

Sudeley Castle 1572: A Digital Reconstruction Shauni Waller, 1904380 2024

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Abstract

Technology in the heritage field is increasingly becoming more capable of presenting heritage sites in variable areas of research. Archaeological study is becoming more reliant on electronic survey and exhibitions are massively enhanced with the use of computer aided design software (CAD) to provide a further appreciation of history and heritage. Much of this appreciation is limited in an 'organic' viewing as many sites are in a ruined state or have limited access. The purpose of this project was to explore the practice of digital reconstruction and how the results were achievable using the 3D reconstruction software SketchUp. The project was specifically undertaken to challenge the visualisation of uncertain features – areas that are not specifically recorded in documents, explicitly revealed in archaeological survey or visible in the present day and whether digital reconstruction aids an effective construction or reimagination.

Introduction

The purpose of the model – is it archaeological or exhibitionism? Or both? By claiming it to be exhibitionist, it allows more room for personal interpretation and reduces what can be a frustrating responsibility to be creating a model so factual it can be relied upon as actual truth. The purpose of this project is to exhibition Sudeley in a 3D form working on what is known and applying assumption to create a piece that could be used as a digital exhibition to attract attention and inspire thought.

The reconstruction of Sudeley Castle aims to challenge and explore the uncertainty surrounding what actually is a 'reconstruction'. Reconstruction implies the rebuilding of a structure with certainty, but this is far from the truth for medieval buildings.

Establishing a scientific valid model can be entirely speculative, but this depends on the sources used. I began my approach for this project with Masuch's categorisation of sources as follows:

Findings: artifacts that actually have been excavated.

Deductions: facts that can be derived directly from the excavation.

Analogies: Facts that have no excavation equivalent, but can be deduced from similar buildings of the same architectural period.

Assumptions: details that are assumed because "something had to be there" but which have no excavation basis.

(Masuch: 1999, p.3)

Masuch describes analogies and assumptions as "dangerous" (Ibid p.3), as they veer from scientific truth and are largely speculative, and while this can be agreed upon, it is an impossible task to create a full reconstruction without any speculation at all, and it is therefore a vital attribute to complete the task. Afterall, historic research is an entirely speculative task in itself. Furthermore, Masuch does not have a category for sources that provide a non-metric based insight into the building – such as illustrations,

documented reference in texts which provide a more dynamic approach to reconstruction and in truth, without such resources, reconstruction would have been more difficult and relied more on assumptions and educated guess. More recently, Landes et al would agree supplementary material or knowledge is often necessary to complete a model (Landes et al: 2019, p.409). It was vital when constructing the model to remain as close to tangible proof as possible, but this presented it's own challenges as getting lost in the detail was always a possibility due to the accountability held in creating a model and calling it a reconstruction. This challenge was overcome by understanding that lack of certainty can be detrimental and hinder further interpretation and analysis (Sylaiou et al: 2009) and it was possible to combine the metric data with historical documents that offer non metric properties (Landes et al: 2019, p. 409).

Most effective means of representation were the geometry and physical structure, the uncertain details would follow but were imperative to be included to create a whole picture.

"people strongly tend to take a depicted reconstruction as scientific truth" Masuch p.3

In reference to my research specifically, I had access to Sudeley's archives courtesy of Derek Maddocks the Sudeley archivist who provided invaluable insight to the history of the castle and documents and illustrations that paved a timeline of changes.

Historically, Sudeley does not have a rich history of excavation, Lidar study and historical account contributed heavily to the reconstruction further aided by recent archaeological excavation by DigVenture, who have occupied the site in (HOW MANY) instances to further explore a Victorian dig site instigated by the castles previous owner Emma Dent in (FIND THIS DATE). This excavation disproved Dents notion that the original Manor House foundations lay in what is known as the hopfield, but reinstated the concept that Sudeley had impressive garden features and supported what was found in Fradley's Lidar survey in 2014. Using this data with the known layout of the remaining castle I was able to produce a 2D layout of foundations to build upon

and deduce that there were walls present there and proceed to build a 3D construction. Details of the castle were visualised from assumptions and taken from illustrations made throughout the centuries and kept in Sudeley's archives. While these are subjective in themselves, there were consistent details such as window locations in illustrations made years apart and by different artists that were interpreted as close to the truth.

Antiquarian sources, like Lelands Itinerary and Dents Annals of Winchcombe provided a castle narrative that complimented the images and delivered a good context of what was likely to be present in the 16th century.

Other reconstructions of the castle are very limited, there is currently a wooden model on display in the castle's exhibition area created by a volunteer that is widely respected, but is confusing to deduce. It reflects Sudeley with the double courtyard, but the features vary and differ from descriptions of the time and how the castle is depicted in illustrations. Furthermore, it is limited to the construction of the building and does not offer insight to the grounds leaving an unfulfilled visualisation.

Choosing Sudeley as a study was an easy choice due to previous employment there and excellent connections maintained with the archivist Derek Maddocks who provided invaluable insight and opinions on my research, and permitted me to have access to private quarters of the castle and the private archives. Study of the area and materials inspired further questions and shaped how the model was to be approached. It became evident that the commercialisation of the castle as a tourist attraction has had quite an impact on what is implied as historical truth. The southeast range ruins are a good example of this; the ruins are advertised as 'Richard III's Banquet Hall', yet there is no evidence to support he ever resided there, visited or even acknowledged Sudeley beyond approving renovations here during his rule. Creating a model that was separate to the commercialised history of the castle was essential to make it an effective interpretation.

Heritage in a Digital Age

The digital age, synonymously known as the information age, computer age, silicon age or the new media age, emerged during the mid 20th century during a leap forward in the discovery of new technologies, most notably the computer in the 1970's. The easy duplication, memorisation and retrieval of information massively impacted the speed of progress and ease of many aspects of life including the physical and the academic. The development in archaeological technology has been imperative to the possibility of discovery in most excavations today.

Technology in archaeology has progressed significantly since the early excavations of King Nabonidus, who founded the foundation-stone of Naram Sin. Through time, excavations and their purpose evolved between religion and greed, even when disguised as a need for unearthing truths of the past. Earlier, unrefined methods of extraction proved fatal to the survival of some objects that crumbled upon exposure to air due to the lack of knowledge of preservation that we have in this age.

Discoveries have been made in recent times that would never have been possible without such technology – for example, the discovery of Richard III. Due to ever shrinking budgets for heritage, trench locations had to be precise and to avoid as much public disruption at all. Without ground penetrating surveys, the team may never have located the 'King of the Car Park'. A more recent discovery using Ground Penetrating Radar, has found the footprints of a female and a toddler, and their mile long journey through soft clay mud. These findings forced scientists to readjust the timeline of humans living in North America (Tewelow, 2021). Discoveries like these are good examples of how digital methods can allow archaeologist to reexamine facts by providing fresh perspectives.

When we look to locating the digital in heritage, it is difficult to pinpoint it to one genre or area of expertise. It is a complex beast that has infiltrated many areas of heritage; archaeology, tourism, research, cataloguing, archiving to name a few. In the beginning, technology allowed for the re-examination of traditional problems to form better systems and protocols. Traditionally, museums were organised on the 'whims' of a registrar or a curator, and this would result in there being little to no communication between museums and consequently, a museum may suddenly realise that their archives are inadequate. (Parry, 2010). Digitising records meant that the historic struggle of keeping up with new records became easier, with management systems and databases. Cross referencing becomes easier, and locations of objects are easier to find.

Technology further advanced and incorporated itself not only in professional fields, but embedded itself on a social level, as part of our 'plugged in lives' (Sherry Turkle: Connected, but alone?, 2012) society started using technology to help us communicate day to day it's reach becoming unlimited in its international capacity. This access to the public also proposed a new venture for heritage and museums. This wider reach correlated with the 27% decline in local authority spending on museum and galleries between 2009/10 and 2019/20 (Rex: 2021, p.9). With more people online and less money to spend, museums and heritage followed suit of many other businesses and began to achieve engagement through social media. Photographs of exhibitions, 'snippets' of upcoming events and colourful eye-catching imagery soon became a popular method to provide access to an even larger pool of people. This new use of exhibitioning merits the method of digitising humanities by providing accessibility and engaging other in projects and events even if they can't visit or understand the primary resource themselves; at the most basic level, it's an appealing approach in a presentation of history than a bulk of text filled with archaeological jargon.

This digital lens of which viewers are appreciating heritage however, may call into question the purpose of a museum altogether, if such wonders can be viewed online –

does this make a museum obsolete? In short, no. The organic experience of viewing history face to face and immersion of knowledge you gain from physically viewing a site, artefact or other is difficult, if not impossible to duplicate and inspire in the same way. Even Caroline Bruzelius, a pioneer in digital reconstruction stated in a previous interview that her digital projects were to be used alongside an organic experience at a site, and rather than replace the experience, it was created to enhance it using an app (Caroline Bruzelius on Animating History, 2013). However, this does not invalidate the usefulness of digitising projects altogether. Mckenna describes exhibition design as:

- Problem solving at its most elemental
- Way-finding and its content delivery at its most practical
- Sparking curiosity and wonder at its most essential (Mckenna: 2013, p.132)

Mckenna's viewpoint is more applicable today than it was in 2013. The Coronavirus pandemic dramatically reduced access to exhibitions, marking a prominent, fundamental change for heritage, both long and short term. Survival for the cultural sector who pinned on various grants and funding from the government to cope in the short term, but long term, even three years on there are still anxieties over long term sustainability due to the impact of coronavirus. Art Fund found that three years on, museums are still only looking at 61% capacity of pre pandemic visitor levels (Art Fund 2022). Museums are struggling to find support for exhibitions and events, while also dealing with the challenges of needing to be seen and constantly delivering new and different activities (Philps: 2022, p.34). The digitisation of events and exhibitions can help ease this problem, while it doesn't solve the problem of visitor numbers, it does support the need to be *seen*.

New methods of showcasing history and the arts however, was not well received across the field, Eunice Lee described digital promotions as 'antithetical' because 'the whole point of a museum is to come see the work in real life' (Levin:2021).

However, what is referred to as a 'post-museum' by Eilean Hooper-Greenhill (van der Akker and Legene: 2016, p.9) is finding more support in the digital age where museums

are becoming less of a site of authority, as implied by Eunice Lees statement 'to come see' but rather a place of mutuality between the historic cultural sector and contemporary communities. Despite the thinking that cultural experiences are only achieved in person, sensory experiences are now becoming more possible as technology develops. Stevens refers to these as 'haptic visuality'; where there isn't a dependence on material presence to achieve connections or interrelatedness (Stevens: 2016, p.21). Steven corresponds haptic visuality as a virtual reflection of the real world, using the internet as a specific example. He describes haptic visions preference for connectivity to the presumed uniqueness of a particular object (Stevens:2016, p.21) and the interconnected pathways of the internet allows the viewer to 'surf' with the movement rather than focus on one specific thing.

The 3D construction of models perseveres a lot of scepticism surrounding it's accuracy and accountability for the implied truth it presents. Barratt discusses how it is not necessary to take this too seriously and how in fact 3D reconstructions can be divided into two categories of 'simple' and advanced' (Barratt: 2018, p.8). In short, simple reconstructions provide a digital platform for present and explaining archaeological context, whereas advanced reconstructions can be manipulated to run simulations, test theories and interactive navigation (Ibid, p.9).

From a practical standpoint, the accuracy of 3D models is questionable. Masuch's hesitancy over the perceived danger of the models implied truth is a concept shared by other authors who discredit reconstructions for their lack of source discussion, while others concentrate on the interpretation bias caused by the presentation of a 'perfect' recreation (Miller and Richards 1995). In 1997, Gerrard already declared this attitude 'depressing', where it seems each time we broaden our information horizon, we run into strong feelings that block our way forward (Gerrard: 1997, p.194). The shift in idealism of what constitutes a museum, an exhibition or research project is persistently questioned, but should not hinder progress.

Sudeley Castle History

Historical Background

The earliest reference to Sudeley is in a Domesday Book entry that describes it as a settlement with a recorded population of 40 households with 4 lord's plough teams, 13 men's plough teams, a woodland measuring 3*2 leagues and 6 mills at the value of 2 pounds 12 shillings (Powell-Smith: 2011). This a substantial holding for the area suggests a prolific manor site with a lot of activity and putting it in the largest 20% of dwellings recorded in Domesday (Ibid). The location of the village is unknown, and there is no evidence to support it was there during the later medieval period. Considering the proximity of the church to the castle, and the fact it was built alongside the 1442 structure, it's likely that the church is situated there due to the occupation of the village in the eastern field, as suggested by DigVenture in recent geophysical survey (DigVentures: 2023) In *Gesta Stephani* Sudeley is described as a poorly garrisoned castle that surrendered to Stephen during attack (Potter and Davis: 1976, p.175), Malmesbury describes Sudeley as 'levelled to the ground' (Sharpe and Giles: 1847, p.511) and the land was not resided by a Lord Sudeley again. Likely, the village, woodland and deer park remained so as to maintain value but a Lord Sudeley did not reside there again and upon John 9th Lord de Sudeley's death, Sudeley was inherited through his sister by the Boteler family.

Funded by 'spoyles gotten in France' (Oswald: 1940, p.456) Ralph Boteler built Sudeley on it's present site. Extensive building programmes were initiated and the castle is built for a residential purpose. Boteler built a double courtyard and a gatehouse with a drawbridge of which the rebate remains. Despite the castle also featuring a parapet, the garrison was for aesthetic purposes and entirely domestic. There is much speculation over the presence of a moat at Sudeley, Emery theorises that there would have been a

moat protecting the outer court (Emery: 2006, p. 170), but Historic England deems a moat unlikely, suggesting the 'Moat' that remains today is more likely to have been a fishpond (historicengland.org). Both speculations hold merit, fishponds became more of a feature in 16th century, Hampton Court Palace being a good example of how they could be incorporated into a garden in later medieval times. Whether they were ornamental, or ever fully functional it is not clear (Jacques: 2005, p.3) but entirely suitable for a house as grand as Sudeley. Alternatively, Victorian ground maps of the castle identify four areas of 'old moat' locations that coincide with the 'pretty lake' (Leland, Vol 2) that Leland observed ran 'out of Sudeley Park down by the castle, and runnith into Esseburne Brooke¹, at the south syde of Winchombe' (Ibid). It's reasonable to assume there was a sizeable portion of water with the castle as justification for the drawbridge and water ditches; at most a series of connected water ditches that allowed for flooding from the nearby river, but whether the moat surrounded the whole castle remains unknown, and unlikely.

Boteler was also responsible for the extensive gardens. Pleasances and ornamental areas for recreation and splendor on the rise post-middle ages, they offered a display of wealth to residents as gardens proved to be more than just functional, the garden was 'a canvas for earthly pleasure and spiritual enrichment' (Woodhouse: 1994). The vast gardens evidence in Fradley's Lidar survey suggest that the early medieval village and mills have now been evacuated or demolished to accommodate such a grand garden renovation (personal communication, Maddocks:2022).

In 1433, Boteler became constable and steward of Kenilworth Castle; the joint appointment became a life tenure on 5th April 1437 (Reeves: 2008) Elements of Kenilworth are very comparable to the surviving 15th century structure. Window style and an exclusive chapel show influence, but most notably are the extravagant gardens and it's very possible Kenilworth inspired many elements of Boteler's gardens, raised terraces, viewing platforms and symmetrical beds are common themes. The tithe barn

¹ *Essenburne Brooke* refers to Beesmoor Brook, a river that syphons directly from River Isbourne to the southern area of Sudeley.

and the chapel also date to this period, the additions making Sudeley a grand rebuild and suitable seat for a Baron.

As a Lancastrian supporter, Boteler suffered massive loss in 1469 with Lancaster's defeat and was forced to sell the castle to Edward VI who subsequently gifted the castle to his brother, Duke of Gloucester then coronated King Richard III in 1483. It was during his ownership that the by far most romantic part of the castle was built. The 'Banquet Hall' was built in replacement of Boteler's eastern range of his inner court. Windows much larger and grander were installed, likely with the purpose to view the extensive gardens to the east.

The castle remained property of the crown until Edward VI gifted the castle to his uncle, Thomas Seymour who married Catherine Parr, Henry VIII's widow. Further renovations were made to the castle that allowed for more grandeur. Evidence of this remains today in the form of 'Katherine Parr's Window'. An oriel window of stained glass overlooking the east side of the gardens above an eastern exit that leads to the chapel. 'Katherine Parr's walk' is still commemorated today where she would regularly leave her residential suite to attend mass at the chapel using her private gentry entrance to the south of the chapel building. Her stay was short, after she died days after her daughter's birth from puerperal fever and was buried in the Chapel of St Mary at Sudeley with Lady Jane Grey officiating as Chief Mourner. The destiny of Parr's daughter, Lady Mary Seymour remains unknown to this date. Her remains are not buried within the chapel and there is very little evidence to determine her whereabouts upon her father's execution in 1549.

In 1554, Mary I gifted the castle to Sir John Brydges, who's descendants held the castle until its surrender during the civil war in 1643. During this phase of Sudeley, alterations were made to the castle including the 'Tudor staircase' to the east of the cross range and new windows were installed to the north range to better suit. In 1643, Charles I temporarily stayed at Sudeley while the royalists made camp and prepared for Roundhead attack. His letter of thanks for support from the Cornwall population was written while he was at Sudeley, and it is displayed across many churches in Cornwall,

such as St Erth where it can be read by the public (Figure). The castle was garrisoned and besieged twice before surrendering for the final time (Dent: 1877, p.270) and left to ruin until 1830 when it was purchased by the Dent family. During this period of neglect the castle was repurposed as farmland and an inn and much of its royal history was forgotten until the discovery of Katherine Parr's place of burial. When first exhumed, it was reported that due to the lead lined encasing, she was perfectly preserved but new spread and more explorers came resulting in the quick decomposition of her body (Longmore-Etheridge: 2017). Remains of her hair and teeth are still on display at the castle. As part of the extensive renovations the Dents carried out, Parr was reburied within the family tombs with a marble effigy in the chapel. Further renovations included the reconstruction of the ruined cross range, now the 'knot corridor', remodeling of the north range to make the castle fit for residential purpose and repair of the chapel roof and interior. An enthusiastic local historian, Emma Dent is largely responsible for the extensive curation of artifacts pertaining to Sudeley.

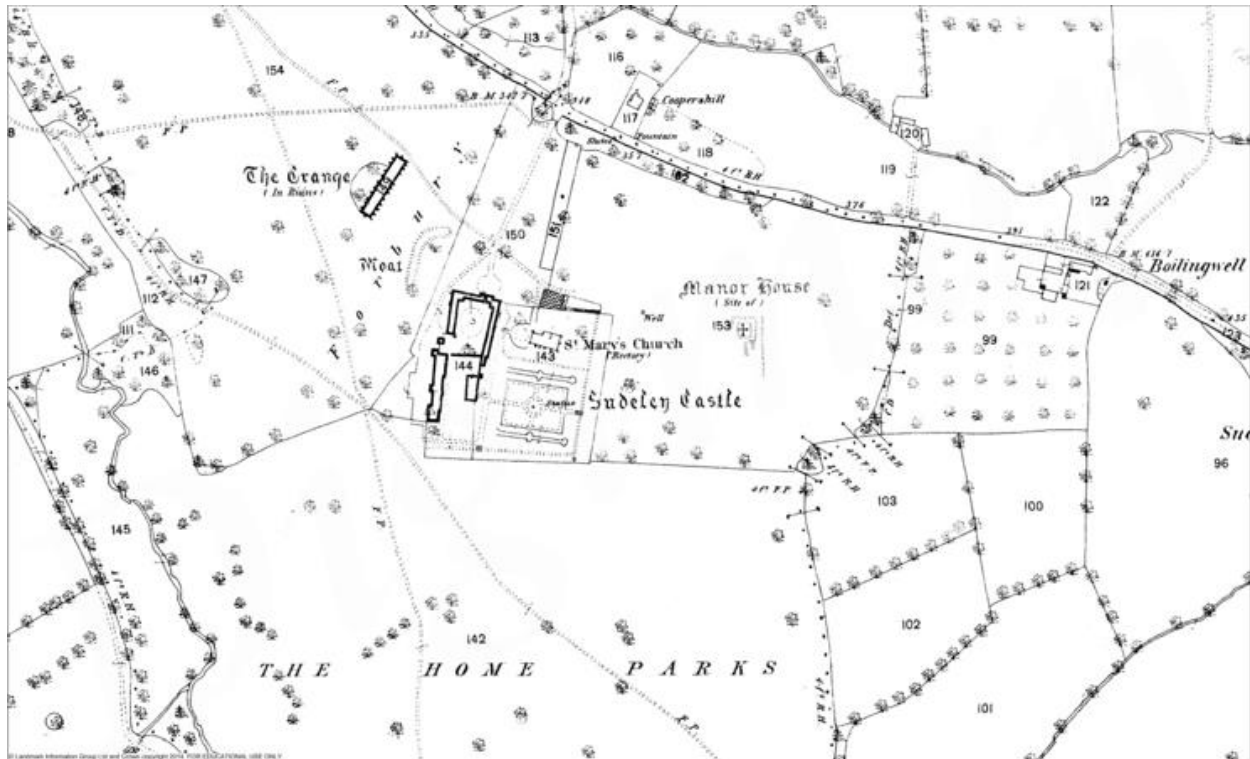
The castle has remained within this family until present day, where it is now owned by and resided in by the Dent-Brockelhurst family, with Lady Ashcombe (by marriage) at its head. The site opened up to tourists in the later 20th century to subsidize upkeep to the castle and estates and has been open to the public since.



Figure 1: Charles I Letter of thanks, St Erth's Church, 1643.

Archaeological Discoveries

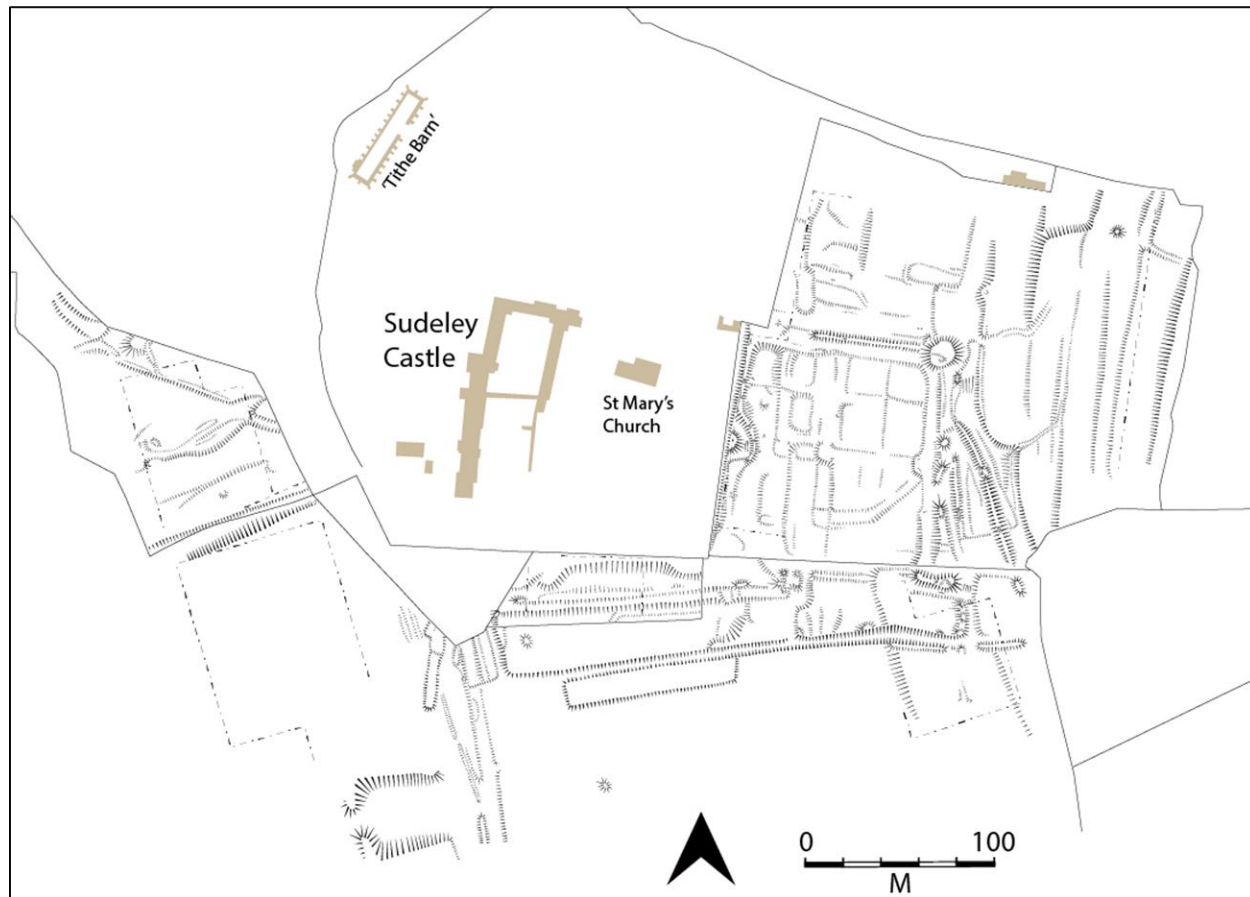
The earliest evidence of archaeological investigation was made by Emma Dent, a previous owner and resident of Sudeley castle who instigated an excavation of the possible location of the Olde Manor House. She located the area using an excerpt of Leland's Itinerary who identified an area that existed 'before the building of the castle, and the platte is yet seen in Sudeley Parke, where it stode (Leland, Vol 2). In annals of Winchcombe she specifically identifies an area 'in the vicinity of the Olde Manor House measuring about sixty by fort pace's (dent: 1877, p.77). She funded the investigation in 1875, and oversaw the excavation and found 'foundations and walls' in this assumed location of the Manor House, therefore presuming the discovery was Anglo Saxon in date. Thereupon this discovery, it was recorded in the 25' 1st edition Ordnance Survey map of 1884 labelled as the Olde Manor House and until recent archaeological work, was unchallenged by descendants of the castle and historians.



(Figure 2: Ordnance Survey Map 1884)

In 2014, Fradley et al conducted a geophysical and archaeo-topographical survey at Sudeley as part of the 'Anarchy? War and Status in Twelfth Century Landscapes of Conflict' project at University of Exeter (Fradley et al: 2014). The purpose of the study was to substantiate the potential insight into the 'Anarchy' period, but provided new details of the time about formal gardens that would have dated to a later medieval and early post-medieval period (Ibid:2014). Lidar depiction of Sudeley reveals key areas of activity to the east of Sudeley in the Hop Field where they identify terraces, symmetrical earthworks and remains of a water feature that are found to be comparable with other examples dated to the 16th or 17th century. A large low mound was identified in the north-eastern corner which corresponded to the 'Manor House' site investigated by

Dent in 1875. (Ibid:2014



(Figure 3: Archaeo-Topographical Survey, Fradley, 2014)

More recent archaeological digs at Sudeley undertaken by DigVentures have determined an alternative explanation for the foundation remains. Two trenches were excavated in 2019, situated to the east of St Mary's Church and over an area of earthworks discovering enclosures that likely relate to a Tudor Garden and banquet house (Jago et al:2021, p.18). Further investigation discarded the potential of a banquet house and determined the foundations were remains of a garden wall, and further trenches revealed a potential water feature and walkways (Duensing: 2022, p.19) which support Fradley's magnetometry survey confirming the existence of raised platforms and garden features (Fradley 2014: p.). Stonework uncovered at the site had ball-flower features, a popular architectural style of the 13th century, suggesting stone from the

demolished Hailes Abbey was repurposed at Sudeley during it's renovations (Duensing: 2022, p.29). Fieldwork by DigVentures at Sudeley is ongoing; currently, they are crowd funding for a potential excavation of the medieval village mentioned in Domesday records (Digventures:2024)

The Reconstruction

Layout

As a stand alone project without professional funding, I immediately met with challenges in creating an accurate layout of the castle. Without geomsymmetry as an option, alternative methods were sought. Using Google maps and a scaled layout plan provided by Derek Maddocks, I was able to trace and build upon these to create a foundation to build upon. Given the project's purpose was to exhibit, rather than scientifically instruct, this was an acceptable form of building. A similar method for reconstruction was seen in 'The Oxford Friars Project', and still provided an effective and informative illustration of a historic site.

Line Drawings

Once the layout was established, progress could be made on creating the 'bones' of the building. Avoiding adding detail to the structure in the early stages allowed less distraction from the building's fundamentals. Correct window placement could be established without concerning the ornamentals and without the hindrance of detail, I could explore the elementary aspects of Sudeley at an earlier stage and edit these while the task was still relatively basic. Edits once detail had been added would create a more time-consuming project. This was a particularly useful method for the reconstruction of the south range. The early version of the south range raised many questions I may not have approached through academic research alone. The height of the south range was a concern, and called into question the function of the remaining banquet roof window, should the south range have met the height of whole wall. Therefore, a major change in this area saw the south range lowered, and a parallel window was added.

Bringing Sudeley to Life

To create an identifiable model of Sudeley in a 3D presented many challenges given limitations in accessible technology at low cost that was suitable for the project at hand. Following advice from Jim Knowles, the co-author of The Oxford Friars Project, (Knowles: 2022) I used Sketch Up to configure the main body of the model, then exported animations to stitch together a video with additional elements for better impact. The definition of the programme is that it is a software based on the 3D modeling in which edges and sides can be modified to obtain the desired result from a 2D image (Carmona-Mederio et al : 2021). The software allowed me to apply measurements and scale to analyse dimensions and appropriate the relationships between objects. While the software has been used to satisfaction for previous heritage modelling (Knowles: 2022), it is met with challenges in other areas where participants report the impossibility of using all software features in the free version (Ibid: 2021). Using the software, it was immediately apparent that there would be limitations with mass use of all features as this lowered the overall quality of the model. For example, shadows, which were a highly anticipated feature to create a more realistic look were not possible due to the software crashing with each attempt to combine multiple scenes with shadows into an animation. However, realistic expectations were maintained for a post graduate research project that was self-funded.

Primary techniques for achieving a visual that was as realistic as the software could allow included softened edges, textured walls, components push and pull and downloaded extensions such as easy roof and vray rendering.

Softening the edges and removing lines gave the model a more seamless look, that was complimented by lighting. This combined with push and pull was used to create good comparison with real life photographs. Windows and doorways were key to maintaining this look by frequently pushing and pulling window frames and to create a 3D look.

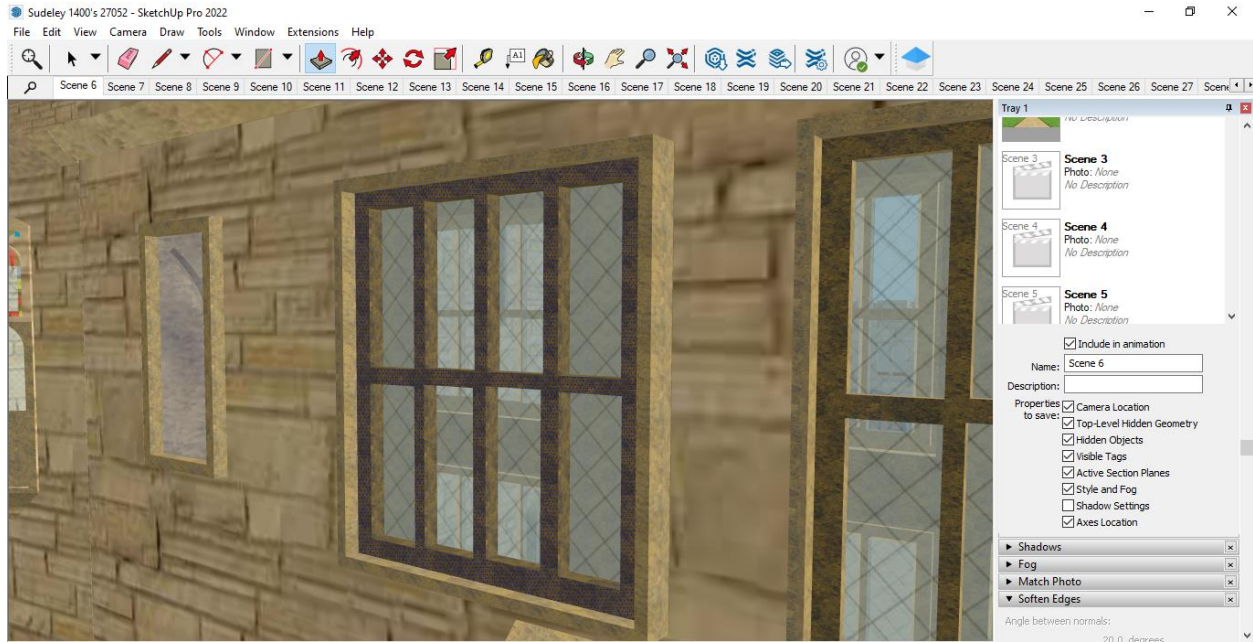


Figure 4 : example of realistic window construction.

Being able to monitor the depth allowed for consistent depth measurements on all windows of the same style to make it more seamless. Altering the shade of stone colour created more depth and imitated shadows where the software could not allow. Paired with the transparent glass imitated a true to life window.

Push and pull played a significant role in creating formal structure of the gardens where components were not available. Raising grass beds to imitate shrubs and topiary overcome the lag that persisted when using multiple components, but also to create a uniform look that was integral to formal garden arrangements.

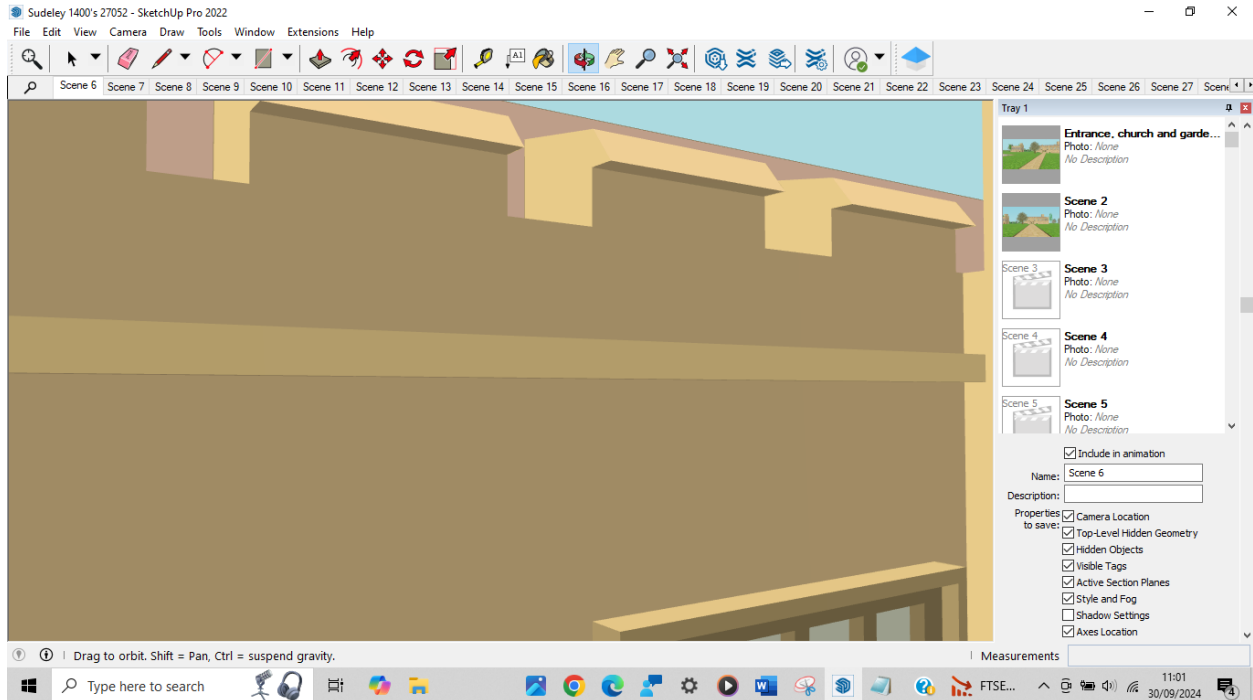


Figure 5: Pre texture and materials added.

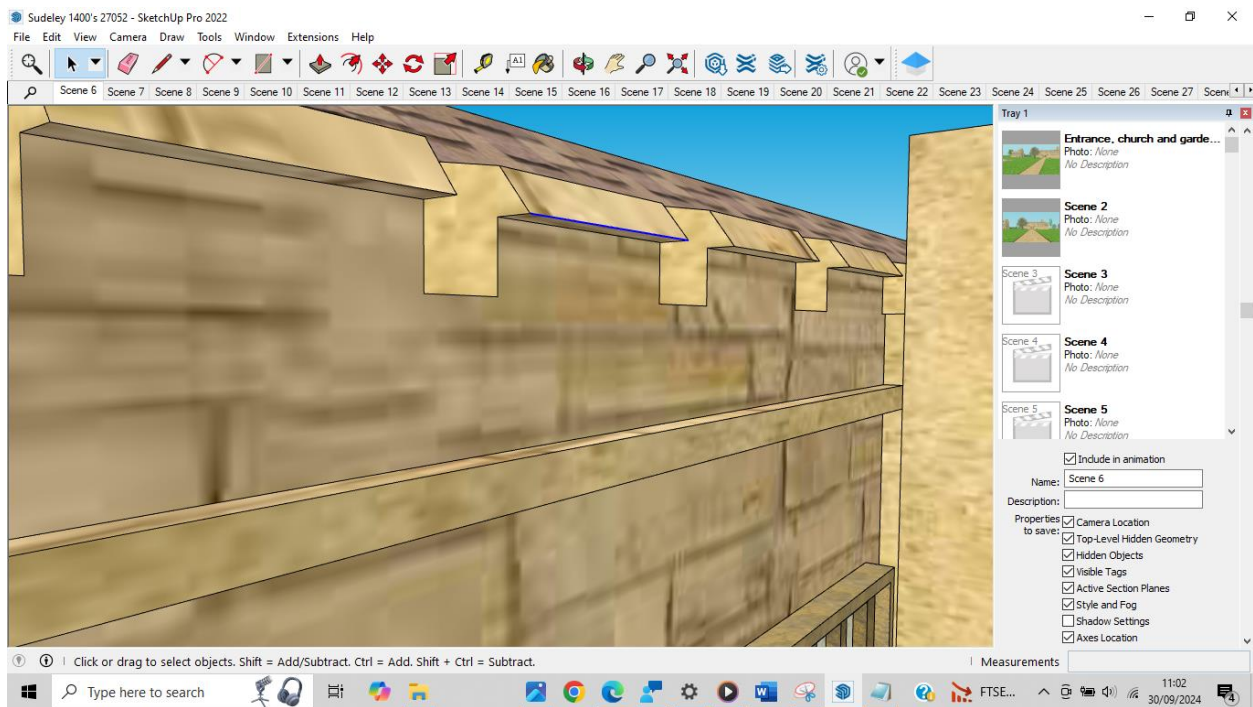


Figure 6: Representative example of finer details to create depth in building structure.

Here, texture was key to creating a shrub look. Filling the area with material texture could again be edited in it's dimension to make shrub detail look more or less prominent

depending on the area. The lowered pathways that had been pushed were given a magnified look, so gravel was more visual, where shrub details were minimised to lessen to preserve a rustic look.

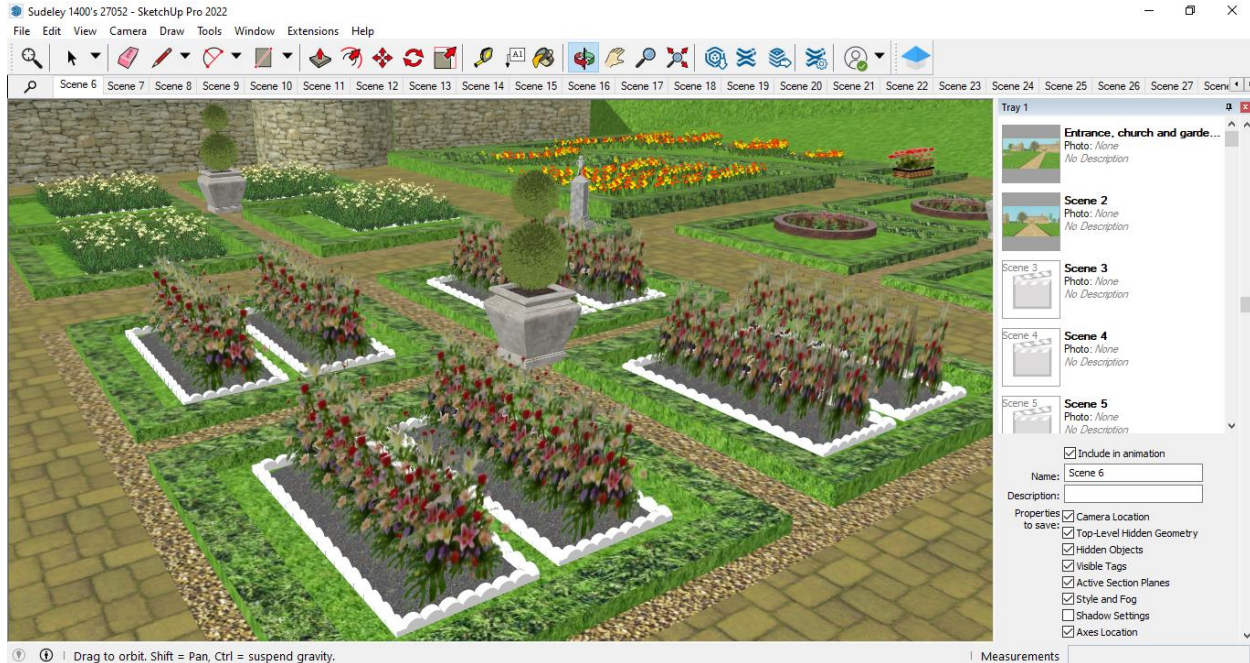


Figure 7: Representative example of use of texture and components.

Texture was further manipulated for rendering. Rendering was a difficult task to accomplish due to limited options for brick. Sudeley's iconic yellow Cotswold stone could be mimicked by editing an original material offered, and the mismatched brick sizes gave the model a more rustic look that related to real life. Pairing this with plane stone colour matched to the brick, but with edited shades was used for windows and doorways. Plain grass was used for the topography and various gravel and paving slabs were installed to separate the pathways from courtyards and plain land.

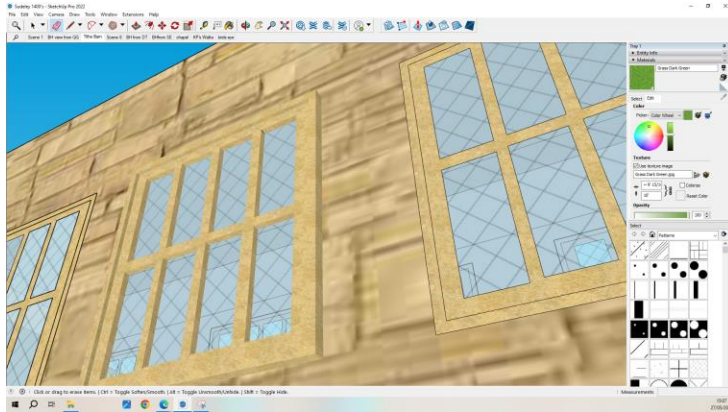


Figure 8: Before and after example of push and pull use to create 3D look windows.

Sandbox and smooove were utilised to create some form of topography too the East of Sudeley. The tool was slow, but effective and with better access to technology, could have been proven to put the model in a whole new dimension but to keep the programme from crashing the use of this tool was limited to one area to preserve the rest of the model. Accuracy of this tool was less than of the building structure, as the Lidar maps did not extend fully to the surrounding areas, but images and photographs provided a good context for this.

Finishing touches relied heavily on components to create a relatable image.

Components mostly used were trees and shrubs to soften the blunt meeting points of castle to floor and trees added dimension to the finished image. Flowers were imperative to finish the garden look and, in a bid to give idea of size, I added a human figure to Katherine Parr's window viewing the gardens. The potential here for dressing the model is massive, unfortunately memory limitations of the software could not make this possible. More trees could have been added, shrubbery to the south and more human figures or animals. Moving components was out of my reach, but this was identified as another potential next step for further modeling of the castle.

South Eastern Suite

Popularly known as the 'Banquet Hall Ruins', its function has never been truly confirmed. The current remains exhibit its elaborate design and provided a good indication of its Tudor form. The outer wall, while in uninhabitable state is largely intact, and foundations of the inner wall of the banquet hall exhibit evidence of a bay window, suggesting the 15th century renovations were inclusive of the whole suite. The rebuild of this area was the most elaborate, assuming a symmetry that would allow for views of the inner courtyard I installed windows on the inside. Given the pattern of windows on the outer wall and the different position of the window frame that is identifiable in the current ruin, I assumed that a high window to continue the pattern could not be possible due to the height difference between the banquet hall suite and the south east tower, parallel to the dungeon tower. Perpendicular brick fragments indicate the end of the hall and the continuation of the ruin south supports the notion of a south east tower. A further window was positioned to mirror the upper north facing window of the banquet hall in the south.

Twin doors were further installed to the adjoining tower mirroring the entrance from the Garderobe tower and consideration taken to the exit doors of the octagon tower was also made. There are currently doors that lead to both the roof of the banquet hall and the garderobe tower. Two functions of this could be considered; firstly it is possible that these areas could be used in conjunction with the fortified element of the original build and rooftops used as a patrolling area, or secondly the area was used for walking and recreation (Goodhall: p.359). Either function is plausible and likely considering the castle's residential turned military status during the civil war. This element dictated my decision to not install gable roofs to the southern range, differentiating it from the northern range.



Figure 9: View of Banquet Hall Ruins 2023

Gardens

The remains of the gardens as seen in present day are a fraction of the original splendour that existed at Sudeley during the 16th century. By this age, the castle was

well established as a royalist residence, and a key factor to Tudor decor was in the manipulation of the landscape. The control over topiary, flowers and format were a key indication of wealth and status.

The surviving Queens Garden is a Victorian recreating based upon the discovery of the foundations of an older fountain SOURCE MEE. The gardens imitate the formal garden complex typical of a Tudor garden and indicate the potential of further gardens.

Sudeley's period of neglect strongly suggest that the foundation would have been Tudor and built during it's opulent era. The key to the digital reconstruction of the gardens was founded in the Lidar survey conducted by the University fo Exeter in 2012. The Lidar analysis focussed primarily on what was referred to as the Home Farm area, or 'hop field' as it is more widely known. Currently, the area is grassland with trees and topographical evidence is limited. Lidar analysis uncovered a very different picture with symmetrical ditches indicative of formal gardens, steeped mounds which are discussed as viewing platforms and further areas that promote the gardens are ore expansive than what is visible today. More recent investigation of the area conducted by Digventure uncovered a garden wall, which when compared to Kent's? Lidar analysis complies with the notion the area was walled leading to a viewing platform for recreational purpose. All these aspects were incorporated into the digital design. I built upon the Lidar depiction, with wider reference to the archeo-topographical survey to create symmetrical structures in the further eastern garden. I added pathways and garden components to give it a grander display using the current Queen's Garden of Sudeley and the Elizabethan gardens of Kenilworth as inspiration.

and the result further justified Richard III's elaborate window installation. The view from the eastern chambers would have been exemplary and fit for court style. Previous theorisation that the gardens would have been reminiscent Kenilworth are justified, with the sunken structure, walls and layout. While Boteler's involvement with Kenilworth would have pre-dated their Elizabethan garden, the former gardens there would have at

least been a good pre-cursor to his building plans. As Sudeley was described as 'ahead of the times' for it's day, and even a foreshadowing of Hampton Court, it would be reasonable to assume he began the garden expansion and planting before it was perfected and gentrified by the Chandos in the Tudor period.

South Range

The area of the south range is grassland, with no topographical evidence visible to the naked eye. Fradley's Lidar shows some faint potential for walls, but the object of his study was the surrounding area, and the archeo-topographical study omits the residential area. While there is little scientific or archaeological records to prove there was in fact a south wing, it is safe to assume there was due to many primary references to the 'double courtyard' that Boteler built. The embellishments to the masonry of the southeast are of later date and it is not clear whether these refurbishments. As there are no archaeological records of the actual layout of the south wing. I studied the state of the current ruins to create an assumption of what the southeast area would have looked like. Protruding stonework to the right of the first-floor bay window indicates a missing wall. Evidence of a window matching the designs of the latter 15th century refurbishment led to my decision to continue the aesthetic across the whole east wall. As there are no painting or surviving descriptions of the rest of the wing it is unclear how far these refurbishments went. I imitated Boteler's astringent window design and door placement for the south cross range assuming the arch in the cross range was also incorporated. The east facing door on the ground floor of the dungeon tower, and the adjacent door at the foot of the circular steps provided an insight into where the south range would have been. There isn't much surviving evidence to prove it's exact location but the floating door (now a window) on the first floor of the circular steps indicates there would have been access to another floor. Lysons's line drawings depict a low ruined wall that ran perpendicular to the current tower and banquet hall ruins during the period of neglect;

this is a good indication of the south ranges parameters and support the theory that the whole south range was enclosed. Furthermore, watercolour paintings at Sudeley's archive illustrate occupation of the area that may have been built on old foundations, and Buckle's artwork in 1832 show low walls in the area that could be accounted for as a sister tower to the dungeon tower. Using these as a starting point and viewing the building as it stands today, I estimated that the outer wall would run between the two doors and estimated it's width to finish parallel to the end of the banquet hall ruins. This created a space that was similar in size to the medieval cross range, creating a balanced measurement to the castle which satisfied my resolution. A small bay window was also included on the ground floor mimicking the foundational evidence of a larger bay window on the ground floor of the ruins. It is likely the bay window of the south east range was added by either Richard III or Boteler to fulfil the residential aspect of the range, and provide space for leisurely viewing of the privy garden. The smaller bay window that is included is merely a continuation of this theme and signify the area as residential or principal. It is also an ode to the potential theory that this area was once the site of the great hall as proposed by Emery (Emery: 2006, p.172). It's proximity to the kitchens and southern light makes it plausible, but not definitive. A further doorway was added to provide access from this range to the inner courtyard, as would be likely given the residential status of the south range.



Figure 12: Lysons, 1803

Figure 13: Sudeley Archives, unknown date.



Figure 14 : Buckler, 1810.

North Range

The north courtyard is the most recognisable area of Sudeley as it presently stands. Drawings, lithographs and paintings all depict the

area with striking resemblance to its current form even before disregarding Victorian upgrades. The first-floor casement windows are all Chandos contributions. Outer court ground floor windows are noticeably absent in illustrations prior to the renovation but the inner north court still has Chandos' two-storey range lodges that are immediately accessible from the courtyard with individual entrances. Given that during the 16th century era, the southern and southeast ranges would have still been intact for residential purpose, there is a strong likelihood that these lodgings were reserved for guests or had a household function. Absent windows on the outer walls of the ground floor can be attributed to Boteler's initial fortification of the house. In the absence of a surrounding moat or curtain wall, the lack of entry from the outside allowed for a better resistance. Indeed, this is evidenced in the north range's survival after the civil war. The southeast suite, once ornate but very open in design, would have been a weak spot for entry leading to its destruction.

There is no visual depiction of stables for the castle, or evidence of a structure that fit its purpose. Giving the grandeur of the house lands, and prominent royal guests, it is reasonable to assume that the stables must have been part of the castle itself. This layout of lodgings, stables and double courtyard floor plan is comparative to nearby Thornbury castle. Sudeley's northern range would easily fit a stable to the west gateway,

a convenient location for storage and horses on arrival. Illustrations show this area north to the Portmare tower as vacant or with a gateway. The stables being located here would be suitable for its purpose and follow other leading layout trends of the time.

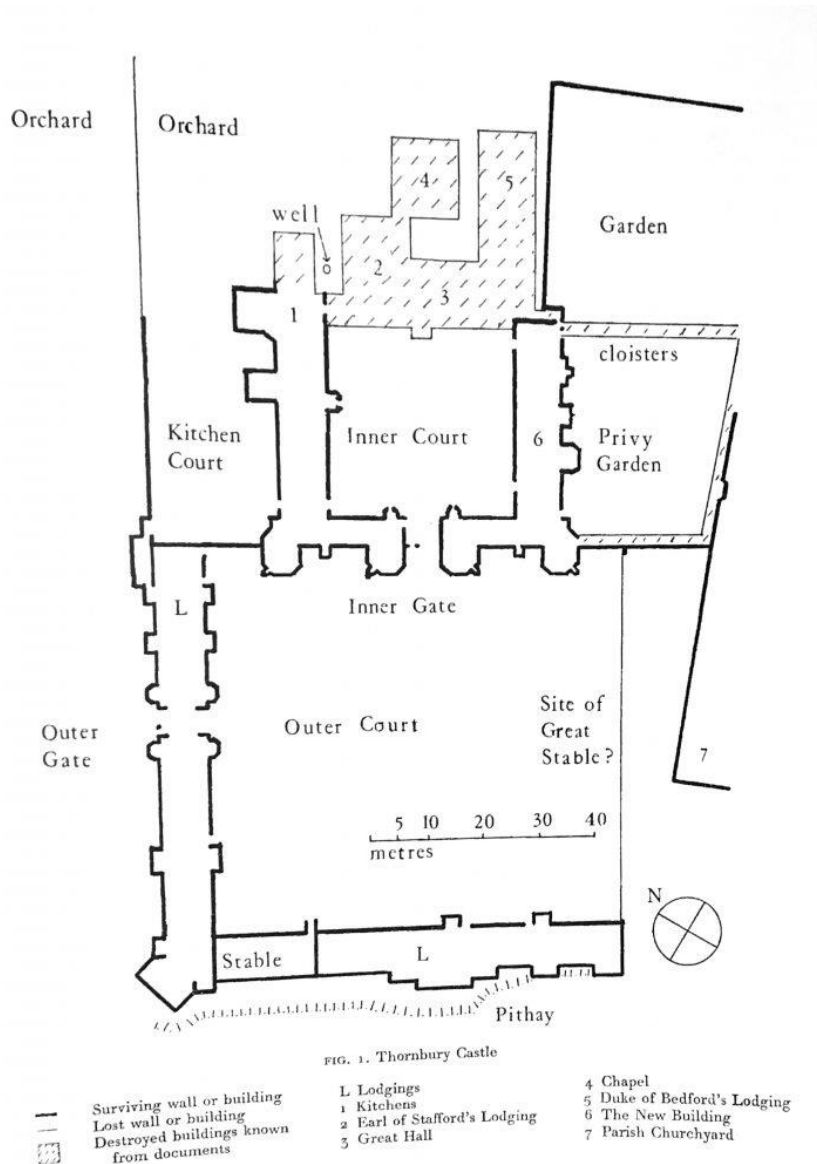


Figure 15: Floorplan of Thornbury Castle

Further addition to the north range is the small side building to the north west, its lack of decoration suggest a servants function but this can not be determined.

Cross Range

The current structure in the cross range, known as the Knot Corridor was constructed in 18—during the Victorian redevelopment of the castle. Evidence of the earlier cross range consists of a medieval arch to the East of the range, which was subsequently blocked up during a renovation at an unknown time. The vaulting corbels, arch and wall ends give a rough indications that the range would have been approximately 18 feet wide. The purpose of this area is debatable, Walter Godfrey suggests this area to have housed the Great Hall, as depicted on his ground floor plans of the castle in 1930 (Godfrey: 1977) which is easily disputed considering the area is likely to have been the most narrow range of the structure.

Creating the cross range relied on line drawings of the ruins, photographs and physical inspection of the remaining arch. The twin doors offer good indication of the first floor, likely leading to a long gallery with view into the privy courtyard. Given no evidence of window placement, size and shape the 3d construction is traced from following suite of other areas of the castle. It is unknown how much of the cross range was renovated during Richard III's ownership or the Tudor period, but as nothing remains, the build features windows more aligned with Boteler's style with less adornment. Less and smaller windows distributed across the bottom to provide privacy from the working courtyard to the inner courtyard. The cross range is typical of Tudor builds, but would have been forward for Boteler's construction time. At Sudeley, the cross range would have been integral to separating the administrative and working area of the castle from the residential. Whether use of the cross range being as part of service or residential remains unclear, but its convenience for travelling between towers and twin doorways suggest frequent service use.

The battlement feature in the cross range to continue the garrison aesthetic that Boteler initiated.



Figure 16: View of medieval arch in missing Cross Range area, 2023

South West Range

Most of the current walls in this section are of Victorian refurbishment. This is evident given visual assessment of the current structure where the Victorian brick is significantly more yellow and has a smoother render. This area, well known and identifiable has

historically being the kitchen area due to the large chimney stack, is of primarily Victorian build. 19th century Lithographs depict the west facing as derelict (Figure 16) but a print from the 18th century shows the wall at a fuller height with a large window that spans over two floors, a likely inspiration to the Victorian rebuild. Tentative attention is made to this drawing due to the inaccurate location of the Tithe Barn and chapel, but overall the image resonates with other comparative images. Therefore, the window is included in the 3D model. It is likely the kitchen and service area here spanned over two floors, but this would call into question the exit in the spiral staircase that would naturally lead to a second floor. A balcony area, offices or storage facility that did not spread across the whole area is possible. Today, there is a subfloor exhibition area with modern steps that lead to a long gallery through a modern door. It could be possible this subfloor area was limited and not in connection to a whole first floor area as it stands today. For the sake of the 3D model, I incorporated the long window, with the suggestion the area was not split between floors.

The parapet was continued, as it's suggested in Bucks drawing there was evidence of it pre-destruction. The juxtaposition of the kitchen and the inner courtyard dictates the choice of window placement on the inner side. If following the theory that the kitchen was two stories, then windows on the ground floor could be omitted to save provide more privacy for residents, erase unwanted views of servants at work and reduce noise.



Figure 17: Wyatt, 1856

Figure 18: Shauni Waller, 2022

St Mary's Chapel and Tithe Barn

Both buildings are recorded as Boteler's addition, making it a 15th century construction. The Tithe Barn has suffered minimal preservation and is now a ruin feature of a garden, whereas the chapel was restored by the Victorians and remains functional to this day. With the chapel roof the primary fault, the walls and small adjoining chapel remain 15th century work, which allowed for a depiction that would closely resemble it's look during the Tudor period.

Using measurements and google earth, I could map a locations of the church and tither barn with accuracy. The exterior shell of the church is evidence of Boteler's original build, with the interior largely of Victorian refurbishment. An original stained glass window in the chamber on the north side. What is locally referred to as 'Katherine Parr's window' on the south side is still evidenced and it is widely believed by Sudeley staff that there a pentice once allowed private travel for gentry from the south side of the castle to this window of the castle.



South West View of the Chapel at Sudeley Castle.

Figure 18: Buckler, 1810

Moat

The moat and its location was very difficult to determine, even with Fradley's Lidar, the potential locations for a moat were numerous. Indeed, this could support the notion that there may have been smaller ditches that connected as one but given the complete lack of any depiction of this in any pre-Victorian illustrations, and Leland's itinerary entry not being specific, I determined it would have been unlikely to have remained in the Tudor period. I couldn't disregard the moat altogether; therefore, I placed it where a uniform body of water exists as decoration at Sudeley, and felt the pond-like structure of it was reminiscent of other Tudor properties such as Hampton Court Palace and kept it there.

Conclusion

The humanities are nothing if not born of humanity's past, to explain to us what it is to be human now, to lead us to imagine what it might mean to be even more fully human in the future' (E.Gardiner: 2015, p.181). Considering this viewpoint when discussing the project outcome, it is reasonable to acknowledge that now digital platform could supplant the human experience of an exhibition; and while the purpose of this project was not to replicate such an organic experience for exhibition, it does alter the lens of which I have viewed the result. Obsession over detail surmounted unreasonable expectations in areas of which the software used undoubtably fell flat. However, producing a 3D model inspired by discussion and theory that surrounds the castles history had a positive impact on construction. The ambiguity of the Great Hall location, which until now has been speculated to be in three separate areas of the castle, can be understood better when viewing the missing ranges, their size and location in 3D. Given the floor area and height of the other ranges, it's location in the eastern suite is most likely. Furthermore, viewing the model as a working royalist residence, other questions posed along the way such as stable location were given the opportunity to be answered, albeit the answers aren't concrete, but serve better in visual capacity. SketchUp as a digital heritage tool has barriers. While accuracy and potential tools within the software were a positive contribution, limitations were many. Memory space and lagging incompatibility were troublesome, and resulted in areas that would be revisited, particularly the topography. Moreover, the potential for more in depth walkthroughs inside the house, as initially hoped, would have given the reconstruction a better exhibition quality. Components and memory space would not allow for this; with an upgrade in the software and wider range of components this could be very achievable. It would also be interesting to see this project work in conjunction with new virtual reality technologies, a process that is compatible SketchUp.

Given that there has not been a digital remodeling of the castle yet in its research history, it still provides the three elements of exhibition that Mckenna covets: problem solving, way-finding and sparking curiosity (Mckenna, 2013: p.132) and I therefore consider it a success, opinions were positive from Sudeley's archivist and has struck a new conversation regarding the cross range and it's original use given the projected size of it in the model.

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