Road B also appears to argue strongly for a multi-phase site in that it violates the Phase I plot boundaries, and even appears to have gone through a structure (A3S9). Figure 45 shows the situation for structure A3S9. The roads provide significant evidence of multiple phases of habitation occurring within the habitation period, which as a phenomenon indicates a growth in population and complexity as well.

Figure 45. Road B eclipsing structure A3S9, discussed in section 3.4 Road Analysis.
3.5 Linear Features Analysis

There are several long, linear features that are not necessarily plot boundaries. Most notable are the handful of long trenches visible in Area 9, which unfortunately are archaeological only in the sense that they were made by archaeologists (Figure 46). An investigation is known to have been conducted using a series of long excavation trenches (Read 2005) in this area. However, a map of those excavations was not made available to this project. The macro-analysis shows a few archaeological excavation trenches, as well as two very long features that only appear at depth, indicating they are in situ archaeological features. One of these linear features was exposed to sample excavation (Garvey’s Field Cutting) in 2016, and it was found to be a drainage feature, probably associated with medieval farming practices (Brady and Connell 2016).

Figure 46. Two likely medieval linear features, drawn in blue, were in Garvey’s pasture, as well as numerous modern linear tracks (Area 9).
3.6 Structure Analysis

Fifty-two probable structures were identified in the macro-analysis. These features were often first identified based on the identification of a central hearth on magnetic imagery, or by the shape of a floor found in radar slices, usually occurring in the 40-60 cm below surface (cmbs) depth range. Once a location was identified, it was reviewed in the other data sets including radar profile, which was found to generally offer the most comprehensive understanding of subsurface features. Each probable structure is listed individually in the appendices and shown in all available data sets. Each feature was given a “confidence interval” (abbreviated CI), based on how certain analysts felt that excavation would match the geophysical description in this analysis. Confidence intervals were rated on a scale of one to five, five being the most certain. In general confidence is reflected by both how well surveyed a feature was (not all areas of the site were equally susceptible to magnetics or to radar) as well as the state of preservation. In many cases in the southern half of the site deep plowing has apparently disturbed the medieval strata. Likewise, in the northeast near the seasonal wetland (turlough) there has been enough soil leaching and mechanical disturbance to greatly decrease magnetic susceptibility.

As a rubric, each feature was rated on the analyst’s confidence in its interpretation based on whether it was covered by magnetic survey, whether it was covered by radar survey, and how strong of signature was apparent in all data sets, gradiometry, radar slice, and radar profile. The characteristics of each feature were then judged compared to similar identified features, such as those that had been ground-truthed through excavation. Finally, the surrounding spatial context of each feature was considered based on the presence of other identifiable features around it, such as trash pits and plot boundaries, and if its location followed normal cultural patterns (houses near or
perpendicular to roads, etc.). It is worth mentioning that features previously identified in preliminary reports were weighted with more confidence due to the quality of the profile analysis carried out in those studies (see especially Bair 2019). Every feature was carefully observed using every set of data available, cataloged in the appendices, and then entered in the summary table below (Table 2).
### Table 2. Inventory of Probable Structures Detected in Macro-Analysis

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Figure 47. The Probable Structures Identified in Area 1, on a Google Earth Satellite image.
Inside the Castle

Area 1 Structure 1 (A1S1)

Confidence Value: 5

Figure 48. Area 1 Structure 1 in GPR timeslice.

A1S1 is clearly a stone structure, the same as detected on previous resistance surveys (Nicholls 2008) (Figure 47). The structure has a remarkable resolution in both radar profiles and slice maps due to the difference in porosity and water retention of its stone construction relative to the surrounding context.

The location of three pairs of buttresses indicates that the structure was almost certainly a chapel or monastic structure of some sort, but it is not clear yet why the west end of the structure is missing in the data collected. It is possible that the west end was robbed of stones for later construction, particularly in the castle’s heavily renovated northwest tower, but it could also be the
case that the west end collapsed and is still in situ, merely below the depth of geophysical penetration. In terms of depth, the signatures are visible at 120 centimeters below the surface and are still visible at 220 centimeters below the surface, at which point it is unclear if the feature itself bottoms out, as radar penetration is rarely readable below more than two meters in this area.

**Area 1 Structure 2 (A1S2)**

Confidence Value: 4

A1S2 was likewise detected in previous survey (Nichols 2008) and is thought to have been an aisled structure supported by pillars or partitions (Figure 48). The investigation here also recorded stronger signatures at semi-regular intervals, which corroborates that theory. Buildings sometimes collapse at such intervals due to the presence of gaps represented by windows and doors, or they can remain standing at intervals due to the reinforcement of partitions. It is likely that this structure was divided into cells, and the corners where cell partitions met the outer walls collapsed more slowly than the unsupported sections of the wall, leaving behind the curious dashed line reading observed in the slice maps. The relatively light signatures in profile are still visible enough to be stone, but the walls themselves were likely much thinner than those seen in Structure 1, and thus in their collapsed state they present a weaker signal.
This was the largest structure identified in our survey and probably served some form of public or commercial function such as a hall, warehouse, stable, or similar. It does not appear to be connected to the interior face of the castle wall.

**Area 1 Structure 3 (A1S3)**

Confidence Value: 2

This structure was likely related to A1S4 due to proximity and the lack of property boundary between the two (Figure 49). This is also supported by the absence of a hearth, its large size and weak signature, indicating that rather than a residential purpose this enclosure was likely a large shed. This feature is almost certainly post-medieval given its proximity to the castle’s walls, which is atypical of medieval defense strategy (O’Keeffe 2019). Another possibility is that its proximity to the castle and lack of a hearth indicate that it was created before the castle. Its shape and size, however, is more typical of early modern than early medieval structures. This
feature was not covered in GPR survey so no profile or slice data could be used to further verify the peculiarities of this feature or determine its depth below the surface.

![Figure 50. A2S3 in gradiometric survey, both with and without annotation.](image)

**Area 1 Structure 4 (A1S4)**

Confidence Value: 3

A T-shaped structure, likely residential due to the complexity of the building, clear hearth feature, and trash pit. Its location immediately adjacent to the castle and A1S3 (probably a shed), as well as its very strong magnetic signature indicate that it is likely a post-medieval feature. The heightened magnetic signature is probably due to a much higher frequency of metals used in its construction, nails, and other fasteners. Despite the absence of radar data for this feature, its clarity and complexity in the magnetic survey, and the post-medieval logic of its location strongly indicate that it was an early modern farmstead.
Area 1 Structure 5 (A1S5)

Confidence Value: 2

Though this structure had only a faint magnetometry profile, its presence was corroborated by GPR Profile 43 where it is possible to make out a floor and hearth. This feature coupled with the hearth showing clear magnetometry indicate that there was likely a residential structure here. The orientation of the structure relative to the nearby plot boundaries, along with the proximity to the castle, strongly indicate that it is a post-medieval feature. The only other sufficient explanation for the proximity of these plot boundaries to the castle is that they predate the castle altogether. Without expanded geophysical survey to the north and west of this feature however, it is difficult to discern if the logic used in the plot orientation better matched medieval behavior or that of other eras.
Area 2 Structures

Figure 51. Probable structure located in Area 2, Google Earth background.

Area 2 Structure 1 (A2S1)

Confidence Value: 1

This feature was only surveyed in magnetometry, and has a relatively weak overall signature there, probably due to the fact that the majority of the feature is obscured by the presence of a metal object nearby (Figure 50). The signature does however have a hearth in the middle along with a trash pit just outside the structure’s walls, and the location and orientation appear to fit with the medieval features around it, making a case for the presence of a medieval feature in this location. Due to the lack of corroborating data from GPR, and the obscured magnetic imagery, the structure was assigned a very low confidence interval; there is probably a medieval feature here, but there is too little information to discern much more about it.
Area 2 Structure 2 (A2S2)
Confidence Value: 2

One of two adjoining signatures, the north-eastern structure is clear on magnetometry though it was not covered by GPR (Figure 50). Its orientation and location within the plot are somewhat obscure. The presence of nearby trash pits however reinforces the notion that this structure and its contiguous cousin were perhaps residential. Their proximity may indicate that they were not contemporaneous with one another, and that an outbuilding or house was relocated slightly when the old one was replaced.

Area 2 Structure 3 (A2S3)
Confidence Value: 2

The southwestern of two nearly adjoining structures covered only by magnetometry, and this feature’s proximity to A2S2 may indicate that it was built either before or after it (Figure 50). It is a curious structure, as unlike many structures in the settlement, it is not aligned with the corresponding plot boundaries. There is a strong magnetic signature in the southeast corner which may be a trash pit or hearth. Very little can be said about this feature without radar survey or excavation, except for its size, shape, and position.
Area 2 Structure 4 (A2S4)

Confidence Value: 2

Despite its weak magnetic signature, this feature exhibits a floor visible in GPR G38P55, adjacent to the boundary ditch which reinforces the magnetic signature (Figure 50). Its orientation to the plot boundaries coupled with a hearth could indicate that it is indeed a structure, except that its diminutive size (3m x 2m) is too small to be a house. It is possible that this is part of a house that was destroyed or is no longer detectable for some reason, or more likely that this is some other kind of medieval feature. Its location and orientation along Road I make it very likely that this feature was part of the Phase II medieval habitation of the site.

Area 2 Structure 5 (A2S5)

Confidence Value: 3

This feature has a long and somewhat curious magnetic signature, suggesting that it was two adjacent structures, perhaps one that was rebuilt next to an abandoned one, or that it was just one unusually long structure that was partitioned (Figure 50). We have chosen to interpret this feature as one long rectangular building, as the geophysical signatures are not easily divided. There are multiple hearths present, and its walls are clear on magnetometry and GPR G38P57. The hearths and nearby trash pits indicate that the structure served a residential purpose. The orientation of the feature matches the medieval plot boundaries around it, and its proximity along Road I makes a strong case that this is a Phase II medieval house (or two).
Area 2 Structure 6 (A2S6)

Confidence Value: 2

The location and orientation of this feature along Road A and aligning with the medieval plot boundaries makes it a prime candidate for a medieval structure (Figure 50). The area is somewhat crowded on magnetic survey, so magnetic analysis is challenging here, however A2S6 is clearly visible as a floor in G38P57. It may not have been a residential structure as it is both small and lacks a hearth. The clarity of its profile signature and its location along the road indicate that whatever was located here was worthy of a choice location during the medieval occupation. A low confidence interval was assigned due to the inability to determine what this feature was, despite all the evidence strongly indicating that it is medieval.

Area 2 Structure 7 (A2S7)

Confidence Value: 2

Magnetometry suggests that there may be some form of enclosure or animal pen at this location, but due to a weak magnetic signature we are not overly confident in the interpretation of A2S7 as a building (Figure 50). There is however a floor surface in GPR G38P75 as well as what may be walls. This coupled with the orientation indicate that while it is unlikely to be a residential structure, it is highly likely that there is a medieval structure here, perhaps an outbuilding such as a workspace or market structure.
**Area 2 Structure 8 (A2S8)**

Confidence Value: 4

A long rectangular structure with clear walls on magnetometry, GPR Slice and Profile, as well as a central hearth feature (Figure 50). This coupled with its orientation to the adjacent plot boundary and main road seem to indicate that this is a large structure, most likely a house. It is possible that the eastern boundary extends out further towards the plot boundary, however this is unclear in the collected data so instead a more conservative interpretation of this wall is shown.

**Area 2 Structure 9 (A2S9)**

Confidence Value: 3

A2S9 is clear in both our magnetic and radar data (Figure 50). Its orientation with respect to nearby roads and plot boundaries along with its distance from the road indicates strongly that this is a medieval structure. Inside there is a clear hearth signature, and externally there are nearby trash pits. GPR G39P29 shows two strong walls the appropriate distance apart to match the magnetic imagery. While the presence of a structure here is nearly certain, the complexity of its signature in magnetometry and radar imagery make it difficult to accurately interpret the shape of A2S9.
Area 2 Structure 10 (A2S10)

Confidence Value: 4

A2S10 is remarkably clear on magnetic imagery and contains a central hearth. It is the correct size, location, and shape to be a residential structure (Figure 50). While its orientation matches the surrounding plot boundaries nicely, its proximity relative to both Road A and Road B is so close that it is reasonable to think that this structure was most likely part of the Phase I medieval occupation, and that it was thus destroyed before or during the expansion of Road A and the creation of Road B. GPR G27P109 shows only a weak signature, and only the floor surface is detectable. Radar images of GPR SL2 clearly show the compacted surface of the road encroaching well into the wall signatures, confirming the magnetic and profile interpretation that the road encroaches into this house feature.

Area 2 Structure 11 (A2S11)

Confidence Value: 2

A2S11 is difficult to see in our magnetometry, as it is on the edge of two surveys and there is some discontinuity between the signatures, likely due to the variation in field conditions at the times the two surveys were conducted (Figure 50). There is a possible hearth in the northwest corner, and the size is consistent with a small house. There is a weak floor signature in G39P37, and this coupled with a compacted floor surface evident on GPR SL2 seems to indicate that there was an enclosure at this location. It is unclear if this feature was a house, an outbuilding or an animal pen, however its location and orientation along Road C indicate that it was likely a Phase II medieval feature.
Area 2 Structure 12 (A2S12)

Confidence Value: 3

Present in magnetometry and G39P79 but absent in slice layers, the strong magnetometry signature of this structure may be indicative of a burning event and contains several potential hearths (Figure 50). The profile seems to show a partially sunken floor surface with two apparent wall signatures on either side. The location and orientation match the roads and plots around it, and the signatures are so clear that it is almost certain that this is a Phase II medieval structure. A2S12 was only assigned a confidence interval of three because it is unclear what kind of feature this is, and why it looks so different from the others around it. The strong and “blown out” magnetic signature could be indicative of a burning event.
Area 3 Structure 1 (A3S1)

Confidence Value: 2

A strong floor signature on GPR SL3 indicates a potential enclosure, despite the absence of a magnetic signature (Figure 51). G39P125 corroborates GPR SL3’s floor, and though a strong
wall signature is absent, A3S1 may have been a residential structure due to the location and orientation with nearby plot boundaries and the road.

**Area 3 Structure 2 (A3S2)**

Confidence Value: 5

This structure has a strong signal in magnetometry, GPR profile (G27P91) and some indication on GPR slice 4 (Figure 51). A strong central hearth is present as well as nearby trash pits. The Castles in Communities Field School excavated here in 2018 and 2019, designating their trench DS2 (Deserted Settlement 2). This feature was selected for excavation because of its clarity in both profile and magnetics, along with its size, location, hearth, and trash pit. Field excavation confirmed these observations, as well as uncovering a large hearth or kiln feature.

**Area 3 Structure 3 (A3S3)**

Confidence Value: 4

Very clear on magnetometry and GPR G27P77, this structure exhibits two clear walls, and GPR SL 3 potentially indicates the floor space of the structure as well as the hearth and the nearby trash pits (Figure 51). The shape and proximity of the two parallel trash pits may indicate that they are borrow pits, used as sources of plaster or daub for the walls of the structure.

**Area 3 Structure 4 (A3S4)**

Confidence Value: 3

GPR SL4 indicates the presence of a floor surface (Figure 51). GPR G27P41 has a strong signature that clearly shows walls, a floor surface, and a deep hearth. The likely partition may
indicate that one part of the structure predated the other. The magnetometry signature is clear at most corners, and at least one hearth is visible. The location and orientation match the medieval settlement features around it very well.

**Area 3 Structure 5 (A3S5)**

Confidence Value: 2

GPR SL3 shows a partial floor level (Figure 51). Magnetometry shows clear southern walls while the northern ones are washed out. G27P17 shows two walls and a hearth in the middle, though there is not much evidence for a floor surface. The location and orientation make sense, though the size of the structure seems a little on the small side for being considered a residential structure.

**Area 3 Structure 6 (A3S6)**

Confidence Value: 1

This feature’s magnetometry signature is weak and there is no GPR coverage of the structure, however the location and orientation, as well as a possible hearth, do indicate a probable structure at this location (Figure 51).

**Area 3 Structure 7 (A3S7)**

Confidence Value: 1

The magnetometry in this area is very washed out due to the seasonal turlough which means our structure is only clear in GPR (Figure 51). The walls are highly visible in GPR
SL2 and SL3 while the floor can be clearly seen in GPR G39P151. Its orientation and location make it an anomaly compared to the rest of the settlement.

**Area 3 Structure 8 (A3S8)**

Confidence Value: 3

Very visible on magnetometry with a clear hearth, though it is a small structure (Figure 51). GPR G39P141 shows a floor and walls so clear that they are likely made of stone. This feature’s magnetic signature indicates large volumes of biomass or ash associated with this feature. This coupled with the small size indicates that it is unlikely a house, more likely a storage or manufacturing building.

**Area 3 Structure 9 (A3S9)**

Confidence Value: 3

This feature exhibits a strong hearth but only weak wall signatures in magnetic survey, however the partial floor is clear in GPR G27P103 (Figure 51). The orientation and layout match the structures observed around it on both sides, and it was first located in profile analysis by Andrew Bair (2019). Its slice map interpretation is inhibited by the fact that this structure appears to have been mostly destroyed when a road was built over/through it.

While the state of preservation for this feature appears relatively poor relative to others at this archaeological site, the positioning of this feature makes a strong case that it belonged to the earlier Phase I medieval settlement, and thus it serves as a good candidate for future testing to determine the chronology of the medieval settlement.
**Area 3 Structure 10 (A3S10)**

Confidence Value: 3

This feature is likely a residential structure; its walls and hearth are remarkably clear in gradiometry, and the floor signature appears cleanly on radar profile (Figure 51). In radar slices 3 and 4 evidence of the northern half of the feature appears more clearly than in the south, which is likely a result of how the feature decomposed once abandoned.

The orientation of the structure is identical to those around it, and its position within a very small plot indicates that the residents lived in a semi-urban context and depended on either farming lands not adjacent to their home or on specialized crafts or services to provide income. To the immediate south of the structure is a large magnetic signature that lacks definition in radar survey which may be a related craft area.
Area 4 Structures

Area 4 Structure 1 (A4S1)

Confidence Value: 4

This feature is very clear on magnetometry; however, the walls are depicted as white and the floor is depicted with a darker signature, unlike all the other structures in our survey (Figures
There is a very faint central hearth visible in magnetics. This feature’s outline is highly visible in GPR SL4 and GPR profile G37P29 shows a structure with two adjacent floor levels of different elevations (north at 40 cmbs and south at 80 cmbs). This feature’s signature is different than all of the others found in this survey, and in particular shows evidence in both magnetic and GPR returns of a likely souterrain, and a large one at that. Souterrains are discussed in section 4.2.

Figure 54. A4S1 in annotated and plain magnetic map, and in GPR profile.

Associated with this feature are three trash pits to the south and west and what appears to be a collapsed subterranean storage feature to the northeast as is evident in G37P29. The orientation and location do not correspond to the rest of our settlement, potentially indicating that A4S1 may pre/post-date the medieval settlement.
Area 4 Structure 2 (A4S2)
Confidence Value: 5

GPR G32P31 displays a very clear floor surface which is further supported by GPR SL3 (Figure 52). Magnetometry shows a weak distinction between the interior and exterior of the structure, with a strong hearth signature in the center of A4S2. Field survey revealed that this structure was built upon a raised platform a meter and a half above the rest of the terrain on the edge of the turlough. The shape of this platform is visible in satellite remote sensing images due to the surrounding seasonal floodwaters. This feature was excavated by the Castles in Communities field school in 2019 and designated T1 (Turlough 1).

Area 4 Structure 3 (A4S3)
Confidence Value: 1

A rectangular floor surface is visible in GPR SL3 and GPR G30P105 and is well demonstrated in profile G30P105 (Figure 52). While the size of this feature is only slightly larger than observed residential structures, the lack of a hearth and visible walls make it unlikely that this feature was a house. The orientation matches the general layout of the settlement; however, its position is further from the road and past what is likely the boundary between a residential toft and its agricultural croft. Thus, the location of this feature indicates that it was most likely not a home or structure of any kind, so much as a pen or enclosure that was rectangular in shape.
Area 4 Structure 4 (A4S4)

Confidence Value: 2

This feature exhibits one of the clearest floor surfaces found in radar slices, as seen on GPR SL2 and SL3 (Figure 52). Accordingly, radar profile G30P35 also shows a long rectangular floor in precisely the same location. Unfortunately, the gradiometry survey shows that the soils in this area have lost their magnetic properties, likely due to regular flooding from the nearby turlough. Without the ability to compare to a magnetic signature this feature can only be described as a rectangular floor occurring 60cm below the surface, of appropriate location and orientation to belong to the medieval settlement. Its size is consistent with a residential structure, however none of the other houses had floors that were so neatly visible to slice maps, indicating that this feature may have had a different type of flooring altogether.
Area 5 Structures

Figure 55. Area 5 probable structures annotated onto a Google Earth background.

Area 5 Structure 1 (A5S1)

Confidence Value: 4

This feature, possibly a pair of adjacent features, is clearly visible in the magnetic survey (Figure 54). The location immediately next to the main road is prime real estate and the orientation is parallel to the road itself. The plot boundaries, as visible in both magnetic imagery and GPR SL3, bow out to accommodate this feature. The floor, northern wall, and boundary ditch are all readily apparent in G38P37.
This feature is an excellent candidate for future sampling, as it appears that when the Phase II plot boundaries were created this structure was already in place and likely still in use, as it influenced the shape of the plot boundary. It is also large, and the orientation parallel (as opposed to perpendicular) to the road is unlike most housing structures. It is likely that this building, or pair of buildings, served a non-residential purpose.

**Area 5 Structure 2 (A5S2)**

Confidence Value: 2

Positioned near the primary road and parallel to it, this feature is visible on magnetic survey, and may have a very weak hearth signature (Figure 54). It is similar in size to some of the smaller houses. Although a floor is clearly visible in radar profile G27P62, only a faint shadow of it can be seen on SL4, with some forgiveness for dislocation due to the way slope distorts large radar grids.

Although on first glance it appears that the plot boundary runs through the structure itself, this is not likely the case. As found at other Hiberno-Norman settlements and in excavation DS2 in Ballintober, house walls could act as plot boundaries, taking the place of a section of berm. That pattern is discussed in greater detail in section 4.3 of this report. In profile analysis this appears to be the case for A5S2; the berm is missing but the ditch continues running along the structure regardless, suggesting that they were both in use together with the structure itself serving as part of the property boundary.
Area 5 Structure 3 (A5S3)

Confidence Value: 4

This structure is most likely residential in nature, as it runs perpendicular to the road and is located only a few meters back from the plot boundary along the road, which appears to be the most common situation at Ballintober (Figure 54). A hearth and all four walls are visible in the magnetic survey. The floor signature is obscured on radar slice maps by the noisy surrounding context caused by post-medieval behavior immediately west of the feature and deep plowing immediately above and possibly through the structure. The bottom of the feature, however, appears intact and is visible on radar profile G25P155, which clearly reveals traces of both the floor and central hearth.

Area 5 Structure 4 (A5S4)

Confidence Value: 2

This feature is marked by a clear central hearth and some wall locations on magnetic imagery (Figure 54). The location a few meters away from the plot boundary nearest the road is normal for residential structures, although its orientation is parallel to the road rather than perpendicular. Like other features around it, the deep plowing in the context immediately above this feature and its location on a slope make it a poor candidate for identification in radar slice maps, however profile analysis confirms the magnetic survey results rather nicely. While a portion of this feature’s floor presence is clear in G25P139, it is difficult to make out the eastern boundary, so it may be somewhat larger than is indicated by the available data.
Area 5 Structure 5 (A5S5)

Confidence Value: 2

A relatively small feature, Structure 5 has a clear signature in the magnetic imagery, but it is difficult to determine if there was a hearth (Figure 54). The position and orientation are similar to the other structures around it. Unlike the other structures to its west, this one appears only weakly in profile G25P133, but presents a clear rectangular shadow and likely hearth on SL4.

Area 5 Structure 6 (A5S6)

Confidence Value: 4

This feature runs parallel to the road and sits near the plot edge closest to the road, indicating a likely residential structure (Figure 54). Its size is very similar to others in the settlement, particularly A3S2, which was partially excavated in unit DS2. All four walls and both a hearth and another large internal feature are visible clearly in the magnetic imagery. Radar slice SL2 presents as a clearly defined rectangular shadow, apart from a small amount of location distortion caused by georeferencing issues, as grid GPR25 was performed without the aid of differential GPS and experienced distortion due to slope. Likewise, the radar profile G25P141 shows cleanly a very strong floor signature and picks up the hearth.

Area 5 Structure 7 (A5S7)

Confidence Value: 4

This feature could be one long structure divided into cells, or several smaller structures-built side by side (Figure 54). The walls have strong magnetic signatures, and each square cell has a small shadow in the center that is too weak to identify positively as a hearth, but exists,
nonetheless. On radar slices a rectangular shadow outlines the floor in SL4, and the walls and some sort of internal feature are visible above that in SL3.

Some allowances must be made for the location of the structure relative to its location in radar slice, as its position on a slope caused mild distortion when G35 was performed before the project acquired a differential GPS. Regardless, the radar slice imagery gives an excellent report of this feature. Likewise, the profile is highly informative; G35P31 shows both wall locations so clearly that it indicates they are likely thin stone walls, however the floor is missing, and the context between the walls is different than what is around them. These findings almost certainly reflect the state of preservation of the feature, which may have been robbed of its stone floor, and the insides contain either debris from its collapse or some other substance that was placed inside this curious cellular structure.

**Area 5 Structure 8 (A5S8)**

Confidence Value: 3

Located adjacent to A6S7, this feature is also long and thin running parallel to the road (Figure 54). Curiously the magnetic data does not pick up a central hearth (although it shows a signature at the east end of the structure) but radar slice SL2 shows not only a shadow of this structure’s floor but a bright signature in the center, where one would have expected a hearth. If it is possible for a hearth to lose its magnetic signature, perhaps due to flooding after abandonment, that may well be the case here. Another possibility is that the radar signature is not a hearth, but a later disturbance. The choppy appearance of the floor in profile G27P11 is likely a result of plowing or disturbance after the abandonment of this feature, so there is at least some concern regarding the level of preservation here.
**Area 5 Structure 9 (A5S9)**

Confidence Value: 3

This feature evaded the first pass of macro-analysis because it is completely invisible to magnetic gradiometry in a place where other structures were picked up without issue. Despite this, however, the presence of its walls on radar slice SL2 and floor shadow on SL3 are simply too strong to ignore, so a profile was tested. Profile G25P107 demonstrated a well-defined floor, with possible hearth, sitting immediately along the boundary of the plot. In terms of radar this structure could not be much clearer without being made of stone, indicating that the absence of magnetic signature likely has more to do with the way in which the structure collapsed than its medieval use. Like a few other examples in this survey at the base of a slope or near the turlough, flood water may have washed away the ash and other residues that would have provided an unequivocal magnetic signature.

**Area 5 Structure 10 (A5S10)**

Confidence Value: 2

Another feature that was missed early on in analysis, this one is hidden from gradiometric survey by the location of a modern power pole, which not surprisingly obscures magnetic imagery for a number of meters in all directions. Fortunately, the floor of this feature is rather thick, and is thus easily visible on radar slice SL2 and SL3, which prompted profile analysis of G25P69 (Figure 54). While no walls are visible, the thick rectangular floor is hard to question. The size and orientation of the feature indicate it could well have been a house, and its position so far from the
main road indicates that it was likely created in the second phase of the medieval settlement when a narrow alley running parallel to the road appears, allowing the larger plot to be further divided. Alternatively, it is possible that this feature is some other type of enclosure, although the overall boundaries of this plot make it unlikely to have supported serious agriculture that could use a large animal pen.

**Area 5 Structure 11 (A5S11)**

Confidence Value: 4

This was an L-shaped structure located near the southernmost medieval road found in our survey (Figure 54). This feature escaped the first pass of analysis due to its relatively faint (although clearly present) magnetic signature, but it was discovered due to the clarity of the floor in radar slice SL2. Interestingly, SL3 shows the shadow of the structure floor and a long linear drainage feature that ran through the house. It is possible that the ditch was an earlier feature that was filled in, or that the medieval house was built over the drainage, which is not unheard of at other sites in medieval Ireland. The orientation of A5S11 matches its surrounding plot boundaries, and although the hearth is not immediately visible on the magnetic imagery, profile G21P29 shows a clear floor, both walls, and possibly a central hearth. Further south and across the smaller part of the structure profile G21P33 shows the floor in relationship to the nearby road and a prominent plot boundary.
Area 6 Structures

Figure 56. Area 6 Probable Structures annotated onto a Google Earth background.

Area 6 Structure 1 A6S1)

Confidence Value: 1

A significantly strong wall signature is apparent on gradiometric imagery; however, this part of the site was not surveyed with radar so its composition cannot be verified (Figure 55). The
size is smaller than houses in the settlement and it lacks a hearth, so the purpose of this feature is difficult to determine. The orientation matches the layout of the medieval settlement, but the location is farther from the road than one would expect from a house, so again this feature is more likely an outbuilding of some sort.

Area 6 Structure 2 (A6S2)

Confidence Value: 2

Radar survey has yet to be performed over this location, and the magnetic gradiometry is crowded due to the density of both medieval and post-medieval features. That said, there is a roughly rectangular signature sitting parallel to the road at a similar distance to the other nearby better surveyed features (Figure 55). While the presence of an archaeological feature here is all but guaranteed, it is impossible to elaborate this interpretation further until more survey can be undertaken.

Area 6 Structure 3(A6S3)

Confidence Value: 4

A strong magnetic signature in a roughly square shape is visible in the magnetometry, the internal space is filled with two possible hearth features and darker in general than the surrounding context, indicating that this structure either burned down or contained more magnetic residue/ash than the structures around it. Its location near the road, and unusual placement on the plot boundary suggests that it may have been a non-residential structure.

In radar slice maps SL2 and 3 there is a very clear white rectangular signature, which indicates the floor. Profile G41P41 shows the floor clearly and demonstrates that it was built over
an earlier plot boundary exactly and appears to have intruded into the ditch itself. The position of this feature relative to its southern boundary is conspicuous, but the orientation does match the boundary as opposed to the road, which indicates that it was a medieval feature and the structure itself may have served to mark part of the property edge.

**Area 6 Structure 4 (A6S4)**

Confidence Value: 2

This feature was missed on the first pass of analysis, as it has no magnetic signature whatsoever. In radar slice SL2 and 3, however, a clear and dark floor signature is observed. Radar profile G41P61 makes out the floor clearly, and the L shaped outline, size, orientation, and location all make this a likely residential structure. Its lack of a magnetic signature is most likely a preservation issue, as other flood prone areas of the settlement also fail to present signatures. It is likely that this building decomposed in such a way that the ash washed out from rain and flood water.
Area 6 Structure 5 (A6S5)

Confidence Value: 2

This house-sized feature may incorporate the plot boundary as its northern wall, but the other three walls are easily visible in the magnetic survey. Although no radar survey was completed over this feature, the clarity of its signature and central hearth, as well as a secondary feature on the east end, make a strong case that this signature is most likely a medieval house.

Area 6 Structure 6 (A6S6)

Confidence Value: 2

This structure has a strong signature on magnetic imagery and is located in an unusually small and complicated plot along the main road. There is no clear northern boundary to the feature, so what is shown in this report is its smallest possible size, however the northern end likely extended all the way to the plot boundary as seen elsewhere in the settlement. That end of the structure was not clear in profile however, and it may have been disturbed during the construction of the modern turlough edge. The southern end of the structure, however, is clear in profile G41P39 for both walls and the floor.

Area 6 Structure 7 (A6S7)

Confidence Value: 2

This feature was most likely an outbuilding, given its small size and the lack of a clear hearth on magnetometry, although the context inside the enclosure appears different from its surroundings. On radar slices the structure lacks a clear floor, which confirms the profile image from G41P61 that shows two bright, clean wall signatures but no floor.
Area 6 Structure 8 (A6S8)

Confidence Value: 1

This is a large L-shaped structure that is weakly visible in magnetometry, likely caused by its proximity to the turlough and occasional flooding. Its magnetic signature is sufficient to identify a hearth and some outlines. The floor is not readily apparent on any of the slice maps, however profile G41P67 can detect both walls and the floor.

Area 6 Structure 9 (A6S9)

Confidence Value: 2

This feature has a very strong magnetic signature and is located in the sweet spot for residential structures, a few meters off the road and running parallel to it. The length is about what one would expect for a house, but the width appears under three meters, which is possible if unusual for a home. The lack of a clear hearth signature, however, suggests that this may have been some other type of enclosure.

On radar slices two of the walls are visible, and in profile G45P19 the floor is clear next to a robust property boundary. The clarity of the outline in all three sets of imagery clearly represents a feature, but the unusual narrowness and lack of an obvious hearth make it hard to determine what purpose the feature served.
**Area 6 Structure 10 (A6S10)**

Confidence Value: 2

A6S10 is an L-shaped structure with a magnetic signature and internal features that likely show a hearth. Unfortunately, the radar survey barely nicked the edge of this structure, so no meaningful slice or profile analysis is possible at this time. However, based on the magnetic imagery alone it is clear that the size is appropriate for a residential structure and its location near a road, and orientation along the surrounding plot boundaries makes a strong argument that this structure is a medieval house, and likely part of the Phase II expansion.

**Area 6 Structure 11 (A6S11)**

Confidence Value: 2

This feature was barely caught in the magnetic and radar surveys, however its location and orientation along a medieval road are consistent with a residential structure. Although only a portion of this feature fell within the survey areas, the clarity with which its walls show up in magnetics and the floor and wall are seen in profile G42P55.

**Area 6 Structure 12 (A6S12)**

Confidence Value: 3

This feature is only partially covered by geophysical survey, and the magnetic signature could be clearer, however profile G41P3 has one of the clearest images of a floor and wall seen in the whole settlement, leaving little doubt about the interpretation of the signature. The location and orientation along a medieval road are in a prime location for residential structures, although too little of the structure has been surveyed to say more about it.
Area 6 Structure 13 (A6S13)

Confidence Value: 3

This feature is interesting because it is so clear on magnetics, with two possible hearths. Radar slice SL3 shows a nice floor in the western half, and G43P63 has a thick floor with a central feature. There can be little doubt that the house sized structure is physically located as is shown on the report, yet it is at precisely the wrong end of a plot to be a normal house, and there is no reason to think a road ran at any end of this plot except the south end. The orientation matches its medieval surroundings nicely, so the most probable conclusion is that this structure was not a normal house, and that the large magnetic signatures located inside reflect some other activity, perhaps a kiln or other fire-based trade.

Though remarkably unlikely, one factor that prevents a higher level of confidence in our interpretation of the feature is its proximity and orientation to the post-medieval quarry. It is a low probability, but it should be considered that this structure may belong to a more modern landscape.

Area 6 Structure 14 (A6S14)

Confidence Value: 1

A6S14 has a visible square shape in magnetic survey, however this feature has next to no signature in radar survey in either profile G43P45 or the radar slice maps. The existence of later linear disturbances complicates the imagery somewhat, but the lack of a clear floor or walls is hard to ignore. It is not understood at this time what sort of activity could result in such a potent magnetic signature that leaves virtually no effect visible on radar. The orientation of the feature
does not match the medieval settlement well, and its location in the plot is nearly central as opposed to favoring the roadside as one would expect of a medieval feature.

**Area 7 Structures**

![Figure 57. Area 7 Probable Structures drawn onto a Google Earth background.](image)

**Area 7 Structure 1 (A7S1)**

Confidence Value: 2

This feature exhibits strong signatures in all three geophysical image types; the magnetometry, radar slice SL4 shows a floor and possible hearth, and profile G47P217 picks up
two walls and a floor without issue (Figure 56). The location and orientation match the nearby road, indicating a likely residential structure. Although a hearth is not clearly visible in magnetics, every other aspect of this feature falls in line with what one would expect from a medieval house.

**Area 7 Structure 2 (A7S2)**

Confidence Value: 2

A7S2 is not clearly visible in magnetic imagery but is rather based on the astoundingly clear floor seen in radar slice SL3 and 4 (Figure 56). Likewise, the profile shows a thick and well defined, if lumpy, signature that would be consistent with a collapsed structure of some type. The size, orientation, and location within its plot make it reasonable to suspect this was a house, but the weak magnetic signature and unusually thick profile are unlike most of the structures observed in this settlement. It may therefore be interpreted as a pen, enclosure or, as illustrated in G47P235, a collapsed structure. It is difficult to properly interpret the complex signature.
3.7 Excavation and Ground Truthing

Excavations have been carried out by the CIC program since 2015, and will continue apart from a two-year hiatus due to the Covid-19 epidemic. Starting in 2018, the excavations served the additional purpose of ground-truthing features that were found in geophysics, which in general were like the annotated features drawn on various preliminary reports of the geophysical returns. This sub-section correlates the various excavation units, called “cuttings” in their Irish designations, to their responses with geophysical equipment.

Cutting 3

This unit was placed over the original entrance of the castle, along the eastern wall. Excavations here served the dual purpose of providing archaeological evidence and clearing rubble to provide better access to the castle for tourists in the future. The entrance of the castle was through a pair of fortified towers, slightly south of the center of the wall. These towers appear to have had a rectangular base inside the wall, but a rounded face on the outward projections. Additional investigations into the external aspects of the entrance towers will only be feasible after they have been formally inspected for safety and stabilized if necessary. The cutting was started in 2019 and then covered with a protective membrane, but work is planned for that location in the future. None of the 287 artifacts recovered in the 2019 field season were identified as medieval. However, fine stone cutwork was observed in the in situ remains, suggesting that such structural elements were likely robbed from their locations above ground in the rest of the castle. The wall feature recorded in GPR appears to be an accurate indication of the subsurface reality encountered so far (Figures 57 and 58).
Figure 58. Cutting 3 in the GPR macro analysis and profile, and an additional annotation by Andrew Bair.
Figure 59. A map of the finds in Cutting 3 so far, which match up with the geophysical results.

**DS2 - Garvey’s Field Deserted Settlement 2**

This unit was originally opened in 2018 and was designed to collect a long sample across one of the residential plots east of the road. The cutting is 2m by 20m and crosses a house with a central hearth that provided samples which were later radiocarbon dated. That house is designated A3S2 in Figures 59 and 60, and its details in geophysics are shown in Structure Appendix A.
Figure 60. A3S2 as shown in the macro-analysis, with the location of DS2 drawn over the magnetic imagery for reference (yellow).
It was discovered during excavation that plot boundaries in this case were remarkably deep, measuring at 1.37m and 1.6m below the modern surface, with stone lining on the top of the western boundary. These features are deeper than what was immediately visible in GPR, indicating that the radial-dielectric permittivity used to calculate the velocity of signal as an average across the whole settlement did not yield particularly accurate projections of individual feature depths. To create more accurate calculations for feature depths, hyperbola fitting methods would need to be applied in individual locations closer to and including target features. This is a known problem with large scale single-antenna GPR surveys, and one that can only be corrected for in more advanced uses of the software than were employed for this project. Nonetheless, GPR was again found to accurately locate features in their X and Y dimensions, and provided an order of stratigraphy, if not exact depths.

Two sherds of medieval pottery were recovered in the plow zone above the hearth of this structure. Five samples of in-situ food remain were taken from the hearth and exposed to radiocarbon testing (Figure 61). The dates obtained correspond to the hypothesized chronology of the settlement from the late thirteenth to mid-fourteenth centuries. These findings support the
notion that the bailey at Ballintober was a Norman creation, and likely was abandoned during the Norman collapse in the fourteenth century. The earliest date is still perhaps 25 years after the initial construction of the castle, which may indicate that this rather large and impressive structure (compared to others in the survey) was built during the second medieval phase identified in the geophysical analysis.

Figure 62. The radiocarbon dates from grain samples found in excavation units in the deserted medieval settlement, (Brady and Connel 2019:80).
**T1 - Turlough 1 in Garvey’s Field**

This cutting was across a raised mound feature near the turlough (seasonal wetland), at a place identified in geophysics as a probable structure, with a very strong magnetic signature in its eastern side (Figures 62 and 63). The geophysical signatures were found to accurately show the location of a stone sunken feature, that appears crudely built on top of the mound, with signs of frequent burning. The lack of fire cracked rock around the feature excludes the idea that this was a *fulacht fiadh* (Gaelic cooking pit) but suggests that it was more likely a corn (wheat) drying kiln or another agricultural feature. Radiocarbon samples were taken but have not been processed yet.

Figure 63. A4S2 in annotated map and in gradiometry with the cutting location shown in yellow, above the same feature in GPR returns in both plan view and profile.
Summary of Ground Truthing

The ground truthing employed at three excavation units in 2018 and 2019 had a very high degree of correlation with the geophysical imagery, and the excavations were successful in detecting artifacts and burnt food remains appropriate for analysis and radiocarbon dating. The shapes of the features recorded during excavation were excellent fits for the annotations drawn on satellite maps and depths were useful for differentiating features relative to each other, but it was found that too little work had been done calibrating depths of features to their own grids. Because the survey had taken place over the course of several summers, the radial dielectric permittivity across the site varied significantly due to weather and moisture content. It is fair to say that the accuracy of the geophysical macro-analysis was largely due to the relative homogeneity of Irish
weather: even in summer, it rains all the time. Without better controls for RDP (velocity) changes across the site, it is remarkable that finds were as consistent as they were.

3.8 Macro-Analysis Conclusion

The macro-analysis of geophysical data collected in Ballintober, Ireland under the aegis of the Castles in Communities project proved to be highly productive. Continuing the geophysical techniques introduced at this site by Dr. Samuel Connell, Dr. Lawrence Conyers and Andrew Bair, this project expanded the software suite to include the advanced GPR post-processing capabilities provided by Dr. Dean Goodman’s GPR_Slice software program, and thus streamlined the ability to cover many hectares of survey without manually interpreting hundreds of kilometers of radar profile. By instead using enhanced slice maps and more developed magnetic analysis, possible features were identified at a much greater rate, and then each possible feature was tested via direct radar profile analysis. This methodology mirrors the concept of “observational testing,” a technique frequently employed by physicists and astrophysicists when dealing with very large data sets.

The macro-analysis found many more features than previous analyses of the same data sets which were created using the line by line, direct profile approach. It is worth mentioning, however, that features identified using a direct profile analysis (by Andrew Bair in particular) were verified to be highly accurate. The ability to find more features in macro-analysis has little to do with increased accuracy of readings. The advantage of the macro-analytical technique lies in its speed, and thus the capacity to scale up without enormous labor and budget expenditures. The amount of time and quality of labor required to do a direct and intense approach covering the whole site at Ballintober is simply too much area for anything short of a team of scientists and months of study.
This project demonstrated that by using more advanced software methods to make features “stand out” in GPR slices and magnetics, the amount of time spent on profile analysis was cut to less than 10%, and as such the whole of the site could be mapped, reviewed, and then corrected in several passes. A holistic understanding of the layout and function of the settlement became possible, and the conformity of any given feature to its surrounding context became itself an analytical trait: once enough of a settlement is mapped, the orientation and depths of newly detected anomalies provides evidence as to whether they are indeed a part of the settlement, versus natural or modern phenomena.

In conclusion, a finely tuned macro-analysis is capable of not only reviewing and refining larger data sets, but in learning from each “pass” of interpretation, the depth of understanding at a site can be increased so that even more can be learned from successive review of anomalies and possible features. In practice a geophysical data set can be set up, interpreted, adjusted, reviewed, re-adjusted, and “tortured” until virtually every anomaly has a reasonable explanation.

3.9 Satellite Imagery Review

Satellite imagery is now available free to the public from a variety of sources such as Google Earth and Bing Maps (Microsoft). These images were compiled into GIS software to outline visible landscape features and to draw inferences about the geophysical results and the relationship of Ballintober to its surroundings.

Google Earth has been a popular tool to use in archaeology for some time (Myers 2010:456) since it is free, and the three-dimensional environment covers the whole planet. Updates occur frequently to include more recent satellite images, which are often higher in resolution. The software also includes a feature for examining previous satellite images, which are an excellent
tool for identifying aspects of the landscape that are seasonally camouflaged by foliage or wetlands. In Ireland in particular, the landscape is saturated with countless visible features that are remnants of the archaeological past, and even low relief earthworks that are little more than knee-high can be detected in many cases (Condit 2007:29). The satellite imagery review component of this project was conducted with the intention of locating signs of the medieval landscape related to both the pre-Norman and Norman communities.

The survey design was focused on the townland of Ballintober and the townlands immediately around it. Ballintober townland encompasses the modern community as well as the archaeological site and is attached to the castle in the northwest corner (Figure 64). The townland itself is very small, at less than sixty acres total.

Figure 65. Ballintober townland, courtesy of the National Monument Service Historic Environment Viewer.
This project used an approach similar to satellite archaeology performed elsewhere, where settlement remains are observed in overhead imagery collected by satellite or aerial photography, and then examined based on their physical layout to identify which cultures constructed them. This method has proved useful particularly in desert environments (Hritz 2014:258). Unfortunately, although Ireland is in general an excellent candidate for satellite archaeology, for the purposes of analysis relative to the Norman era, there is a fatal flaw which ultimately rendered this modality inapplicable to the rest of the project.

The fundamental problem with remote sensing applications is the requirement that targets must be identifiable without ground-truthing or hands-on inspection. The modality relies on visible features having unique physical characteristics that allow them to be identified based on their layout, or methods of construction. The ubiquitous stone walls that serve as property boundaries throughout most of Ireland share the construction technique of loosely stacked, unmortared stones that goes back to the Neolithic. Even in the event of ground-truthing, it would be difficult to date such features during excavation, as nothing about their physical form corresponds to different eras of habitation, and there is little to stop trash and organic features from other eras from becoming enmeshed with the physical wall, as they commonly serve as a dumping ground for rocks and debris encountered when plowing. It was hoped that the long, thin rectangular plots identified in the Ballintober geophysical results could be identified as distinctively Norman, and thus even though their construction techniques are indistinguishable the layout itself would render sufficient evidence to tag Norman satellite communities around Ballintober itself.

In the course of the analysis, however it became clear that although there are certainly numerous sites containing dense plots in the Ballintober vicinity, there is absolutely nothing to distinguish them from early modern constructions. Laragh and Ross townlands, for example, is
about 1.6km southwest of Ballintober, and contains what could very well be a Norman settlement with perhaps three parallel roads supporting healthy rows of herringbone style residential plots (Figures 65 and 66). Unfortunately, without a means to ground-truth these areas of concentrated remains, their connection to the medieval era remains entirely speculative. It was decided that this modality could be useful for identifying areas for future research, particularly in regards to determining where geophysical analysis and small sample excavations could detect and identify associated settlements. On its own however, the analysis of satellite imagery did not contribute much to the understanding of medieval Ballintober in this project.

Shown below are images that highlight the method’s results before it was abandoned. A concentration 1.6km to the south of Ballintober is marked “Laragh and Ross” on townland maps; those maps show a handful of inhabited plots among dozens of apparently vacant spaces, which are far to small to have been required for cattle agriculture (Figures 65, 66 and 67).

![Figure 66. 6-inch Cassini map showing the density of plots in Laragh and Ross.](image-url)
Figure 67. Laragh and Ross Townland relative to Ballintober townland.
In conclusion, it was determined that although numerous archaeological features are plainly visible in satellite images, there is no meaningful way of distinguishing medieval from early modern features using this method alone. In looking at historic maps, particularly the 6-inch Cassini maps provided by the National Monument Service’s “Historic Environment Viewer,” a number of small townlands around Ballintober also exhibit concentrations of long, thing plots gathered along central roads that bear the classic hallmarks of a Norman settlement layout. The only useful output of the satellite imagery review was to highlight a handful of locations where visible remains and townland shapes indicate a high probability of containing a Norman or hybrid settlement (Figure 68). Without a means of determining which of these settlements are indeed medieval, these locations could not contribute to this analysis.
Figure 69. Townlands with dense concentrations of narrow plots near Ballintober.
Chapter IV: Discussion

4.1 Ceramics

Ceramics are perhaps the most important items of material culture available to archaeologists. This is due to the inherent stability of fired clay, and thus its ability to survive for millennia in almost any context. Combined with its brittle fragility, resulting in frequent breakage and replacement of ceramic vessels, filling garbage deposits around the world (see Balco 2009; McCutcheon 2008; McCutcheon and Meenan 2011), pottery is one of the most common categories of material culture recovered on archaeological sites. In addition to providing clues about subsistence and interactions between groups, ceramics often carry stylistic markers, which can signify different ethnic groups, belief systems, or other identities that once affected the creation and use of pottery. Ireland is no exception to this rule, and the differences in ceramic assemblages between native Irish sites and migrant populations are clear. With that in mind, ceramics should be the most reliable and accessible source of information that can be used to address questions of entanglement and identity on medieval sites in Ireland.

Native Irish Ceramics

Unfortunately, medieval native Irish ceramic assemblages are mainly known for their absence. Curiously, despite having a highly complex society with metal technology, long distance trade, and other evidence for sophisticated technology, the native cultures of medieval Ireland were almost completely aceramic (see McCutcheon and Meenan 2011). At Early Medieval sites in Ireland, and on into the Late Medieval period in places where Normanization did not occur, the only sherds found are those from vessels used primarily for underground storage (Armit 2008;
McSparron 2011; Ryan 1973). The term used for this type of large, hand-thrown rough ware is thus “souterrain ware” based on the eponymous underground root cellars or storage features often found on sites of this period, although they could be used as emergency housing when required (see Clinton 2001:211-282) (Figure 69). At the northern end of the island the term “Ulster ware” is used for a type of storage vessel that is so close to souterrain ware that they may not be separate traditions at all, but a reflection of geographic variation (McSparron 2011).

Figure 70. Souterrain vessel shapes (Armit 2008).

Aside from the occasional storage pot, pottery is rare during the period covered by this thesis, so ceramic traditions are not useful for differentiating between medieval Irish native cultures. No cups, wine glasses, tableware, bowls, plates, or any of the other vessel types found throughout the rest of Europe at the time are found at Irish sites. In fact, the medieval Irish language
does not appear to have a native word for “potter,” as indigenous tableware consisted of wooden wares turned on a lathe and leather vessels (McCutcheon and Meenan 2011:92-94).

Everted rim and Crannog wares (Figure 70) were once thought to be a modification of souterrain ware in response to exposure to English pottery (Mcneill 1974), although it is now thought that these were minor variant types within a single tradition that changed very little over the course of the whole medieval period (Ivens 1988a, 1988b, 2001). These wares are part of a tradition of hand-thrown courseware with a flat base, shoulders, and an everted rim that was often incised but appears to have been used exclusively for storage and cooking, without any tableware components (McSparron 2011). Thus “everted rim/crannog ware” (Figures 70 and 71) does not represent a clear break from native traditions or appear to reflect the other entangled behaviors; there is no reason to assume it was impacted by the kinds of transformational processes this project is interested in identifying.

Figure 71 Various Crannog Ware rims (McSparron 2011).
Souterrain Ware that has been subjected to microscopic fabric examination has always been found to be locally produced (McCorry and Harper 1984; McMullen 2001) and as yet there is no reason to believe that Everted Rim/Crannog Ware was not part of the same native Irish tradition as Souterrain Ware: locally made, hand thrown, unglazed courseware reserved for storage.
and cooking. No other ceramic vessels of any type are commonly found in native Irish medieval sites.

Non-local Ceramics

Unlike their native counterparts, migrants on the island produced and used extensive, identifiable ceramic assemblages. Norman ceramic wares in Ireland have been identified and interpreted as distinct from native traditions for many years (Hurst 1985).

Bristol wares are the most common English imports found in Waterford and Cork but may have been difficult to import in Dublin, which could explain the creation of local “imitations” of Bristol ware in that area (McCutcheon and Meenan 2011: 93). The Chain Book of Dublin (14th century) makes only one mention of “potters” (Gilbert 1889), although it has been argued that these are probably makers of “chimney pots” as opposed to ceramic tableware (McCutcheon and Meenan 2011: 94).

Excavations at Carrickmines in County Dublin have located Norman-era pottery kilns, demonstrating that locals were in fact creating “imitation” wares, mimicking those from migrant homelands, at least in the areas around Dublin; the assemblages from trash pits and trash deposits are similar to what one would expect from their English counterparts (Breen 2012; McCutcheon 2011). Nothing of this kind has been found thus far at sites like Ballintober, however. Common types of Norman imported wares include coarse Cooleware from southeastern England, red-painted wares from Normandy, Stafford type wares from the English Midlands, and Ardenne type wares from the Meuse Valley in France (McCutcheon and Meenan 2011: 95-96).
Another clearly non-native cultural marker is the popular Norman jug (Figure 72) which are found in great quantities in Dublin and Carrickmines throughout the late 12th to 14th centuries. These vessels were typically made in Gascony (southern France), which was under English control at the time. While these are found in small numbers in England, they are found in greater quantities at Norman migrant sites in Ireland (McCutcheon and Meenan 2011: 97).

Migrants to Ireland do not appear to have developed noticeably different ceramic traditions than their English and Welsh counterparts, save perhaps a reduction in the quality of the locally made vessels, and a greater proportion of imported ware. As a behavior marker, ceramics indicate that the technologies of food preservation, consumption, and eating practices, as well as social markers, can be used to identify migrants still associated with their homelands in the archaeological record. Ceramics are considered one of the most direct and useful windows into the hybridization of people involved.

Figure 73. Examples of jugs from Carrickmines (McCutcheon and Meenan 2011).
in culture transfer and can be an excellent tool for detailing the complex paths of colonization and native power dynamics (Antonaccio 2010; Balco 2009, 2012). Unfortunately, they are in short supply and have limited utility at sites like Ballintober. Such evidence as exists is discussed further below.

**Entangled Ceramics at Ballintober**

Areas immediately outside Dublin but within the Pale have turned up coarse unglazed “Leinster Cookware” that appears to be a native reproduction of Anglo-Norman ceramics. This has been documented at Carrickmines, Dundrum, and Merrion Castles (McCutcheon 2008), and many archaeologists believe these wares did not extend into other areas of Ireland (McCutcheon and Meenan 2011), indicating that they may have only been in use in migrant communities. Likewise, almost no imported or native production of tableware pottery has been documented archaeologically after the Norman collapse in the 14th-16th centuries (Ibid:113).

The Ballintober excavations, however, have yielded trace amounts of medieval pottery that clearly do not match the native ceramic tradition (perhaps five sherds), given that they do not correspond to any known variation of Souterrain or Crannog Ware (Brady and Connell 2018). Too little of the pottery has been found to determine its function, so it is not clear how closely that pattern followed those of migrant communities. However, the material is clearly medieval tableware and not Souterrain Ware, so a simple process of elimination leads to the conclusion that these were almost certainly fragments of Norman vessels. The ceramic assemblage at Ballintober awaits full analysis, but at the time of this writing it is not clear if the “medieval pottery” that was located was specifically glazed, wheel thrown, or had any stylistic clues. The shortness of the ceramics description most likely has to do with how the amount found so far, which could fit in
the palm of a single hand, is expected to be an insignificant sample size relative to the upcoming work at the site. In the future those details will allow further discussion about what sort of Norman ceramics have been found, but for now they can only be tagged as medieval and not an indigenous tradition. Most likely, more ceramics would have been found if they had been in daily use as in the migrant communities within the Pale and in England and Wales, where excavations of houses and residential plots typically recover much greater quantities of ceramics (McCutcheon 2008).

At present what can be said is that the habit of using small amounts of ceramic tableware represents a break from both native and migrant patterns of behavior. The relative paucity of ceramic finds at Ballintober thus indicates that life and identity at the site may have been different than in either of the two parent cultures, a classic example of a “third space” that can sometimes result from such contact situations. However, the sample size is as yet too small to speak conclusively on the topic.

Elsewhere in Ireland, there is discussion of a tradition of entangled or hybridized pottery in the form of a type known as “Ulster Ware,” or “Leinster Ware,” which likely belong to the same tradition but are geographically differentiated. The tradition appears to be derived from ceramic styles found in southwest England, but in form these wares seem to fill the function of Souterrain Wares in places where no pre-existing Souterrain Wares are known (Ó Floinn 1988: 340). It has been observed that Ulster Type A pottery is not found at many 13th century sites, but occurs exclusively in places where imported wheel thrown pottery is also found (see Waterman 1959; McSparron and Williams 2009). The physical form of Ulster Ware suggests that it was made using non-native technology (wheel throwing) but was produced to fulfill a native demand for Souterrain Ware in terms of its function (McSparron 2011: 116). The implication of entanglement between migrant and native cultures here is that either non-native people or at least their technology was
being used to create wares that only natives were known to use. There are no cases that I am aware of where wheel thrown pottery was produced in a native Irish kiln, or one that has been identified as belonging only to migrants.

For the time being it is best to presume that UlsterWare was produced exclusively in hybridized Norman kilns, which is to say by Normans who were continuing the native Irish table ware and storage tradition but had access to wheel throwing technology. The map below supports this hypothesis, as the locations of Ulster Ware correspond to Norman Irish habitation, but do not cluster around the Pale or other locations where migrants would likely be most common (Figure 73).

![Figure 74. Distribution of Type A and Type B Ulster Ware throughout Ulster (McSparron 2011; 101).](image)
4.2 Defenses and Fortifications

Defensive structures have a long and storied tradition of being central to the social identities of European cultures from the medieval era all the way back to the Neolithic (Ballmer et al. 2019), particularly in the Iron Age (Arnold and Fernández-Götz 2018). The level of labor investment and the resources used in the construction of massive fortifications testify to their importance to their creators, and in Ireland particularly there are stark, noticeable differences between the defensive structures of natives and those of their migrant counterparts (Duffy 2015, 1997).

Native Irish Defenses

In Ireland the small, defensive ring forts, with their many variations made of stone, earth, or wooden perimeters, have left their remains all over the island. The National Monument Service of Ireland recognizes over 50,000 ring fort sites of various types (cashels, cathairs, raths, etc.), and many more ringforts are still being identified in aerial and satellite imagery as well as archaeological surveys. These are generally interpreted as fortified farmsteads, as they were too small to support a military garrison, and the archaeology within them is consistent with continuous habitation (Brady 2009; Fitzpatrick 2009; Lynn 1975, 1982). A great deal of discussion has surrounded ringforts as a feature. Whether or not they had any military capacity, and if they were a purely early medieval or even earlier phenomenon were popular debates well until the early 2000s. Brian Graham’s suggestion ringforts may have been inhabited throughout the Norman era as well (Graham 1985b:14), a notion that has become much more popular today (Mathew 1991:240), was initially viewed with skepticism.
Another defensive element that is unique to Gaelic culture on the island is the previously discussed souterrain, which is a broad category for underground features made in soil or stone, which could be anything from a simple root cellar or storage pit to a series of elaborate escape tunnels complete with redundant air vents, trap doors, drain systems, and independent wells (Figures 74 and 75). Some souterrains are surprisingly extensive for simple storage facilities, and unsurprisingly, these subsurface features could be well hidden from attacking forces, used for fall-back and ambush locations, or used to hide wealth. An excellent review of the archaeology of souterrains is available in a compilation by Richard Warner (1979) and one by Mark Clinton (2001).

![Image of a stone-built souterrain](image.png)

Figure 75. An example of a stone-built souterrain from Co. Antrim with a central passage and five chambers, an air-vent, and several “creeps” -narrow sections perhaps meant to confound attackers (Warner 1979:114).
In addition to the souterrains and fortified homesteads characteristic of pre-Norman Irish culture, a number of larger fortified sites are known from the historic record to have been timber castles or “ring-work castles,” which are thought to have had a more military function than the fortified farmsteads (Barry 2016, Duffy 2015, Fitzpatrick 2009). These structures have been the subject of healthy debate and research, as some appear at first glance to be scaled up versions of Gaelic ring forts (native culture adapting foreign tech), while others are possibly Norman culture adapting to the climate and resources of Ireland (see Simpson et al. 2019). Although this structural feature may represent cultural entanglement, more work will need to be done on excavating and dating a number of these sites before ring-work castles can be confidently placed into their respective categories, despite being clearly important social markers. For now, it is appropriate to say that Ballintober is far from the only place in Ireland where medieval defensive architecture

Figure 76. A clay-tunneled example of a souterrain from Lisheen, Co. Cork (Warner 1975:105).
mixes foreign and domestic patterns of construction, and the entanglement approach may be able to shed light on some aspects of fortification practice.

**Migrant Defenses**

The appearance of Norman style fortifications across the landscape is considered one of the most characteristic indicators of Anglo-Norman colonization (Figure 76). Recent research has illuminated the Norman habit of converting ring forts to mottes and castles (Brady 2009; O’Keeffe 2001) to be incorporated into a centralized social system. In terms of the large and impressive medieval castles found throughout Ireland, it is generally presumed that they were all or nearly all built by Norman lords, although many of them lack convincing historical pedigrees as to which lords built them and when (Barry 2008).

![Figure 77. A photograph of Roscommon Castle, courtesy of the National Monument Service.](image)

Castles are frequently viewed as a central feature of Norman Ireland, as much for their economic functions for storing and protecting taxable goods as for their symbolic reference to
foreign power, with their military capacity being important but perhaps even secondary to their role in socio-political power dynamics (O’Keeffe 2004). The locations of castles in or near urban communities, always with a commanding view of the landscape, gave them both a military function and a symbolic role in terms of visual dominance (McManama-Kearin 2020). In many cases, the urban areas near castles were themselves fortified with walls and towers, as is shown in the drawing of the fortification of Galway (Figure 77), which was founded by Anglo-Normans in the 13th century (McKeon 2011).

Figure 78. A 16th century drawing showing the fortification of the town of Galway (McKeon 2011:154).
**Entangled Defenses at Ballintober**

Unlike the “royal” castles in Roscommon, Carrickmines, Dublin, Limerick and so on where there are written records of the English crown funding their construction, most castles in Ireland are only mentioned in passing in the surviving documentation, if at all. Physically, the royal castles are not only unusually large, but very well constructed and attractive, with regular proportions and matching towers, and highly uniform designs characterizing both defensive and decorative elements (Barry 2003, 2008, 2016; O’Keeffe 2001). Ballintober, by comparison, is large but highly irregular (Figure 78), with no two towers matching and too much space between its towers to conform to typical Norman practice, such as Roscommon Castle or other royal castle sites (Simpson et al. 2019). Ballintober Castle is too big to be considered “cheap” by any stretch of the imagination, dwarfing most Irish castles of the period, but the unevenness of its design has contributed to the idea that it was built by somewhat less well-trained or financed builders (Brady and Connel 2018; Murphy 2003). As is the case with many castles in Ireland, there is no record of its being funded or built by a Norman lord, although the first appearance of the castle in the documentary record is in an *Inquisitions Post Mortem* dating to 1333 AD, in which the estate of a Norman lord was described for tax and inheritance purposes (Brady 2014a).
The town itself, based on the geophysical analysis, does not appear to have had a defensive boundary. It is possible that the boundaries of the settlement were the same as the townland boundaries, which include the river and some canal/raised berm boundaries that may have once been more significant or perhaps even defensible. Figure 79 shows the locations of the physical townland boundaries that may have been more substantial during the medieval era. In short, it is not completely certain if the town or “bailey” located at Ballintober was fortified in any way.
Figure 80. Ballintober townland in historic map and satellite image (National Monument Service). Note that the boundaries (red) are represented with physically visible boundaries even today. These have not been tested to determine if they were fortified.
Whether or not the town itself was made defensible may become an interesting point of study in the future, as the knowledge base of rural medieval Ireland grows. Given the amount of raiding and warfare recorded during this period, it is reasonable to assume that a town like Ballintober would have needed at least some level of deterrent, even with an adjacent castle. If that is the case, the classic “motte and bailey” system of settlement pattern (discussed in the next section) may have indeed been replicated in Ireland. At present however, there are precious few examples of baileys (fortified towns) in Ireland compared to those found in England (O’Conor 1998).

A handful of references to Ballintober have survived in the historic record and are described in a recent review of the surviving documentary sources in Niall Brady’s (2014) history of the townland and castle. In particular it is recorded that a mercenary turncoat named Seonac Mac Uidilin betrayed and killed his O’Conor lord (at the behest of the Norman William Liath), and years later was later killed in Ballintober by Gaelic forces. It is unclear why he was in Ballintober at the time (Brady 2014:12). Likewise in 1347 AD. A William mac David Burke was killed in Ballintober, although it is not certain if the castle was still under Norman control at the time (ALC 1347.4 in Brady 2014:18). It is recorded that Felim O’Conor (the king of Connacht) seized Ballintober in 1362 AD., but it is not known if he took it from a rival Gaelic power or a Norman one (Annals of Connacht 1362.5-6 cited in Brady 2014:19). Although the historic record is not complete enough to construct a confident timeline for the castle’s construction and ownership throughout the period, there is a clear indication that it was in a frontier zone between groups that were engaged in frequent conflict.

The town itself may or may not have been fortified, either situation being normal in both parent cultures; undefended medieval settlements are found in England as well as on the Irish
coasts. The castle itself, however, is less typical. The sheer size of it represents a major labor investment, and the means to pay for such labor on the part of its creators. It is a tall structure with four corner towers, the quintessential shape of classic Norman castles, yet the proportions are wrong. The towers are unusually far apart with no buttress or supporting battlements along the spans, and no two of the towers have the same cross section. The remains above ground, which are substantial, appear almost undecorated compared to the stylish royal castles, including the one in nearby Roscommon (see Murphy 2003) (Figure 80). While there is not strong enough evidence to argue that the castle is an imitation built by native Irish people before or after the Normans, there is a lack of cohesion between this castle and those of clear historical pedigree paid for by the English crown. It gives the impression that it was built in stages over a longer period of time than other, better-documented Norman castles, rather than to a particular standard plan; this may account for the cobbled-together appearance of its layout.

Figure 81. Aerial photograph of Roscommon castle (visitroscommon.ie). Note the additional battlements along the longer walls, and symmetrical styling of nearly identical towers.
The defenses at Ballintober do not match the royal Norman castles found elsewhere, despite it being clearly unlike any well identified native Irish fortifications. Whether its builders intended this as a way of marking a distinct identity, or if those physical differences were merely due to the limitations of local masons, remains somewhat speculative. In either situation, the physical form of the castle is a clear example of how entangled Norman populations had become during the height of their power in Ireland.

4.3 Settlement Pattern

Perhaps the most visible and often dramatic difference between cultures in late medieval Ireland is the way they utilized the landscape and laid out their structures. The construction of houses is itself a grounded, lower range theory topic, in the sense that “this is what they lived in, these are what they built,” but the differences in that way of life are so vast that any discussion requires some knowledge of land use strategies, including differences in how society was structured and run, and how power dynamics were perceived. The differences between an early medieval Irish farm, often identical to those from the post-Norman era, versus those found within the Pale constructed by Anglo-Normans are striking. Below is a very brief discussion of settlement patterns in both parent cultures compared to those revealed in the macro-geophysical analysis presented here.
Native Irish Spatial Organization

Any discussion of land use in early medieval Ireland necessarily focuses on the ubiquitous ringforts, with the wood, stone, and earthwork variations found throughout the country in tens of thousands of examples. These structures were covered earlier in the defenses and fortifications section, and for good reason: they were obviously designed to protect the people and livestock contained within them from raiding and pillaging. Beyond their defensive capacity however, an enormous percentage of the island's population lived inside such sites, which were situated for agricultural exploitation of pastureland as their primary use, and thus they are distributed across the landscape to take advantage of good grazing land. There is some debate over whether these were purely agricultural/pastoral installations, or if they represented a low class of nobility that controlled the small unenclosed settlements located around them, mirroring a feudal social structure (Fitzpatrick 2009).

Aside from ringforts, the population of Ireland was certainly familiar with the towns built by Scandinavian migrants along the coasts beginning in the ninth century. However, aside from monastic settlements relatively few towns can be identified as having been founded by the native Irish population. It is also worth noting that although some ring forts are larger and perhaps more important than others, there are only a handful of clearly “elite” habitations that were strikingly larger or more elaborate than common ring forts. The housing of medieval native Irish society rarely projects a strong signal of social power (Patterson 1994), which is strikingly different than the palaces and castles that characterize Norman communities in other areas of Europe (Mcneill 1997; O’Keeffe 2019). This does not mean that native Irish society was egalitarian, however; the use of personal ornament, such as torcs and other gold adornments, and weapons as markers of rank and status appears to have continued into this period and the Senchas Mor and other legal
documents clearly describe a society organized according to a complex system of kinship and lineage as well as wealth, especially in cattle (see Patterson 1994; Gibson 1995). Whether the hierarchical aspect of this system existed before the arrival of the Normans or was influenced by that contact, and if so, to what extent, remain open questions.

**Migrant Community Spatial Organization**

The core element of English style governance in Ireland is visible in settlement patterns; centralized organization, once called “feudalism” is characterized by nucleated centers with tributary communities organized around them spatially (Carpenter 2000; Gillingham 2007; Graham 1985b). The concept is visible within settlements, which often have castles or monasteries around which the settlements are organized, and on the distribution of settlements in the landscape, in which come centers command more power over smaller counterparts around them than others. The core concept is that a centralized authority inhabits a (usually fortified) central position, and agricultural produce and other products flow to that authority, who is then responsible to the next layer of hierarchy, from towns to regional (county) capitals, and ultimately to the king. In theory the king was in a direct line of authority that ended with the Pope, and through the Pope to God, at least in the Norman variation of political theory (Carpenter 2000; Mcneill 1997).

Nucleated settlements were common in England after AD 1066, with the classic “motte and bailey” (raised fort and town) still visible in deserted medieval settlements throughout the country today, surrounded by unenclosed settlements that served a supporting role for fortified settlements and castles (see Beresford et al. 1994). In Ireland, a handful of clearly nucleated settlements have been found, although few have been thoroughly excavated at the time of this
writing (Figure 81). These are thought to be exclusively communities of Anglo-Norman migrants, and what is recorded about them in historic documentation supports that idea (Barry 1996, 2016). It is worth noting that many ringforts do have raised earthen platforms that mirror the physical form of an English motte, but almost none have yet been associated with a bailey, although it is presumed that they likely existed (O’Conor 1998).

Figure 82. Motte locations in Ireland (Simpson and Duffy 2019). Note the position of Ballintober relative to the main concentrations of Norman-style habitations.
Another aspect of the medieval Irish settlement pattern is that housing in Anglo-Norman settlements made obvious visible distinctions between nobles and commoners. Castles were, apart from their military capacity, imposing homes for elites and symbols of their power across the landscape (Hermans 2010; Liddiard 2005). The royal castles of Dublin, Roscommon, Athlone, and even the boundary castellations at Carrickmines (Barry 2008), all served to display the power of landed aristocracy over the areas around them, which gives insight into the social hierarchy reflected in Anglo-Norman settlements; there was a vast difference between elites and commoners.

Entangled Community Spatial Organization

The geophysical macro-analysis at Ballintober reveals the layout and settlement pattern employed by an entangled Hiberno-Norman community (Figure 82). Ballintober is a case study that can be used to represent broader cultural trends that would have been in use throughout the rural entangled populations of Ireland, which is to say most of the population of the island.
Clearly visible is a main central road, with house plots radiating off it to both sides, in what is often referred to as a “herringbone pattern.” Based on the patterns discussed in the results section, it is most likely that there are two distinctive occupational phases visible along the main road. It is not known if the transition was gradual or if there was a second major construction period after the initial settlement was established. Plot boundaries that are seen deeper beneath the ground surface consist of larger, less subdivided plots, and are located closer to the main road. The law of superposition suggests that the deeper plot boundaries are older, and in a few places it can be seen that roads were built on top of them as the settlement plan changed (Road B in results section).
The Phase II maps based on the macro-analysis show that a number of additional roads were added to accommodate greater traffic flow and allow house plots to be subdivided into plots suitable for a house but without the associated small farmland seen in Phase I. The discussion of agricultural practiced in Section 4.4 noted that smaller land plots do not necessarily indicate a shift away from agriculture as the main source of subsistence activity, as open field “runrig” cereal and pastoral plots were most likely located outside of the community. It is possible that the shift identified in the geophysical data from Phase I to Phase II at the site reflects a change in property ownership from individual plots held by families to larger outlying field systems that may have been controlled and owned by whoever was living in Ballintober Castle. This could imply the introduction of a more centralized system of land management in tandem with the appearance of the Normans in Co. Roscommon but this remains a hypothesis to be tested.

The Phase II map of the settlement shows that more habitation existed outside of the surveyed area, so it is unclear if the whole settlement could be better described as “proto-urban” or even “urban.” It is possible that the main road of the modern settlement followed the course of a medieval precursor, as the orientation and much of the medieval settlement lies beneath modern structures. It is worth noting that Roads A and D line up neatly with modern byways, so the medieval street layout is most likely the same or similar to what can be seen today. An image of the roads indicated in geophysical analysis is shown below (Figure 83).
What the Ballintober geophysical macro-analysis indicates is that the settlement itself was designed using a pattern common in post-Norman England and most of Europe at the time that Irish people who traveled abroad would have observed. The herringbone layout optimizes the use of a large, central road system by putting houses side by side, each with its own large backyard, presumably used for supplemental food production. That sort of layout became popular in continental Europe centuries sooner (Arnold 2004; Garstki et al. 2015), however it marks a deviation from the cattle-based layouts of rural Irish settlements before and after the Norman conquest (Fitzpatrick 2009; Lyttleton 2008; Monk 2008; Patterson 1994). This change from the native pattern may or may not have involved symbolic as well as functional transitions. In short, to build a farming town that grows wheat, there are only so many ways to shape the town. The
layout seen in Ballintober matches ubiquitous cereal agriculture settlements throughout Europe at
the time (Bates et al. 2017).

The Phase II buildout of the town follows a similar pattern; its curvy, organic layout does
not present striking evidence of centralized planning so much as economic growth and the need to
subdivide large plots into numerous smaller ones to accommodate population increases. The Phase
II layout, which would be hard to characterize as anything less than a “town,” indicates that the
economic aims of the Phase I era were highly successful and resulted in significant growth.

That the Norman economy in Ballintober was apparently booming should come as no
surprise; the “long 13th century” is commonly recognized as having been characterized by intense
building and population growth (Brady 2019; Graham 1985a; Simms 1989). The settlement pattern
at Ballintober reflects the fact that its inhabitants engaged in that growth economy, and themselves
experienced great success for at least a few generations. Likewise, the nobles at Ballintober at
some point moved into a new castle, an unmistakable sign of increasing social status for both the
nobles and the settlement. From a purely pragmatic perspective, the strategies in use during
Ballintober Medieval Phase I apparently benefited at least some members of the community during
this time.

4.4 Agriculture

In terms of directly visible cultural behaviors, the importance of food technology is hard to
overstate. The production, storage, distribution, and consumption of food is and always has been
one of the main concerns of all human societies. Unsurprisingly, small variations in those
behaviors often serve as excellent cultural markers for identifying populations and their
chronology across the landscape (Lyons 2015; Pluciennik 2022; Terrell et al. 2003).
Apart from the visibility of social groups in the details of how agriculture is performed, there is a certain pragmatic necessity in food production; it is critical, central even, to every pre-industrial society. The techniques of how one produces food, at its heart a lower range theory topic, underwrites almost every other major aspect of society. Ireland is no exception to this rule, and in that context the different cultures interacting on the island demonstrated distinct agricultural practices.

Native Irish Agriculture

The native Irish populations, from at least the sixth century on until the early modern era, are generally described as “pastoralist” (see Brady 2011). Much has been made of the consequences of that behavior pattern compared to the cereal agriculture strategy that had dominated most of Europe since Neolithic times. In Ireland pigs and sheep were raised, but cattle are thought to have perhaps represented as much as 71% of all livestock (McCormick 1983). The ability of livestock owners to move their wealth to avoid military threats or exploit political opportunities is a major difference between pastoralists and highly sedentary cereal agriculturalists. The ability to move cattle inside the walls of a ringfort, or out of harm’s way to avoid raids, was a key component of Irish medieval culture (Stout 1991).

While in many parts of Europe at the time peasants were valued as a unit intimately connected to their land, in Irish culture livestock and in particular cows were frequently cited in legal texts and poetry as the main means of measuring a person’s standing and value in society (Patterson 1994). The dominance of pastoralism in Ireland, before and after the Norman-era migrations, has much to do with both the stability of the patron-client relationships that characterized the clan system and the effectiveness of that agriculture in the wet climate (Brady
1993, 2019). The Norman era in Ireland coincided with an unusually dry, warm weather period, and cereal agriculture disappeared from the island precisely when the good weather ended (Ludlow et al. 2013).

In terms of archaeological evidence, the habit of constructing ringforts is a good indicator of pastoralist activity. Aside from the obvious benefit of having a place where one could keep livestock at night and in the winter, the defensive ditches around ringforts may have been an agricultural feature themselves. The native Irish populations were known for constructing extensive and sophisticated fish traps in rivers and lakes, as well as practicing water agriculture by the early modern era, and it is likely that certain wet crops, birds or fish could have been kept in the ringfort ditches (O’Sullivan 1998, 1994, 1995a, 1995b, 1997).

Despite the dominance of cattle and livestock culture as a whole, plant agriculture was also critical to society to provide a sufficiently diverse and attractive diet. Cultivation often occurred on small patches of arable land not adjacent to structures, which were typically unenclosed. This practice is referred to as “rundale” in Ireland, “runrig” in Scotland, and “open fields” in England (Evans 1939; Patterson 1994). The plots were often split among several nearby households, who would each own a section and farm it permanently and intensely. Likewise open pasture and waste land in the area was proportionally owned by each family. The rundale system was often further optimized by rotating access among several owners, allowing arable land to lie fallow for crop rotation. This behavior is called “changedale” and is well documented in late medieval Ireland (McCourt 1971; Nicholls 1972, 1987).
Migrant Agriculture

One of the key aspects of Anglo-Norman governance is its reliance on growing grain in peripheral areas and storing it in fortified central locations (Carpenter 2000). The necessity of moving grain to distribute it through taxation and trade and protect it from theft and warfare in the process, resulted in the highly visible behaviors described in the defense and settlement pattern subsections of this chapter. Looking at agricultural production itself, the act of intensively farming small plots of land for cereals and other plant-based food products is very different from livestock dominant approaches. Whereas pastoralism is characterized by almost continuous, rural population levels spread across the landscape, cereal agriculture is one of the prerequisites of urbanization and city-dwelling (Brady 2019; Lewis 2001; Mitchell-Fox 2001; Dyer 2001; Simms 1983). In early medieval Ireland the coastal Scandinavian migrants were able to support a few town-sized settlements through fishing as well as plant agriculture, but the advent of migration from England and Wales in the late medieval period marks the beginning of real urbanization in Ireland (Duffy 1997), and the agriculture the migrants brought with them is synonymous with this process.

Excavations at Carrickmines have provided insight into the food production and consumption practices characteristic of migrant communities in medieval Ireland. It was found that both plant macrofossil analysis (Lyons 2012, 2015) and agricultural stone artifacts (Carey 2013) support the notion that the population within the Pale emulated English and Welsh agricultural practices. The medieval diet was primarily grain based, but small amounts of livestock and a surprisingly diverse edible plant menu sustained the urban fortified communities. Small supplementary gardens were typical throughout the residential areas, but most agricultural produce came from plots outside the settlement itself.
Entangled Food Production Practices in Ballintober

As with other patterns of behavior, the population in medieval Ballintober exhibited agricultural traits of both parent cultures. Although the amount of excavated material is still too limited to provide a representative comparison of livestock versus cereal agriculture, the layout of small dense house plots found along the main road in the geophysical analysis indicates a very different system of food production than the open grazing found around ring forts. The level of urbanization, best termed “proto-urban” or town sized, indicates a concentration of humans who would not have been able to herd animals for a living, as the house plots are too small for such activity. While grazing outside the town was certainly employed, the people in many of these house plots would have had nowhere to keep the livestock during winter, although in a number of the larger rectangular plots compacted features that lack hearths were identified, which indicate animal pens may not have been a rarity inside the settlement. The size and configuration of the plots of land are such that it is reasonable to assume that the inhabitants who were engaged in agricultural production beyond their own supplemental needs did so on land outside of town and came back to their homes in the evenings. As mentioned previously, the idea of open field or “rundale” agriculture was common to both parent cultures and is not itself an indicator of entanglement.

While rundale/runrig/open fields were known to both parent cultures, what can be said is that in native Irish culture this subsistence pattern accounted for only a small percentage of agricultural produce, and before the Norman era no known settlements are thought to have practiced plant dominant agriculture. The only towns on the island before the Normans arrived on the scene were Scandinavian settlements, which practiced mixed agriculture supplemented largely by fish (Boyd 2009; O’Sullivan and Downey 2019). Again, the subsistence pattern at Ballintober
is distinctly different from the highly mobile cattle economy that dominated the region before and after the Norman era; agriculture and life in medieval Ballintober were intensely sedentary.

The agricultural activity at Ballintober is not what one would expect from a native Irish community. It involved a mixed cereal agriculture system using techniques familiar to natives, but at a scale that required most of the population to be fully sedentary. It is also worth noting that people in Ballintober produced foods that were in demand for taxes and distribution to the Pale. A review of the agricultural evidence from Ballintober supports the notion that the population most likely consisted of native Irish people joining, perhaps voluntarily, the Norman economy. It is evident in the expansion from Medieval Phase I to Medieval Phase II (less than three generations apart) that they enjoyed great success because of doing so. On the other hand, whether the local population or the castle-dwellers benefited equally from these changes is unclear.

4.5 Migration Patterns and Genetics

One other source of evidence must be discussed in this context, since it is increasingly being used to support theories of mobility and culture contact. The DNA Atlas Project (Gilbert et al. 2017) found that genetic flow between Ireland, Wales, Scotland, and France remained essentially unchanged from the Neolithic to the Early Modern period. The evidence suggests constant albeit low level intermixing, rather than several discrete large-scale migration events, between these groups throughout the medieval period. There were several historically documented “admixture” episodes, periods in time when new genetic material was brought in from foreign sources. It was expected that the Vikings, Normans, and later Tudor invasions would all be clearly visible in the genetic record.
The DNA Atlas Project performed a fine structure haplotype analysis that was designed to improve upon previous experiments. Admixture data were put through a computerized statistics program named “globetrotter,” which compared Irish genetic groups to surveys conducted in Scandinavia and England. To further investigate the spatial patterns of genetic structure within Ireland and Britain, the project employed the software package Estimated Effective Migration Surfaces (EEMS), which was designed to visualize relative gene flow across a habitat. This method allowed the creation of confidence intervals of 95% to be placed around a time and location of Viking admixture, a goal that had eluded previous attempts to compare the genetic make-up of these populations over time (Mattiangeli et al. 2008; McEvoy and Bradley 2006).

The analysis found an enormous amount of Irish genetic material derives from Norwegian sources, as high as 20% of the material tested. Those groups came specifically from western Norway. Similar studies have found non-negligible Irish components in Norway, which could reflect historical records describing a slave trade. The number of generations that material has been in Ireland matches the predicted dates for the Viking invasions, and the affinity of the material to western Norway in particular supports claims previously made by ceramicists (Mccutcheon and Meenan 2011; McSparron 2011) regarding contact between these cultures. The genetic record supports the popular view of archaeologists and historians regarding the Viking invasion in terms of the connections with particular parts of Norway and the forced relocation of some Irish people. Another admixture event was detected in evidence for populations from western England and Cornwall that migrated to Ireland in the 17th and 18th centuries. That finding matches very well with the predicted Tudor admixture event, which the DNA Atlas was able to map in detail.

The key finding, relative to this study, is that the DNA Atlas found no evidence of the
predicted Norman admixture event. The project was able to outline in detail the back-and-forth
gene flow Ireland maintained with surrounding areas throughout the period: for Scotland, France,
and even Belgium there is no change in the pattern of genetic material moving at low level rates
between those places. However, the project was unable to detect any significant amount of genetic
material being introduced from England and Wales during the entire medieval period. The fact
that English genetic evidence was used as the main basis for comparative data in the project
highlights the fact that if there had been a significant introduction of Anglo-Norman people to the
island, their haplogroups would have been particularly well defined; the project was not able to
identify any such medieval Anglo-Norman admixture event.

The idea of a mass Welsh invasion by proxy is also counter indicated; no evidence was
found of a sharp increase in admixture from the other Celtic areas either. In simple terms, a
comprehensive genetic research project that was able to describe in detail the order and locations
of older Scandinavian migrations found absolutely no evidence to support the idea of
English/Anglo-Norman or Welsh large-scale migration. The predicted admixture event tested
negative completely.

Despite the results of the DNA Atlas project, it is possible that the Norman migrant
communities identified by archaeologists existed, particularly if the individuals were from Wales
and few. The sample size of the DNA Atlas project would make it hard to detect small changes
from one generation to the next as the result of migration between Celtic genetic groups, and earlier
Welsh intermixing would be even harder to define. It is also the case that the Norman migrants
are said to have left Ireland and returned to England and Wales during the economic collapse in
the 14th century (Barry 2003; Otway-Ruthven 1967, 1968). While it is profoundly unlikely that
hundreds of thousands of migrant Normans could have lived in Ireland without leaving a
significant genetic trace of their presence, the few inland sites that have been positively identified as Norman settlements (mainly on the basis of ceramics) are isolated and few in number. Outside of the Pale there are only a handful of locations along the coast that have been marked as definitively associated with Norman migrants (Graham 1985b). It is possible that these communities did not interbreed with natives due to a situation like the one outlined in the Statutes of Kilkenny enacted in 1366, which legislated the separation of local and immigrant communities (Gale 2004). The nucleation of Anglo-Norman sites is itself known to have created a significant barrier to gene flow in England (Schiffels et al. 2016). It is reasonable to think that the handful of isolated migrant Norman communities found in Ireland may have arrived, lived a few generations, and then left without leaving a significant genetic imprint. The migrating and then returning behavior described in the historical record fits the observed genetic findings, and likewise matches the coming and going of the warm weather period that made extensive cereal agriculture on the island possible for a limited time.

While the missing Norman admixture event puts to bed any notions of waves of English soldiers and migrants crossing the sea and fighting their way westward, as was once believed (O’Doherty 1938), it is important not to become overly skeptical of the historical record’s claims regarding particular events. In fact, some of the historical record is supported by the genetic evidence: Earl de Clare came over from Wales with a few thousand people in 1170 AD, King Henry II and a small army came in for a few months and then left in 1171-1172 AD, etc. Rarely do the written sources directly claim that large hosts of people came from across the sea and settled Ireland during the Norman era; the mass migration of Normans was largely an inference made by historians and archaeologists who could not otherwise explain how the material culture,
architecture, and surnames of the Normans came to be dominant throughout Ireland. That is precisely the question this project was designed to target.
Chapter V: Conclusion

The application of the entanglement approach to Norman Ireland, emphasizing Ballintober as a case study, has revealed several important dynamics with regard to the cultural forces at play in late medieval Ireland. The inhabitants of Ballintober participated in a culture practice, or “habitus,” that attached them intimately to the forces of foreign influence on the island. Their homes and settlements, their occupations and activities, their diet, the imposing castle on the hill, and a social restructuring based on Christian religious hierarchy would have all created a familiarity between the native inhabitants and Anglo-Norman colonists that were initially established on the coasts. These might have made them feel a degree of attachment, even respect and affinity, for the forces of the English King.

In contrast, however, foreign culture markers that were not immediately connected to economic prosperity and other trends seen throughout the Christian world appear to have been uniformly rejected by the native population of the island. The nearly exclusive use of traditional Irish table-wares, Gaelic language, Gaelic law, and perhaps more compelling than any other evidence the limited interbreeding with colonists reflected in the genetic record, all indicate that Anglo-Norman cultural influence outside of the Pale may have been much less extensive and intensive than has traditionally been assumed. Detailed below is a chart of the behaviors evident in the material record, as they correspond to each of the groups in question (Table 3).
### Table 3. Behavior Pattern Comparison

<table>
<thead>
<tr>
<th>OBSERVED BEHAVIORS</th>
<th>Native</th>
<th>Norman Migrant</th>
<th>Entangled</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type Site:</strong></td>
<td>Tulsk</td>
<td>Carrickmines</td>
<td>Ballintober</td>
</tr>
<tr>
<td><strong>Ceramics:</strong></td>
<td>Souterrain Only</td>
<td>Heavily Imported</td>
<td>Less Imported</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Local Imitation</td>
<td>Little to No Imitation</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Ulster ware</td>
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<tr>
<td><strong>Defensive Strategy:</strong></td>
<td>Moated Sites</td>
<td>Encastellation</td>
<td>Encastellation</td>
</tr>
<tr>
<td></td>
<td>Ringforts</td>
<td>Walled Settlements</td>
<td>Walled Settlements</td>
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<td>Open Settlements?</td>
<td>Open Settlements</td>
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<td>Ringforts</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Moated Sites?</td>
</tr>
<tr>
<td><strong>Spatial Organization:</strong></td>
<td>Rural Ring Forts</td>
<td>Urban House Plots</td>
<td>Urban and Rural House Plots</td>
</tr>
<tr>
<td></td>
<td>Wood Structures</td>
<td>Stone and Wood Structure</td>
<td>Stone and Wood Structure</td>
</tr>
<tr>
<td></td>
<td>Minor Elite Housing</td>
<td>Impressive Elite Housing</td>
<td>Impressive Elite Housing</td>
</tr>
<tr>
<td><strong>Social Boundaries:</strong></td>
<td>Communal</td>
<td>Household Plots</td>
<td>Household Plots</td>
</tr>
<tr>
<td></td>
<td>Low Hierarchy</td>
<td>Strong Hierarchy</td>
<td>Strong Hierarchy</td>
</tr>
<tr>
<td><strong>Agriculture:</strong></td>
<td>Livestock Dominant</td>
<td>Cereal Dominant</td>
<td>Mixed</td>
</tr>
<tr>
<td></td>
<td>Plow Pebbles</td>
<td>Iron Plow Blades</td>
<td></td>
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<tr>
<td><strong>Gene Flow:</strong></td>
<td>High Velocity</td>
<td>Low Velocity</td>
<td>High Velocity</td>
</tr>
<tr>
<td></td>
<td>No Barriers</td>
<td>Strong Barriers</td>
<td>Little to No Barriers</td>
</tr>
</tbody>
</table>
5.1 Geophysical Macro Analysis as a Tool for Archaeology

Geophysical technology can record information about the physical properties of archaeological sites and provides two avenues for approaching archaeological interpretations related to entanglement. The layout and position of settlements on the landscape, combined with an understanding of their relationship to surrounding sites, can be a productive source of information for making inferences about social structure and the transfer of technology and people across the landscape over time, which is a well-established practice in archaeology (Clark 1977; Hodder 1977, 2011).

In addition to the use of maps as a dataset for analysis, the value of geophysics in archaeology is to expedite the location of productive areas that might reveal other types of artifacts. Using gradiometry and GPR this project was able to accurately identify signatures generated by buried structures, hearths, plot boundaries, and roads. Numerous trash pits and other features were detected but remain untested so far. In other contexts, geophysical surveys have been effective in identifying other kinds of settlement features (see Conyers 2019; Bigman and Balco 2021) as well as human graves (Moffat 2020). These archaeological contexts, particularly trash pits, garbage pits, and graves, are rich with the sort of materials that archaeologists rely on for dating and interpreting past lifeways. Ceramics, grave goods, seeds, burnt organic material for radiocarbon dating, and so on can all be located and sampled by selecting appropriate features based on a subsurface map, and “surgically” excavating the desired features, as opposed to large scale and ponderously inefficient random testing. Mirroring its counterpart in medical scanning, geophysics allows archaeologists to examine a situation before minimally invasive testing is performed. Such testing requires much less physical excavation than expansive trenches or grids of shovel units,
and is therefore more cost effective and faster, while inherently more thorough, as the boundaries of a settlement are generally an easy target for geophysical exploration, yet only visible in large-scale excavation otherwise.

Similarly, remote sensing approaches such as aerial photography, satellite sensing, and LIDAR have been applied with great effect in many archaeological investigations (see Sever and Irwin 2003; Tsioukas 2018). The remote sensing component of this project was minimally successful, due to the overabundance of archaeological features visible to (free) satellite imagery, as opposed to a lack of features. A more focused investigation that tied remote sensing to historic maps and even modest sample excavations would likely be able to uncover additional insights for the areas around Ballintober, and elsewhere in Ireland.

5.2 Describing the “Conquest”

In reviewing the above patterns of behavior, much can be said about the way in which cultural transformation occurred during the Norman occupation. Several possible strategies that could have been employed by the indigenous population that could explain the archaeological findings documented so far. Irish archaeologists have for generations had issues with the interpretation that Anglo-Norman armies directly conquered the island, but curiously, have been hesitant to propose a strong alternative theory. I was unable to find a single source that directly claimed “the Normans did not really invade medieval Ireland” or any of the sort of heavy skepticism one would expect five years after the well circulated “Irish DNA Atlas” failed to detect any significant Anglo-Saxon or Norman genetics in the medieval era. In answer to the hesitancy of Irish archaeologists to depart from such a cornerstone of Irish culture history, this study provides the following hypotheses for additional testing. Several models of behavior, arranged from least
supported by observed findings, to strongest, are discussed in this section, and I believe that the
Native Opportunism model is the best fit with the evidence available so far.

**Migration as a Conquest Model**

One theory of conquest that was much more popular a century ago was the idea of mass
migrations. Certainly, mass migrations of populations around Europe were a feature of the
medieval era; genetic analyses carried out in England have provided excellent evidence of genetic
admixtures and mobility (Schiffels et al. 2016), and likewise in Ireland itself both Vikings and
later English Tudor populations moved into historically clearly defined areas and displaced the
local inhabitants (Gilbert et al. 2017). It is easy to understand why the Normans were viewed as
another such group, either radiating from England directly or simply being pushed out of Wales
into Ireland.

The problem with the migration model is that it fails to explain the absence of evidence for
English laws, languages, ceramics, and especially genetic material observed at sites such as
Ballintober. When a new population pushes out a native one, they bring their traditions with them.
It is extraordinarily unlikely that such a transformation would occur slowly across the island over
several centuries, resulting in the uniform adoption of non-native languages, laws, and ceramics.
The lack of evidence for a genetic admixture event makes the idea of large volumes of foreigners
landing on the shore and radiating out through the island even less compelling; it’s hard to imagine
hundreds of thousands of migrants landing and not interbreeding with the Irish, who are well
recorded to have interbred with any other group they came in contact with, a measurement politely
described as “gene velocity” (Gilbert et al. 2017:8). There is no trace of such a Norman admixture
event in the genetic make-up of the modern population tested so far. As such there is only very
weak support for the idea of Irish Normans as mainly made up of foreign or migrant populations from England and Wales.

**Military Conquest as a Model**

The classic image of Norman knights landing on the coast as an invasion force, and then hacking and slashing their way across Ireland is an enduring and popular image of the medieval world, but likely inaccurate. It has been observed for many generations that the simple idea of massive armies invading across the sea does not hold up to a skeptical review of the historical record, which only accounts for military movements in the low thousands, and irregularly at that (Duffy 1997; O’Keeffe 2008). Given the level of detail with which clerical records annotate skirmishes and small-scale battles, it seems unlikely that massive troop movements from England would not have been noted in some part of the preserved historical record. The superiority of Norman weapons and armor is sometimes cited as the reason for their success and eventual conquest of the island (O’Doherty 1938:155), but such an unstoppable technological advantage usually makes conquest a matter of a single generation, not a gradual process over centuries.

The military conquest model does not require waves of English or Welsh migrants, and the lack of adherence to English traditional clothing, language, law, and ceramic tradition could all be explained as native resistance, at least initially. The genetic record, however, would be hard to explain using this model. Much like the issue with mass migration theory, one would expect that Norman armies, responsible for all the Norman names left on the island, would have brought English or at least Welsh genetics with them. It is hard to imagine that a community like Ballintober could have existed, a full three generations after the beginning of the Norman “invasion,” without leaving a very strong genetic signature in the modern population. Likewise
with ceramics, clothing, language and law; conquering colonial forces typically emphasize their differences from the natives and are unlikely to adopt their customs so thoroughly. In summary, there is little to no evidence in the material record to suggest that medieval Ireland was at any point overrun by vast armies of Anglo-Norman warriors.

**Political Dominance Model**

If the English King did not command his armies to invade Ireland directly, what about indirectly? Many Norman lords had Welsh names after all, and their fealty to the English King is explicitly stated in the written record in many places (Simms 1989:85). The idea that England effectively conquered Ireland by proxy is far more feasible than a direct military campaign. One need only to make the reasonable assumption that English nobility could indeed direct Welsh lords and motivate them to action. The habit of Norman lords occasionally turning against the English King, and in at least one situation the King allying with Gaels in a fight against Normans (Otway-Ruthven 1967:361), could be a reasonable scenario for a monarchy interested in keeping rebellious subjects in line, and willing to ally with a foreign force to do so.

The problem with the political conquest model is that it fails to address the lack of participation in Anglo-Norman culture markers that are not directly related to war and money in rural Norman settlements. If the English King was indeed the ultimate political authority, issuing desirable titles and decrees that allowed Norman lords to attack and conquer the lands of the Gaelic nobles, such commands and titles would be highly sought-after assets, and pleasing the English nobility would be an obvious boon and source of political capital. Given the stated English desire to have their Hiberno-Norman counterparts speak and write in English, and use English law, and otherwise engage in English traditions, as seen in many complaints by Anglo-Norman lords and
particularly as reflected in the Statutes of Kilkenny (Gale 2004), it would be hard to explain why Normans keen on English approval would have avoided all such behaviors. Building kilns in which to make imitation Norman table wares and getting at least the royal court to wear English style clothes, for example, would have been relatively easy ways to endear oneself to the English King, and would likely result in favorable treatment in political matters.

The physical record, however, fails to generate indications of that sort of political dominance. Aside from the behaviors outlined in the Statutes of Kilkenny, the continued aversion to English ceramics outside the Pale demonstrates that “Englishness” was not a virtue Irish Norman lords were trying to signal. In short, if being more “Anglo” than one's political rivals was a source of power, it would be reasonable to expect a much higher degree of imitation of social behaviors, not just economic ones.

**Native Opportunism Model**

Another possibility is that entanglement in Ireland was not driven primarily by the foreign culture, but by the inhabitants of the island themselves. Similar situations have been archaeologically attested in the Iron Age Mediterranean (Balco 2008; Antonaccio 2010; McConnel 2012), where agents in native cultures chose to join the Greek world, due to the economic and political benefits that went along with doing so. In parallel with the finds in Ballintober, the Elymi of Sicily for example, adopted Greek architecture and agriculture, but otherwise appear to have remained native and even politically autonomous, except for some political gestures such as the perpetually unfinished temple building project at Segesta (see Balco 2012; McConnel 2012).

The political system in Ireland is well documented as being characterized by constantly shifting, tenuous alliances and hierarchies (Patterson 1994) and there is no reason to assume that
the medieval Irish population was averse to aligning itself and intermingling with Norman neighbors and colonists on the coast. To the contrary, the historic record is filled with examples of Irish nobles allying with and against each other, with and against Normans, and, when he was on the island, with and against the English King (Glasscock 1987; Nicholls 1987).

If one accepts the idea that the primary driver of Normanization was the exploitation of newly introduced agricultural and economic technologies, and the defensive techniques necessary to protect those assets from raiding, then it is easy to imagine native Irish people constructing farms that mirror the ones they had observed coastal colonists using while cultivating similar grain crops to enjoy similar prosperity. The stunning population growth and widespread castle construction seen in Norman Ireland is doubtlessly a testament to how successful cereal agriculture was at the time.

Native culture groups, by comparison, do not seem to have had as sharp of an economic ascension. It is likely that many Irish medieval people observed that cereal agriculture was astoundingly profitable and said, “I should do that too!” The habit of using plow pebbles, as opposed to metal plows, for example, indicates that sites such as Tulsk saw cereal agriculture conducted in ways familiar to Celtic populations, but on a scale, they had observed among foreign migrants.

As discussed in the defenses and fortifications section, the sedentary nature of cereal agriculture necessitates large static defenses, since mobility is no longer a defensive option. A culture that was already familiar with stone defensive structures that suddenly had to accommodate larger population density and economic power could certainly have scaled up their defenses. Castles like Ballintober, built to at least functionally mimic the royal Norman castles seen in
migrant communities, would seem one obvious and practical choice, while ringwork castles may have been another.

The lack of strong ceramic traditions, but tolerance of at least small amounts of imported and imitation wares, is unlike what is seen at contemporaneous native and migrant sites. The entangled Ballintober population appears to have adopted behaviors that enabled great economic prosperity, but if those changes were driven by native motivation, there is no reason to assume that they would have abandoned other traditions, especially in the areas of daily life not directly related to economic or subsistence activities. The tolerance for imported ceramics, however, shows that people in medieval Ballintober may have shared at least some material identity markers with their coastal migrant counterparts, at least enough to accept those behaviors in the settlement, if for no better reason than to signal a shared habitus with other Norman populations.

Finally, there is the issue of genetic evidence, where a missing English admixture event is consistent with the absence of strong foreign ethnic markers in the archaeological record. The process of Normanization for Irish lords and ordinary people may have been almost purely in the form of adopting foreign economic and military technologies, but the attachment to an English economy would still have been a profitable market and communicating (at least superficially) an adherence to the English crown and even paying taxes may have seemed worth access to foreign markets and trade. It is not unreasonable to think that much of the political posturing and oath-swearing of symbolic allegiances were largely ways of incorporating the newly Normanized Irish populations into an existing economic system, and the increase in Norman surnames could well reflect the adoption of a new socio-economic sphere, as opposed to an ethnic marker. Much the same thing appears to have occurred in Britain after the Romans had established a flourishing system of colonia there (see Ghisleni 2017).
5.3 Character of the Cultural Transformations

The different models above are supported by observed archaeological findings to different degrees. It is unlikely that a single model can completely describe the full breadth of the cultural transformations that occurred in nearly three centuries of Irish history; however, understanding those paradigms dramatically alters the way in which these events are understood. The cultural transformation that accompanied the Norman presence in Ireland appears to have benefited native populations, and likely not just the nobles, tremendously. The old Latin expression *cui bono* (or “follow the money”) suggests that the people who stood to gain the most from an event are likely the ones who caused it to occur. Likewise, in forensic science the phrase “means, motive, and pattern of behavior” is often used to identify the individuals involved in a particular felonious action. The native Irish populations had observed the prosperity that accompanied cereal agriculture in coastal migrant communities, and already knew how to grow wheat and build stone buildings.

There is considerable evidence that places like Ballintober were designed to operationalize the economically advantageous aspects of Norman culture, while the other aspects of Gaelic culture remained traditional. Perhaps it is best to consider the “Hiberno-Normans” described in historic texts as quite literally Irish people, doing a carefully chosen number of Norman things; there may be no reason to assign foreignness to the title.

The Influx of Foreign Surnames (without Foreign Genetics)

Irish political strategy before Normans already included a “kinship lattice” and the habit of creating fictive origin stories to justify changes in secular authorities (Gibson 1995; Patterson 1994). These stories, known to be literally untrue, were nonetheless a system for explaining who
had authority over what areas and which resources, including people. It is possible a similar situation developed during the reign of the Angevin King Henry II: a relationship emerged wherein Irish lords would swear fealty and symbolically join the Norman world, often taking a Norman name to mark their entrance into this new socio-economic system.

A good example is the knighting of a Gaelic warlord after he was defeated by the Normans (O’Byrne 2002: 14); native individuals could be transformed into members of the Norman world and would likely have identified as such. The scarcity of direct evidence for migrant groups, particularly in the form of population genetics, suggests that many Norman names in Ireland today did not originate from migrant populations. These names could have been chosen when Gaelic people joined a Norman political entity (Morley et al. 1994:8). There is evidence that taking a Norman name may have been a feature of civil rank; only the betaghs (extreme poor) in 14th century Irish manorial records had Gaelic names (Hickson 1891).

Reconciling Theory with the Historic Record

The key to understanding the Irish motives in the Normanization process may lie in more than simple economics, although those behaviors are intimately visible in the material record. As much as economic prosperity is itself a powerful motivator, the native Irish already had strategies for attaining wealth and privilege within their society. Switching from indigenous patron/client strategies of social and economic growth to a system based on taxable revenue may indicate a less superficial force. One often overlooked aspect of the Normanization of Ireland is the social dominance the movement had in the religious sphere. The Gaelic Irish started to become Christian beginning in the 7th century, and it is thought that by the twelfth century paganism had more or less died out in Ireland (Duffy 1997). Curiously, the Irish aristocracy had not adopted any
Christian philosophy for secular authority; in written accounts it is clear that kinship links to previous rulers and ancestral (pagan) territorial claims were still the predominant basis for declaring leadership rights (Gibson 1995; Patterson 1994).

One of the critical differences between the Gaelic and the Norman populations was that leadership in the Norman world was not at all seculars; the Pope was God’s supreme representative on earth, and both ecclesiastic and mundane hierarchies existed in parallel, but ended with that one individual (Zuckerman 1973:100).

At the onset of the first Crusade Pope Urban II called upon all Christians to make “armed pilgrimage” to retake the Holy Lands in Jerusalem, which had seen constant turmoil and civil war since the death of the Seljuk Sultan Malik-Shah (Geoffry 2004:15; Hillenbrand 1999). The impact this had in Ireland has historically been understated, because Ireland at the time had no great ruler who led crusader armies, unlike most of Europe where the (Norman) Kings themselves left the country to go to war and returned with enormous religious (thus political) capital and the spoils of the First Crusade.

Richard de Clare “Strongbow” and his knights were the first Normans to “invade” Ireland, when they were fresh back from the First Crusade (S. Duffy, 1997:59), but they were not the first ones to bring to Ireland the concept of Papal primacy. It is clear from primary sources that Ireland had produced crusaders previously; the German monk Ekkehard listed Ireland as one of the countries contributing men to a group of some 100,000 new crusaders who had taken the pledge (Kostick 2003:12). These soldiers would have returned home with a sense of the enormous military might gathered at the behest of the Pope. They would also have observed the many crusader armies being led by various kings and may have felt somewhat slighted to be unrepresented.
It is possible that in that moment, the introduction of a new sociopolitical philosophy caused a restructuring of foreign and indigenous ideas familiar to the Gaels. Christianity was already firmly established in their cultural habitus right down to their individual identity, but the experience of being a Christian during the crusades brought with it new expectations regarding the noble classes. It is highly likely that the Irish population sought to remedy their lack of military/religious leadership; to be better Christians, they would need religiously connected leaders. Surprisingly, there is no record of a major Irish lord venturing on the First Crusade, despite copious records of their battles and conquests within their homeland. By contrast, the great Norman lords who “conquered” Ireland, the De Lacys, the Fitzgeralds, the De Burghs, were all famous for their support of the crusades. The Irish crusaders returning home, and the Welsh knights who were freshly introduced to the island, may have felt a certain contempt for rulers who had no sense of obligation attached to their “divine right to rule,” a familiar characteristic in late medieval societies across Europe. The residual pagan logic for power structures may have become difficult to defend.

The military overtones that are clear in the written record likely result from the nature of restructuring society to participate as part of the Crusades, which was necessarily a militant movement. Knights and lords swearing “fealty” to the English could have been much more literal than is commonly thought, as it has been long observed that although on several occasions the Norman lords swore oaths to support Henry II and his descendants, these never seem to have materialized in Irish politics (see Barry 2016). It may well be the case that those command roles were allegiances to be viewed primarily in the context of military action for the Crusades. King Henry’s authority over Ireland was literal in the sense of foreign campaigns, if not in domestic matters.
In other words, the knights could very well be called upon to join campaigns in the Holy Land, but not in aggressive actions against other Christians, as that would lie outside the realm of Papal authority, and thus also limited King Henry’s influence on the Island. Despite considerable effort to organize his vassals (including Ireland) for participation in a crusade, Henry II never managed to get one underway. Regardless, the social impetus to have a clear Christian (military) hierarchy could have been a primary driver for the changes observed in the material culture. The inability of traditional Irish lords to support the endeavors of the church may have alienated a culture that was moving towards understanding political power based on obligation and divine rights, as opposed to kin-based lineages linking them to a pagan past.

The monastic side of Norman Irish culture had clear connections to the English king, so much so that even money meant for the Papacy would be sent to the English king first (Müller 2007:85). Likewise, the Papacy recognized the English king as having authority over Ireland. The Synod of Cashel in 1172 created new monastic orders, including the Knights Templar, and endeavored to have the Irish pay a tax to Rome. The tax, called “Peter’s Pence,” was a Saxon tradition in which taxes were gathered to the King, who then gave the money to the Pope (Liebermann 1896:745). Henry instituted that law, and little else, on his short adventure to Ireland before leaving the country never to return. After his departure, the Laudabiliter was ratified by Pope Andrew III, giving Henry dominion over Ireland to end the “filthy practices” of a “barbarous nation,” with the added expectation that Ireland would now pay a penny per hearth in annual taxes to Rome (see Lidbetter 2019:4). Symbolism aside, the notion that Norman lords were responsible to the Pope and acted as his agents gave them tremendous credibility with the common people of Ireland, in a way native leaders would not have been able to emulate.

Were Irish taxes actually paid to England? It could well be that the money brought from
England, for funding castles, among other things, was the same money pulled from Irish taxes. It is probable that the Irish Norman lords were collecting (and spending) taxes on “behalf” of the English crown, as a symbolic gesture. Although some money left the island to fund the English crown’s adventures (such as war with France), a healthy skepticism of the amounts of taxes recorded as “going to the King” should be maintained. Just as King Henry may not have sent all the taxes he collected for the Pope to Italy, so too for his Norman vassals. Similarly, it is possible that the money used to build new monastic structures in Ireland was counted as part of Peter’s Pence, as opposed to shipping physical goods and money to Italy. In both cases divine authority can be seen as radiating from above and commanding those below, but in purely financial terms the taxes may have been raised and spent locally, albeit in the name of a foreign body.

5.4 A Proposed Ethnogenesis

One of the key discoveries of this project reflects the importance of understanding ethnogenesis, which is to say how ethnicities are created and maintained, as opposed to simply drawing boundaries around different ethnicities. As archaeologists have noted, ethnicities are quite capable of going extinct, even when their descendants survive (van der Spek 2009:103; Voss 2015:661). Groups like Babylonians, Sumerians, Thracians and so on doubtless contributed to many modern communities both genetically and culturally, but no modern population can trace the line of their people back to those groups. Such is the case in Ireland today, where popular consensus, since at least the birth of Irish Nationalism and perhaps sooner, is that today’s Irish culture is the direct descendant of the medieval Gael.

Technically speaking there is nothing inherently wrong with accounting medieval Gaelic populations as a parent of modern Irish culture -they certainly are, but ancestry is not a line, it is a
branching, dendritic family tree. The Normans of medieval Ireland have suffered a form of “ethnocide,” the suppression and removal of their identity, postmortem. Perhaps it’s fairer to use the term “nomocide,” which is to say their name has been killed, rather than the subjects themselves (Stojanowski 2010:9). In terms of cultural heritage, nomocide might be considered a serious transgression just the same. Like the Apalachees, Guales, and Timucuas tribes of sixth century Florida studied by Stojanowski, the Irish Norman population is doubtlessly tied to a large descendant group that is unaware or largely uncaring about that link, and enlightenment through good archaeological theory and genetic research may yet rekindle some connection with this entangled ancestral population.

Likewise in recent scholarship closer to Ireland, Heinrich Härke has found through a combination of stable isotope, mitochondrial and Y-chromosome DNA, and artifact analysis that there is very strong evidence that Britons saw continuity as a genetic and social group long after they had adopted Saxon cultural markers (Härke 2011). The case study supports the idea that medieval English populations were layered into many social groups and ethnicities that overlapped through time and across the landscape. It is also apparent that in a few generations such boundaries could grow and shrink or even change their labels and experience “extinction,” at least in the sense of ethnic identity, without requiring actual genocide (Härke 2011:26). It is likely that the same phenomena were at play in medieval Ireland.

Archaeologists are rightly cautious about overusing genetic evidence alone when tracing ethnic groups; there is considerable risk in racializing archaeology to any extent (see Arnold 2015; Moore 2004), but in Ireland, like Stojanowski’s examples in Florida and Heinrich Härke’s work in England, there is ample evidence in artifacts, settlement pattern, architecture, agriculture, and the historic record to corroborate the idea that shifting ethnic and social boundaries, and ultimately
ethnic extinction, are a better description of the movement of material culture across the landscape than physical conquest and migration.

In summary, the claim that there was little to no Anglo-Norman invasion of medieval Ireland may shock seasoned archaeologists familiar with that country and will likely be the cause of considerable debate. Nonetheless, it is reasonable to state, from current evidence, that massive migrations or even military campaigns across the island conducted by foreign-born warriors, or even the descendants of foreign-born warriors, would look very different than what has been found in this study. Genetic and ceramic evidence (or the lack thereof) show a distinctly Irish cultural dominance in the Ballintober case study presented here, despite the large Norman castle and classic herring-bone settlement layout or the historic records detailing its Norman ownership and taxes paid to the English crown. The erroneous assumption that the movement of technology and even ethnic identities across the Irish landscape is proof of conquest and migration is the result of relying too heavily on the historic record or only one or two types of artifacts (see Anthony 1990). It should no longer be accepted, at the very least, that the appearance of Norman names and architecture signifies the presence of a significant population of foreigners.

It remains to be determined to what extent even royal sites and settlements in the Pale were truly subservient to the English, beyond perhaps the recognition of the “King of all Ireland” as commander in chief of military forces when on Crusade. There is reason to doubt that even those areas saw heavy migration, and as such their support for the Crown may have had more to do with the English king being the next link up the Christian hierarchy towards the Pope, than representing an acknowledgement of conquest. Future genetic and mortuary evidence will likely determine if indeed Norman graveyards are full of dead Englishman, or if they were in fact Irish all along.
5.5 Summary and Future Research Directions

Given the strong economic and population growth evident in the settlement pattern analysis at Ballintober and other sites during the Norman period, other elements of entanglement are noticeable as well. The massive expenditure associated with building the large castle, for example, makes sense alongside a thriving town, and challenges the idea that the castle construction had to be funded by money from abroad. The odd physical form of the castle could perhaps be explained by the sudden development of “new money” nobles: the elites in this area did not have an established tradition of castle building to lean on, which may have affected the quality of the architectural design. As an entangled culture that existed somewhere between native Irish and Anglo-Norman/Welsh migrants, the otherwise successful leadership in Ballintober may have struggled to reproduce proper Norman architecture, expertise that migrants might have been averse to sharing. In other words, experienced migrant masons may have been unwilling to work in rural Ireland, unless sent directly to construct the “royal castles” Described earlier in this thesis. In the near future it will be interesting to see if more of Ireland's anomalous, less elaborately decorated castles were also established by hybrid communities with only minimal ceramic and cultural marker affiliation with migrants, but with strong ties to a Norman economy. Geophysical exploration, particularly magnetic gradiometry, makes it possible to test large areas around those castles at low cost and completely non-invasively, as the Castles in Communities project has demonstrated. Also, as a topic wholly left out of this study, the archaeology of human burials will likely shed a great deal of light on the nature of Norman society. It is likely that a review of burials from this period, ideally combined with genetic testing, will conclusively demonstrate how much
migration and conquest played a role in Normanization, or more directly, whether the bodies buried in Norman period cemeteries on the island are almost exclusively Irish, at least genetically.

Lastly, it is hoped that these findings will influence Irish people to consider that the Norman castles, churches, and monasteries of Ireland were often built by Irish hands, paid for with Irish taxes, and intended to benefit Irish people. These monuments are not holdovers from a time of invasion, or a symbol of foreign aggression. They are an enduring testament to the will of Irish people, who worked hard to improve the lives of their descendants and glorify their homeland. It is my opinion that Norman influence is an underappreciated component of Irish ancestry, deserving of far greater respect, and that archaeologists should endeavor to combat the common insistence that the Normans in Ireland were somehow “less Irish” than their Gaelic counterparts.
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Area 1 Structure 1 (A1S1)
Confidence Value: 5

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Figure 5. A1S1 GPR Slice Layer 3
Figure 6. A1S1 GPR Slice Layer 4 with Interpretation

Figure 7. A1S1 GPR Slice Layer 4
Figure 8. A1S1 GPR Slice Layer 5 with Interpretation

Figure 9. A1S1 GPR Slice Layer 5
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Figure 11. A1S1 GPR Grid 33 Profile 90
Area 1 Structure 2 (A1S2)
Confidence Value: 4

Figure 12. A1S2 with Interpretation

Figure 13. A1S2 Relative to the Castle Interior
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Figure 15. A1S2 GPR Slice Layer 3
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Figure 17. A1S2 GPR Slice Layer 4
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Figure 19. A1S2 GPR Slice Layer 5
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Figure 21. A1S2 GPR Slice Layer 6
Figure 22. A1S2 GPR Slice Layer 7 with Interpretation

Figure 23. A1S2 GPR Slice Layer 7
Figure 24. A1S2 GPR Grid 34 Profile 16 NW-SE with Interpretation

Figure 25. A1S2 GPR Profile 16

S2 Southern Wall
Area 1 Structure 3 (A1S3)
Confidence Value: 2

Figure 26. A1S3 Magnetometry with Interpretation

Figure 27. A1S3 Magnetometry
Area 1 Structure 4 (A1S4)
Confidence Value: 3

Figure 28. A1S4 Magnetometry with Interpretation

Figure 29. A1S4 Magnetometry
Area 1 Structure 5 (A1S5)
Confidence Value: 2

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Figure 31. A1S5 Magnetometry
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Figure 33. A1S5 GPR Slice 4
Figure 34. A1S5 GPR Grid 59 Profile 43 with Interpretation.

S5 Floor, Possible Hearth

Figure 35. A1S5 GPR Grid 59 Profile 43
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Figure 38. A2S1 Magnetometry
Area 2 Structure 2 (A2S2)
Confidence Value: 2

Figure 39. A2S2 Magnetometry with Interpretation

Figure 40. A2S2 Magnetometry
Area 2 Structure 3 (A2S3)

Confidence Value: 2

Figure 41. A2S3 Magnetometry and Interpretation

Figure 42. A2S3 Magnetometry
Area 2 Structure 4 (A2S4)

Confidence Value: 2

Figure 43. A2S4 Magnetometry with Interpretation

Figure 44. A2S4 Magnetometry

572812, 774774
Figure 47. A2S4 GPR Grid 38 Profile 55 with Interpretation

Figure 48. A2S4 GPR Grid 38 Profile 55
Figure 49. A2S5 Magnetometry with Interpretation

Figure 50. A2S5 Magnetometry
Figure 51. A2S5 GPR Slice 3 with Interpretation

Figure 52. A2S5 GPR Slice 3
*Wall thickness is exaggerated because the profile passes through at a shallow angle.

Figure 53. A2S5 GPR Grid 38 Profile 57 with Interpretation

Figure 54. A2S5 GPR Grid 38 Profile 57
Area 2 Structure 6 (A2S6)

Confidence Value: 2

Figure 55. A2S6 Magnetometry with Interpretation

Figure 56. A2S6 Magnetometry
Figure 57. A2S6 GPR Slice Layer 2 with Interpretation

Figure 58. A2S6 GPR Slice Layer 2
Figure 59. A2S6 GPR Slice Layer 3 with Interpretation

Figure 60. A2S6 GPR Slice Layer 3
Figure 61. A2S6 GPR Grid 38 Profile 57 with Interpretation

Figure 62. A2S6 GPR Grid 38 Profile 57
Area 2 Structure 7 (A2S7)  
Confidence Value: 2  

Figure 63. A2S7 Magnetometry with Interpretation

Figure 64. A2S7 Magnetometry
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Figure 66. A2S7 GPR Slice Layer 2
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Figure 68. A2S7 GPR Grid 38 Profile 75
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Figure 70. A2S8 Magnetometry
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Figure 72. A2S8 GPR Slice Layer 2
Figure 73. A2S8 GPR Slice Layer 3 with Interpretation

Figure 74. A2S8 GPR Slice Layer 3
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Figure 76. A2S8 GPR Grid 39 Profile 17
Figure 77. A2S9 Magnetometry with Interpretation

Figure 78. A2S9 Magnetometry
Figure 79. A2S9 GPR Slice Layer 2 with Interpretation

Figure 80. A2S9 GPR Slice Layer 2
*Walls appear wider than reality, because the profile goes through at a shallow angle.*
Area 2 Structure 10 (A2S10)

Confidence Value: 3

Figure 83. A2S10 Magnetometry with Interpretation

Figure 84. A2S10 Magnetometry
Figure 85. A2S10 GPR Slice Layer 3 with Interpretation

Figure 86. A2S10 GPR Slice Layer 3
Figure 87. A2S10 GPR Grid 27 Profile 109 with Interpretation

Road

Ditch (Boundary)

S10 Floor

Figure 88. A2S10 GPR Grid 27 Profile 109
**Area 2 Structure 11 (A2S11)**

Confidence Value: 1

---

**Figure 89.** A2S11 Magnetometry with Interpretation

**Figure 90.** A2S11 Magnetometry
Figure 91. A2S11 GPR Slice Layer 1 with Interpretation

Figure 92. A2S11 GPR Slice Layer 1
Figure 93. A2S11 GPR Slice Layer 2 with Interpretation

Figure 94. A2S11 GPR Slice Layer 2
Figure 95. A2S11 GPR Grid 39 Profile 37 with Interpretation

Figure 96. A2S11 GPR Grid 39 Profile 37
Area 2 Structure 12 (A2S12)
Confidence Value: 3

Figure 97. A2S12 Magnetometry with Interpretation

Figure 98. A2S12 Magnetometry
Figure 99. A2S12 GPR Slice Layer 3 with Interpretation

Figure 100. A2S12 GPR Slice Layer 3
S12 is slightly sunken into the ground. It may be a pit house or storage feature, but is too shallow to likely be a midden.
Area 3

Figure 103. Structures in Area 3
Area 3 Structure 1 (A3S1)

Confidence Value: 2

Figure 104. A3S1 Magnetometry with Interpretation

Figure 105. A3S1 Magnetometry
Figure 106. A3S1 GPR Slice Layer 3 with Interpretation

Figure 107. A3S1 GPR Slice Layer 3
Figure 108. A3S1 GPR Slice Layer 4 with Interpretation

Figure 109. A3S1 GPR Slice Layer 4
Figure 110. A3S1 GPR Grid 39 Profile 125 with Interpretation

Figure 111. A3S1 GPR Grid 39 Profile 125
Area 3 Structure 2 (A3S2)
Confidence Value: 5

Figure 112. A3S2 Magnetometry with Interpretation

Figure 113. A3S2 Magnetometry
Figure 114. A3S2 GPR Slice Layer 2 with Interpretation

Figure 115. A3S2 GPR Slice Layer 2
Figure 116. A3S2 GPR Grid 27 Profile 91 with Interpretation

Figure 117. A3S2 GPR Grid 27 Profile 91
Area 3 Structure 3 (A3S3)
Confidence Value: 4

Figure 118. A3S3 Magnetometry with Interpretation

Figure 119. A3S3 Magnetometry
Figure 120. A3S3 GPR Slice Layer 2 with Interpretation

Figure 121. A3S3 GPR Slice Layer 2
Figure 122. A3S3 GPR Grid 27 Profile 77 with Interpretation

Figure 123. A3S3 GPR Grid 27 Profile 77 with Interpretation
Area 3 Structure 4 (A3S4)

Confidence Value: 3

Figure 124. A3S4 Magnetometry with Interpretation

Figure 125. A3S4 Magnetometry
Figure 128. A3S4 GPR Grid 27 Profile 41 with Interpretation

Figure 129. A3S4 GPR Grid 27 Profile 41
Area 3 Structure 5 (A3S5)
Confidence Value: 2

Figure 130. A3S5 Magnetometry with Interpretation

Figure 131. A3S5 Magnetometry
Figure 132. A3S5 GPR Slice Layer 3 with Interpretation

Figure 133. A3S5 GPR Slice Layer 3
Figure 134. A3S5 GPR Grid 27 Profile 17 with Interpretation

Figure 135. A3S5 GPR Grid 27 Profile 17
Area 3 Structure 6 (A3S6) 572929, 774703
Confidence Value: 1

Figure 136. A3S6 Magnetometry with Interpretation

Figure 137. A3S6 Magnetometry
Area 3 Structure 7 (A3S7)

Confidence Value: 1

Figure 138. A3S7 Magnetometry with Interpretation

Figure 139. A3S7 Magnetometry
Figure 140. A3S7 GPR Slice Layer 2 with Interpretation

Figure 141. A3S7 GPR Slice Layer 2
Figure 142. A3S7 GPR Slice Layer 3 with Interpretation

Figure 143. A3S7 GPR Slice Layer 3
Figure 144. A3S7 GPR Grid 39 Profile 151 with Interpretation

Figure 145. A3S7 GPR Grid 39 Profile 151
**Area 3 Structure 8 (A3S8)**

Confidence Value: 3

Figure 146. A3S8 Magnetometry with Interpretation

Figure 147. A3S8 Magnetometry
Figure 148. A3S8 GPR Slice Layer 3 with Interpretation

Figure 149. A3S8 GPR Slice Layer 3
Figure 150. A3S8 GPR Grid 39 Profile 141 with Interpretation

Figure 151. A3S8 GPR Grid 39 Profile 141
Area 3 Structure 9 (A3S9)

Confidence Value: 3

Figure 152. A3S9 Magnetometry with Interpretation

Figure 153. A3S9 Magnetometry
Figure 154. A3S9 GPR Slice Layer 3 with Interpretation

Figure 155. A3S9 GPR Slice Layer 3
Figure 156. A3S9 GPR Grid 27 Profile 103 with Interpretation

Figure 157. A3S9 GPR Grid 27 Profile 103
Area 3 Structure 10 (A3S10)
Confidence Value: 3

Figure 158. A3S10 Magnetometry with Interpretation

Figure 159. A3S10 Magnetometry
Figure 160. A3S10 GPR Slice Layer 4 with Interpretation

Figure 161. A3S10 GPR Slice Layer 4
Figure 162. A3S10 GPR Grid 27 Profile 87 with Interpretation

Figure 163. A3S10 GPR Grid 27 Profile 8
Area 4

Figure 164. Area 4 Structures
Area 4 Structure 1 (A4S1)
Confidence Value: 4

Figure 165. A4S1 Magnetometry with Interpretation

Figure 166. A4S1 Magnetometry
Figure 167. A4S1 GPR Slice Layer 4 with Interpretation

Figure 168. A4S1 GPR Slice Layer 4
Figure 169. A4S1 GPR Grid 37 Profile 29 with Interpretation

Figure 170. A4S1 GPR Grid 37 Profile 29
Figure 171. A4S1 GPR Grid 37 Profile 39 with Interpretation

Figure 172. A4S1 GPR Grid 37 Profile 39
Figure 173. A4S2 Magnetometry with Interpretation

Figure 174. A4S2 Magnetometry
Figure 175. A4S2 GPR Slice Layer 3 with Interpretation

Figure 176. A4S2 GPR Slice Layer 3
Figure 177. A4S2 GPR Grid 32 Profile 31 with Interpretation

Figure 178. A4S2 GPR Grid 32 Profile 31
Area 4 Structure 3 (A4S3)
Confidence Value: 1

Figure 179. A4S3 Magnetometry with Interpretation

Figure 180. A4S3 Magnetometry
Figure 181. A4S3 GPR Slice Layer 3 with Interpretation

Figure 182. A4S3 GPR Slice Layer 3
Figure 183. A4S3 GPR Grid 30 Profile 105 with Interpretation

Figure 184. A4S3 GPR Grid 30 Profile 105
Area 4 Structure 4 (A4S4)
Confidence Value: 2

Figure 185. A4S4 Magnetometry with Interpretation

Figure 186. A4S4 Magnetometry
Figure 187. A4S4 GPR Slice Layer 3 with Interpretation

Figure 188. A4S4 GPR Slice Layer 3
Figure 189. A4S4 GPR Grid 30 Profile 35 with Interpretation

Figure 190. A4S4 GPR Grid 30 Profile 35
Area 5

Figure 191. Area 5 Overview
Area 5 Structure 1 (A5S1)
Confidence Value: 4

Figure 192. A5S1 Magnetometry with Interpretation

Figure 193. A5S1 Magnetometry
Figure 194. A5S1 GPR Slice Layer 3 with Interpretation

Figure 195. A5S1 GPR Slice Layer 3
Figure 196. A5S1 GPR Grid 38 Profile 37 with Interpretation

Figure 197. A5S1 GPR Grid 38 Profile 37
Figure 198. A5S2 Magnetometry with Interpretation

Figure 199. A5S2 Magnetometry
Figure 200. A5S2 GPR Slice Layer 4 with Interpretation

Figure 201. A5S2 GPR Slice Layer 4
Figure 202. A5S2 GPR Grid 27 Profile 62 with Interpretation

Figure 203. A5S2 GPR Grid 27 Profile 62
Area 5 Structure 3 (A5S3) 572805, 774714
Confidence Value: 4

Figure 204. A5S3 Magnetometry with Interpretation

Figure 205. A5S3 Magnetometry
Figure 206. A5S3 GPR Slice Layer 2 with Interpretation

Figure 207. A5S3 GPR Slice Layer 2
Figure 208. A5S3 GPR Grid 25 Profile 155 with Interpretation

Figure 209. A5S3 GPR Grid 25 Profile 155
Area 5 Structure 4 (A5S4)  
Confidence Value: 2  

Figure 209. A5S4 Magnetometry with Interpretation  

Figure 210. A5S4 Magnetometry
Figure 211. A5S4 GPR Slice Layer 2 with Interpretation

Figure 212. A5S4 GPR Slice Layer 2
Figure 213. A5S4 GPR Grid 25 Profile 139 with Interpretation

Figure 214. A5S4 GPR Grid 25 Profile 139
Area 5 Structure 5 (A5S5)

Confidence Value: 2

Figure 215. A5S5 Magnetometry with Interpretation

Figure 216. A5S5 Magnetometry
Figure 217. A5S5 GPR Slice Layer 2 with Interpretation

Figure 218. A5S5 GPR Slice Layer 2
Figure 219. A5S5 GPR Grid 25 Profile 133 with Interpretation

Figure 220. A5S5 GPR Grid 25 Profile 133
Area 5 Structure 6 (A5S6)
Confidence Value: 4

Figure 221. A5S6 Magnetometry with Interpretation

Figure 222. A5S6 Magnetometry
Figure 223. A5S6 GPR Slice Layer 4 with Interpretation

Figure 224. A5S6 GPR Slice Layer 4
Figure 225. A5S6 GPR Grid 25 Profile 121 with Interpretation

Figure 226. A5S6 GPR Grid 25 Profile 121
Area 5 Structure 7 (A5S7)
Confidence Value: 4

Figure 227. A5S7 Magnetometry with Interpretation

Figure 228. A5S7 Magnetometry
Figure 229. A5S7 GPR Slice Layer 3 with Interpretation

Figure 230. A5S7 GPR Slice Layer 3
Figure 231. A5S7 GPR Slice Layer 4 with Interpretation

Figure 232. A5S7 GPR Slice Layer 4
Figure 233. A5S7 GPR Grid 35 Profile 31 with Interpretation

Figure 234. A5S7 GPR Grid 35 Profile 31
Area 5 Structure 8 (A5S8)
Confidence Value: 3

Figure 235. A5S8 Magnetometry with Interpretation

Figure 236. A5S8 Magnetometry
Figure 239. A5S8 GPR Grid 27 Profile 11 with Interpretation

Figure 240. A5S8 GPR Grid 27 Profile 11
Figure 241. A5S9 Magnetometry with Interpretation

Figure 242. A5S9 Magnetometry
Figure 243. A5S9 GPR Slice Layer 2 with Interpretation

Figure 244. A5S9 GPR Slice Layer 2
Figure 245. A5S9 GPR Slice Layer 3 with Interpretation

Figure 246. A5S9 GPR Slice Layer 3
Figure 247. A5S9 GPR Grid 25 Profile 107 with Interpretation

Figure 248. A5S9 GPR Grid 25 Profile 107
Area 5 Structure 10 (A5S10)  
Confidence Value: 2  

Figure 249. A5S10 Magnetometry with Interpretation

Figure 250. A5S10 Magnetometry
Figure 251. A5S10 GPR Slice Layer 2 with Interpretation

Figure 252. A5S10 GPR Slice Layer 2
Figure 253. A5S10 GPR Slice Layer 3 with Interpretation

Figure 254. A5S10 GPR Slice Layer 3
Figure 255. A5S10 GPR Grid 25 Profile 69 with Interpretation

Figure 256. A5S10 GPR Grid 25 Profile 69
Area 5 Structure 11 (A5S11) 572791, 774650
Confidence Value: 4

Figure 257. A5S11 Magnetometry with Interpretation

Figure 258. A5S11 Magnetometry
Figure 259. A5S11 GPR Slice Layer 3 with Interpretation

Figure 260. A5S11 GPR Slice Layer 3
Figure 261. A5S11 GPR Slice Layer 4 with Interpretation

Figure 262. A5S11 GPR Slice Layer 4
Figure 263. A5S11 GPR Grid 21 Profile 29 with Interpretation

Figure 264. A5S11 GPR Grid 21 Profile 29
Figure 265. Area 6 Structures
Area 6 Structure 1 (A6S1)
Confidence Value: 1

Figure 266. A6S1 Magnetometry with Interpretation

Figure 267. A6S1 Magnetometry
Area 6 Structure 2 (A6S2)

Confidence Value: 2

Figure 268. A6S2 Magnetometry with Interpretation

Figure 269. A6S2 Magnetometry
Figure 270. A6S3 Magnetometry with Interpretation

Figure 271. A6S3 Magnetometry
Figure 272. A6S3 GPR Slice Layer 3 with Interpretation

Figure 273. A6S3 GPR Slice Layer 3
Figure 274. A6S3 GPR Profile 75 with Interpretation

Figure 275. A6S3 GPR Profile 75
Area 6 Structure 4 (A6S4) 573007, 774635
Confidence Value: 2

Figure 276. A6S4 Magnetometry with Interpretation

Figure 277. A6S4 Magnetometry
Figure 278. A6S4 GPR Slice Layer 4 with Interpretation

Figure 279. A6S4 GPR Slice Layer 4
Figure 280. A6S4 GPR Grid 41 Profile 61 with Interpretation

Figure 281. A6S4 GPR Grid 41 Profile 61
Area 6 Structure 5 (A6S5)
Confidence Value: 2

Figure 282. A6S5 Magnetometry with Interpretation

Figure 283. A6S5 Magnetometry
Area 6 Structure 6 (A6S6)  
Confidence Value: 2

Figure 284. A6S6 Magnetometry with Interpretation

Figure 285. A6S6 Magnetometry
Figure 286. A6S6 GPR Slice Layer 3 with Interpretation

Figure 287. A6S6 GPR Slice Layer 3
Figure 288. A6S6 GPR Grid 41 Profile 39 with Interpretation

Figure 289. A6S6 GPR Grid 41 Profile 39
Area 6 Structure 7 (A6S7)

Confidence Value: 2

Figure 290. A6S7 Magnetometry with Interpretation

Figure 291. A6S7 Magnetometry
Figure 292. A6S7 GPR Slice Layer 2 with Interpretation

Figure 293. A6S7 GPR Slice Layer 2
Figure 294. A6S7 GPR Grid 41 Profile 61 with Interpretation

Figure 295. A6S7 GPR Grid 41 Profile 61
Area 6 Structure 8 (A6S8)

Confidence Value: 1

Figure 296. A6S8 Magnetometry with Interpretation

Figure 297. A6S8 Magnetometry
Figure 298. A6S8 GPR Slice Layer 2 with Interpretation

Figure 299. A6S8 GPR Slice Layer 2
Figure 300. A6S8 GPR Grid 40 Profile 67 with Interpretation

Figure 301. A6S8 GPR rid 40 Profile 67
Figure 302. A6S9 Magnetometry with Interpretation

Figure 303. A6S9 Magnetometry
Figure 306. A6S9 GPR Grid 45 Profile 19 with Interpretation

Figure 307. A6S9 GPR Grid 45 Profile 19
Area 6 Structure 10 (A6S10)
Confidence Value: 1

Figure 308. A6S10 Magnetometry with Interpretation

Figure 309. A6S10 Magnetometry
Area 6 Structure 11 (A6S11)  
Confidence Value: 2 

Figure 310. A6S11 Magnetometry with Interpretation  

Figure 311. A6S11 Magnetometry
Figure 312. A6S11 GPR Grid 42 Profile 55 with Interpretation

Figure 313. A6S11 GPR Grid 42 Profile 55
Area 6 Structure 12 (A6S12)
Confidence Value: 3

Figure 314. A6S12 Magnetometry with Interpretation

Figure 315. A6S12 Magnetometry
Figure 316. A6S12 GPR Grid 41 Profile 3 with Interpretation

Figure 317. A6S12 GPR Grid 41 Profile 3
Area 6 Structure 13 (A6S13)  
Confidence Value: 3

Figure 318. A6S13 Magnetometry with Interpretation

Figure 319. A6S13 Magnetometry
Figure 320. A6S13 GPR Slice Layer 3 with Interpretation

Figure 321. A6S13 GPR Slice Layer 3
Figure 322. A6S13 GPR Grid 43 Profile 63 with Interpretation

Figure 323. A6S13 GPR Grid 43 Profile 63
Figure 324. A6S14 Magnetometry with Interpretation

Figure 325. A6S14 Magnetometry
Figure 326. A6S14 GPR Slice Layer 2 with Interpretation

Figure 327. A6S14 GPR Slice Layer 2
Figure 328. A6S14 GPR Grid 43 Profile 45 with Interpretation

Figure 329. A6S14 GPR Grid 43 Profile 45
Area 7

Figure 330. Area 7 Structures
Area 7 Structure 1 (A7S1)
Confidence Value: 2

Figure 331. A7S1 Magnetometry with Interpretation

Figure 332. A7S1 Magnetometry
Figure 333. A7S1 GPR Slice Layer 4 with Interpretation

Figure 334. A7S1 GPR Slice Layer 4
Figure 335. A7S1 GPR Grid 47 Profile 217 with Interpretation

Figure 336. A7S1 GPR Grid 47 Profile 217
Area 7 Structure 2 (A7S2)
Confidence Value: 2

Figure 337. A7S2 Magnetometry with Interpretation

Figure 338. A7S2 Magnetometry
Figure 339. A7S2 GPR Slice Layer 4 with Interpretation

Figure 340. A7S2 GPR Slice Layer 4
Figure 341. A7S2 GPR Grid 47 Profile 235 with Interpretation

Figure 342. A7S2 GPR Grid 47 Profile 235