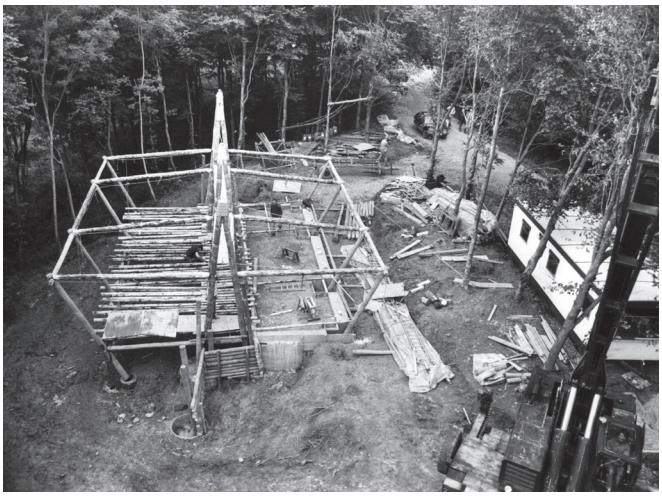
How we Make Houses with Trees

“What is necessary is to make buildings with the lowest amount of energy. I’m not interested in the movements of brutalism, post-modernism, deconstructivism. All these fashions are complete nonsense. It is nonsense to follow these fashions, just do what you have to... it is very clear what is unsolved”
– Frei Otto

Laugier's Primitive Hut

Dimensional Timber



Prototype House, Hooke Park

Suburban Housing, William Garnett

BACKGROUND

"If every project is a one off we're really wasting a lot of time." – Alfredo Brillembourg

Countries around the world depend on the construction of new homes to support ever growing populations. The UK alone estimates a need for approximately 250,000 units per year to support current demand.

Internationally, the work to construct and maintain our built surroundings represents up to 40% of human caused carbon emissions each year. Timber housing research represents an important opportunity to reduce the environmental impact of what we build.

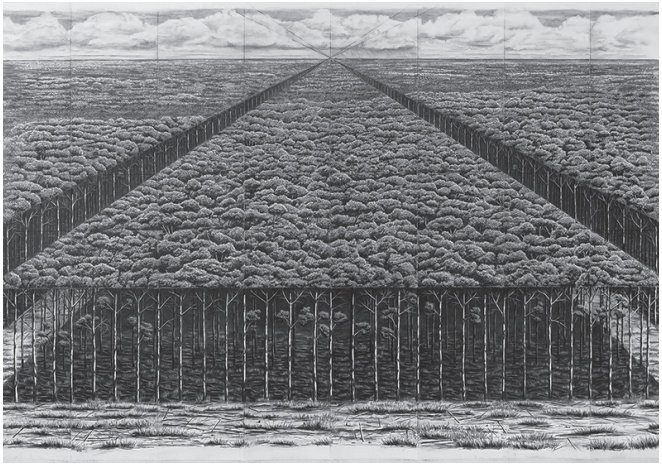
Around a third of the UK's houses built last year were constructed with wooden frames of some kind. While increasingly efficient, predominant methods of construction take a reductive view of the most incredible material source we have – living trees. In seeking to use as little material as possible, the methods depend on an approach which repurposes waste in place of reducing it.

Architects work on approximately 6% of the new homes constructed each year in the UK. As architects we too often design something once and then move on. A shift of mindset away from the one-off might enable architects to reclaim responsibility over the quality of our built environment.

With building and design activities so often strictly compartmentalized, and when existing manufacturing processes are taken for granted (plucked off the supermarket shelf), it is not surprising that the environmental impact of buildings remains under considered. All design should begin to take account of their total energy balance.

Hooke Park presents the ideal venue to explore unusual ways of building houses from trees. Building upon previous research undertaken in this space we will together develop new proposals for the way in which houses can be made from trees with the commercial market in mind.

Repeating the Forest, Giuseppe Penone



Trees by Man, Michael Amery

Manifest Destiny, Jason Griffiths

Woodland Cabin, Design + Make

ASSIGNMENT

"Modernism is about the best for the most for the least." – Charles + Ray Eames

This year we will pursue novel ways of making houses from trees. We seek systems which are both unusual (and unexpected) while also efficient.

The system eventually developed will be demonstrated in a one-off construction designed for the Hooke Park campus, but it must have a view to the commercial market – including the potential to be further developed and repeated often.

Wood has served as an essential structural material for millennia and yet it is some time since we have done something truly novel with the wooden house at scale. While the prolific 2" x 4" frame or the more recent mass timber home become more efficient each year, they continue to depend on a view of timber as little more than 'tree stuff' – readily shaped to our demands. We want to question the reductionism of these approaches.

More timber in construction is not simply better. In place of pure cost or carbon capture we want to account for the effects on our labour, our economy, our health, and crucially our surrounding environments (including living and non-living neighbours).

The process assigned will not start from the design of a specific home's floorplans. Similarly we will not be concerned immediately with the latest work of other schools of architecture. Instead we will start from understanding how we have built wood houses in the past – understanding the origins of the 2" x 4" (and why it measures in at 1.5" x 3.5" instead), as well as reflecting on what indigenous peoples and traditional builders understood that we appear to have forgotten.

Having completed this research we will move on to a phase of systems development where we will refer to previous Hooke Park methodologies in order propose a new way to build. Only with this system established will we move on to spatial/detail design phases. Supplementary pages to this brief will be provided as we enter each new phase.

DETAILS

SUBMISSIONS

Full submission details can be found in the D+M Student Handbook. In brief, submissions for this project will include:

- Group Case Study Book (non-assessed)
- Fabrication Chronicles (Terms 2/3)
- Design Portfolio
- Thesis (+ draft submission)
- Project Portfolio (individual + group)
- Project Film (non-assessed)

BUILT DEMONSTRATOR

The scale and location of the built demonstrator that we will develop together with the Hooke Park team this year is not specified at this stage in the brief. It will be addressed in more detail as we near the 'Spatial Coordination' phase.

Decisions on the demonstrator's scale and location will be based on a number of factors which include: implications of the system developed; available approved budget; the impact of COVID-19 (for example on whether a HP Build visiting school can be hosted this September); and more.

APPROACH TO THESIS

While we work together towards one built project you will each find particular focuses and interests within the project's research. Your thesis work should come out of these interests, and take aspects of the work further – in particular making connections outside of the Hooke Park context.

PHASE 1 – DESK RESEARCH

We will start this project with a thorough investigation of notable existing systems of timber house construction. Case studies are to be developed through analytical text, drawings and made objects. Each group member will select one of the topics below to be developed individually. The group's research will be presented in order to receive further input before submitting. Individual efforts will then be brought together and submitted (non-assessed) as a single unified document. The result should be a thorough (if condensed) history of how we have built houses with trees. Case Studies:

- A/ Heavy Framing – Understanding integral differences between Eastern vs Western approach
- B/ Light Framing – The 2" x 4" frame as built entirely on site or prefabricated
- C/ Mass Timber – Connecting traditional modes of log building to contemporary CLT
- D/ Vernacular Frames – The A-Frame and a second indigenous timber form which understands forces
- E/ Prototype House – Revisiting the first building made in Hooke Park in relation to our own project

NOTES

- For case studies A-D your first step will be to select two specific historical buildings for study. These will be confirmed with your tutors. For case study E you should include within your focus connecting the intentions of the Prototype House to ideas developed in other buildings constructed in Hooke Park.
- Each case study must include the thorough 3D modeling of your subject buildings including at a minimum all timber elements.
- Physical model making and larger scale mock ups should be constructed and documented as a part of the work.

WHAT TO ADDRESS

The exact format of each case study will vary in response to your subject. They must both identify specific examples of the system while also understanding more generally the system itself.

Fundamentally your case study should convey what you feel is its best quality (pragmatic and fantastic) and worst of this system. Further questions to address may include (this list is not prescriptive or exhaustive):

- Where have these methods been most prevalent? Why?
- How does the building type connect to the ground?
- How much timber does it use to enclose a certain volume of timber?
- What is the volume of other materials? (approximate)
- What size of timber elements are required? Which species are often used?
- Where are the timber elements typically source from (how far)? What kind of machinery is involved?
- How are vertical loads resolved within the structure?
- How are lateral loads resolved within the structure?
- How have these systems evolved since their first application?
- Moisture of timber used? (i.e how much energy has been expended for the material?)
- How is timber protected? (Durability)
- Length of construction period
- How is its insulation/envelope typically achieved?
- What material supply/tool inventions support the development of this system?
- Flexibility of system? (i.e. what kind and forms of buildings may it support)

JAN	**TERM 2**	**PREPARATION**	CASE STUDY ASSIGNMENT
FEB		**CONCEPT DESIGN**	PRESENT RESEARCH SUBMISSION OF CASE STUDIES BEGIN SYSTEM DEVELOPMENT
MAR			PRESENT BUILDING SYSTEM
APR	BREAK	**SPATIAL COORDINATION**	DEMONSTRATOR DESIGN (INDIVIDUAL) BEGIN TO IDENTIFY THESIS TOPIC DEMONSTRATOR DESIGN (GROUP)
MAY	TERM 3		FINAL REVIEW OF DESIGN
JUN		**TECHNICAL DESIGN** *PROJECTS REVIEW EXHIBITION BUILD*	PROJECT DETAILING SUBMIT PORTFOLIO + LOG
JUL	TERM 4A	**MANUFACTURING + CONSTRUCTION**	PROJECT DESIGN SIGN OFF REVIEW MATERIAL SOURCING START
AUG			JIG AND TOOL PRODUCTION START
	BREAK		
SEPT	TERM 4B	*HP BUILD VISITING SCHOOL START*	SUBMIT THESIS DRAFT FULL BUILD ACTIVITIES COMMENCE MSC COMPLETION
OCT			PHASE 1 STUDENTS ARRIVE BUILDING HUSTLE
NOV		**HANDOVER**	THESIS WORK CONTINUES
DEC			BUILT DEMONSTRATOR COMPLETE
	BREAK		
JAN	LAST STRETCH	**USE**	FINAL PROJECT JURY SUBMIT PORTFOLIOS + THESIS

REFERENCES

The projects and readings below are not an exhaustive list. Each is in some way interesting to the project we are beginning together. As a group please plan to expand this as we go along!

PROJECTS / THINGS

- Those constructed previously in Hooke Park
- Blunk House // JB Blunk
- Blumer Lehman facilities
- Burton House // Richard Burton
- Cambio (exhibition + text) // Formafantasma
- Cork House // Matthew Barnett Howland and Dido Milne
- Drawing Matter Archive // Hugh Strange Architects
- Dymaxion House // Buckminster Fuller
- Fir Tree House // Frank Lloyd Wright
- Fisher House // Louis Khan
- Haida House // British Columbia, Canada
- 'Half of a Good House' // Alejandro Aravena
- Integrated Centres of Public Education (CIEP) // Oscar Niemeyer
- Leg Splint // Eames Office
- Maison Démontable // Jean Prouve
- Maison Domino // Le Corbusier
- Mjøstårnet // Voll Arkitekter
- Ökohaus // Frei Otto
- Pictou Landing Health Centre // Richard Kroeker
- Ripetere il Bosco // Giuseppe Penone
- Schindler Chace House // Rudolph Schindler
- Sears Modern Homes
- Segal Self-Build Method / Walter Segal
- Trelleborg Long House
- Vacation Home in Leis // Peter Zumthor
- Weald and Downland Living Museum
- Whole Trees Structures firm
- Winter House // Hans Peter Dinesen
- Wilkhahn Production Pavilions // Frei Otto
- Forests of Fabrication // dRMM Architects
- Waste House // BBM Architects (Brighton)
- 20K House // Rural Studio

READINGS

- A First Collection of Ideas for the Use of Wet Timber // Frei Otto
- Why build in wood when there are so many better materials? // Alex de Rijke
- Embodied Information in Structural Timber // Emanuel Jannasch
- How Buildings Learn // Stewart Brand
- Into the Woods // Harvard Design Magazine
- Lo-TEK Design by Radical Indigenism // Julia Watson
- Low-Cost Wood Homes for Rural America: Construction Manual // US Department of Agriculture
- Manifest Destiny: A Guide to the Essential Indifference of American Suburban Housing // Jason Griffiths
- On the Forces that Shape Trees, or How to Steal Order from the Molecular Storm // Salmaan Craig
- Operating Manual for Spaceship Earth // Buckminster Fuller
- Patterns 8 (Article on Hooke Park) // Buro Happold
- Rethinking Wood // Sections by Kiel Moe and Martin Self
- Shelter (first and second editions), Lloyd Kahn
- The Architecture of a Well Tempered Environment // Reyner Banham
- The Architecture of Trees // Cesare Leonardi and Franca Stagi
- The Modern Timber House in the UK: New Paradigms and Technologies // Peter Wilson
- The Timeless Way of Building // Christopher Alexander
- Timber Buildings in Britain // R.W. Brunskill
- Timber Construction Manual // Herzog et al
- Wood Urbanism: From the Molecular to the Territorial // Daniel Ibañez, Jane Hutton, Kiel Moe
- The International Book of Wood // Hugh Johnson

PHASE 2 – CONCEPT/SYSTEM DESIGN

Having spent the past five weeks studying the ways in which people have built wooden houses, it is time to bring our focus closer to home, considering in detail the various buildings found in Hooke Park. We will react to them over the next six weeks to develop the roots of an alternative approach.

In looking around Hooke Park you will find a range of buildings which have each demonstrated innovative approaches to creating structure from non-standard forest products – unique within the history of wood building. Yet on closer observation you will see that with few exceptions these buildings rely on conventional insulating systems, doing little outside the norm to achieve controlled environments.

This we want to question. Dwelling in a home is about comfort. It is about insulation (shelter) from various factors. Through your case studies you will have understood that at the scale of the house there is an intimate relationship between all performative aspects of a building (structure, thermodynamic properties, acoustics, aesthetic experience) very different to larger typologies.

Having thought carefully about the energy embodied in the physical production of wooden houses we want to now consider as designers the energy transfer and general energetic performance of the house during its life. Our ambition remains to reduce the application of energy to a minimum; how can you achieve this with forest products as your primary material?

The Task

For the next 2-3 weeks we will design interventions which address performative problems you will identify in two particular buildings on site: Westminster Lodge and the Woodland Cabin. Prototypes should each be conceived with a specific intent and you must find ways to measure their performance. Their installation should not damage the buildings and should be discussed with your tutors.

Notes and Things to do

Each of you should spend at least one night sleeping in the cabin. Use this time to understand the performance of the building.

Don’t obsess over having brand new ideas. You’ll find that most have been tested in some form somewhere. Observe what’s been tried, and from this seek new possibilities.

Use all tools at your disposal. Think, draw, make and write to get there. Talk to every member of the Hooke Park team as you do.

A few things to do as a group:

– Continue to develop our project manifesto inspired by the reference text by Kiel Moe

– Make a large calendar for the studio space to begin charting the year

– Hang references you’re interested in in the studio. We will add to this with you

PHASE 3 – A SMALL RESIDENCE

PLANS FOR APRIL

It's time to begin drawing a building. Through Term 3 you will build upon the case studies, prototypes and assembly that you've developed through Term 2 – evolving these first ideas towards a matured building system. Before that, over the break we want you to begin to apply your understanding of the implications of the systems emerging to thinking about a specific building that you will fabricate together throughout the summer and fall terms.

Use drawing (in all mediums) as your primary tool for exploration in this period. You are encouraged to discuss ideas emerging, but please do pursue them individually.

This year's brief is for a small residential space within the campus' planning boundary. It is suggested to be developed as a room and a half, and should offer users comfort (as you define it) in two modes:

> First, as a space for short term residence for a visiting researcher or artist (certain needs of their occupancy may depend on access to external facilities such as the lodges)
>
> Second, as an inspiring space for a meeting or quiet working session away from the workshop's many distractions (aim to provide an arrangement suitable for groups up to 4 or 5)

Don't look to perfect a single proposal over the break – as we will not simply choose between five ideas. Instead we will develop a project from the strengths of many ideas from each of you. At the end of our first week of Term 3 we will have a design review with a few friends joining us to discuss what's on the wall – bring everything!

SCALE

The dark room and cabin are our starting reference points on site for the intended scale (approx 20-25 SQM). Set out from the smallest configuration that will be comfortable and allow it to grow only as it needs to. Our ambition is to work towards an innovative construct which not only provokes a rethink of how we build with trees, but also demonstrates clearly the potential of your building system to be applied at scale (measured in number of units as much as size) beyond the boundaries of Hooke Park.

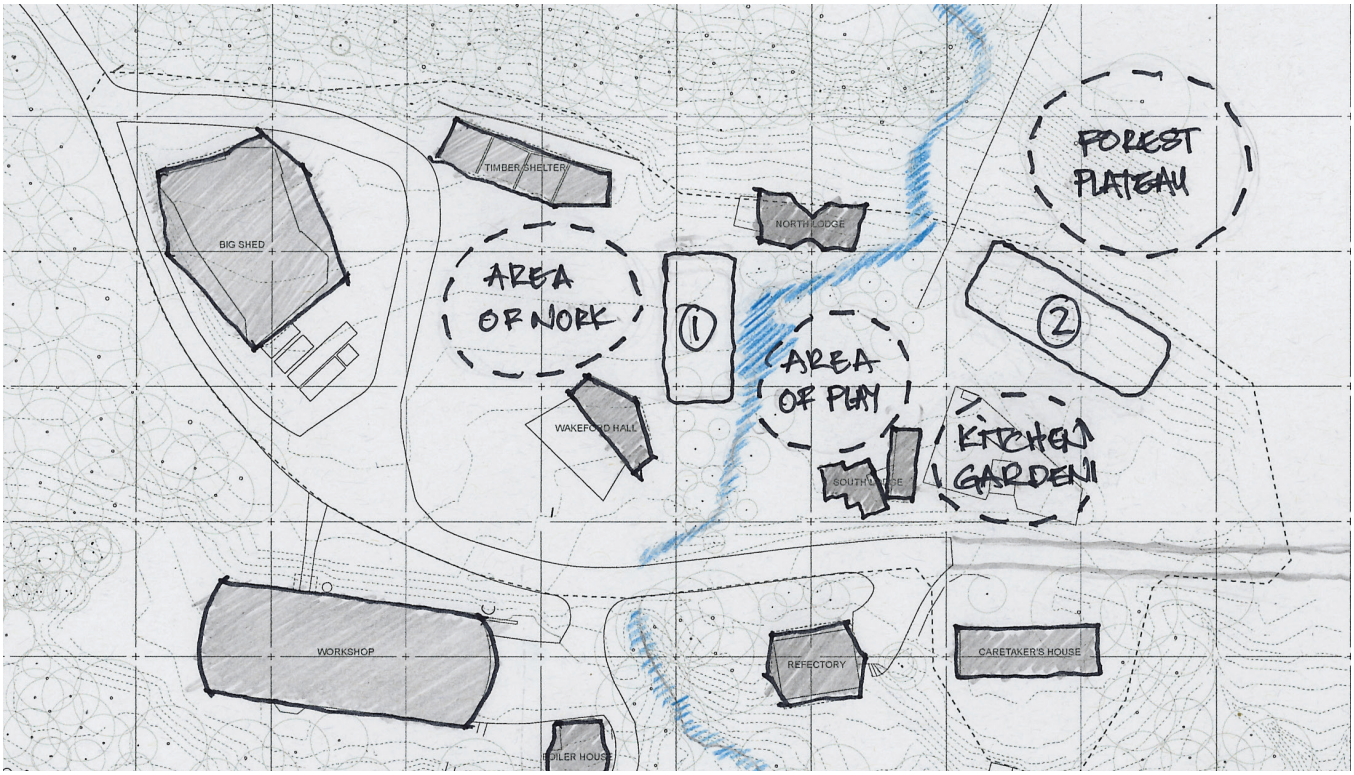
It must include a bed and large clean work table.

It may not be the place to cook a feast, but consider what is needed to make a coffee and a light lunch.

SITE

Ten more houses of varying scale are intended to be built within the north-eastern area of Hooke Park's campus. For many of us it is difficult to see abstractly where they should best be located; recent improvements to the campus such as the pond and enlarged kitchen garden have begun to reveal critical elements and characteristics which are felt to be missing from the site's masterplan. As your predecessors work has, your work this year will be critical to informing what should come next.

Two sites are proposed. Each has potentials, responsibilities to the campus and certain implications.



SITE 1: BETWEEN YARD AND POND

Location
– along the western edge of the pond
– south from North Lodge towards the Library

Potential
The western edge of the pond remains an under considered area of the campus. Separating the working yard from living spaces, the houses which are eventually intended to rest here will need to address varying conditions of landscape and programme together.

Responsibility to Hooke
To help establish a level of privacy between living spaces and the work yard. To give definition to the circulation in this area, learning from desire paths.

Implication
Near any tool on site will be able to access and be used on this site. Here you can test the building system with minimal constraint.

SITE 2: MOVE IN TO THE WILD

Location
– above the kitchen garden
– east of North Lodge below the steep slope

Potential
A number of larger accommodation units will be erected in this area in years to come. In pioneering into this part of the land you will both test strategies which might be reapplied and built upon and literally help to clear the land - understanding well how to build on a wet site.

Responsibility to Hooke
To clear the way towards this unopened area of the campus, following the direct lead of your previous Phase 2 colleagues' work in the garden.

Implication
Large vehicles will not be brought to this site. How you get materials to and erect them on site will therefore have a critical influence on the building.

NOTES TO WORK FROM

Engage carefully with both of the available sites, testing ideas which may be applicable to one, the other or both. We will decide on our project site together after the break based on your work.

What you build will take on a meaningful role on the campus; consider this from the start.

Draw at all scales. From the detail of a window to how you understand the building's relationship to site and to ground. Each time you draw a corner in plan, remember that you are not working with concrete, and that this turn will have implications on how the wall is built.

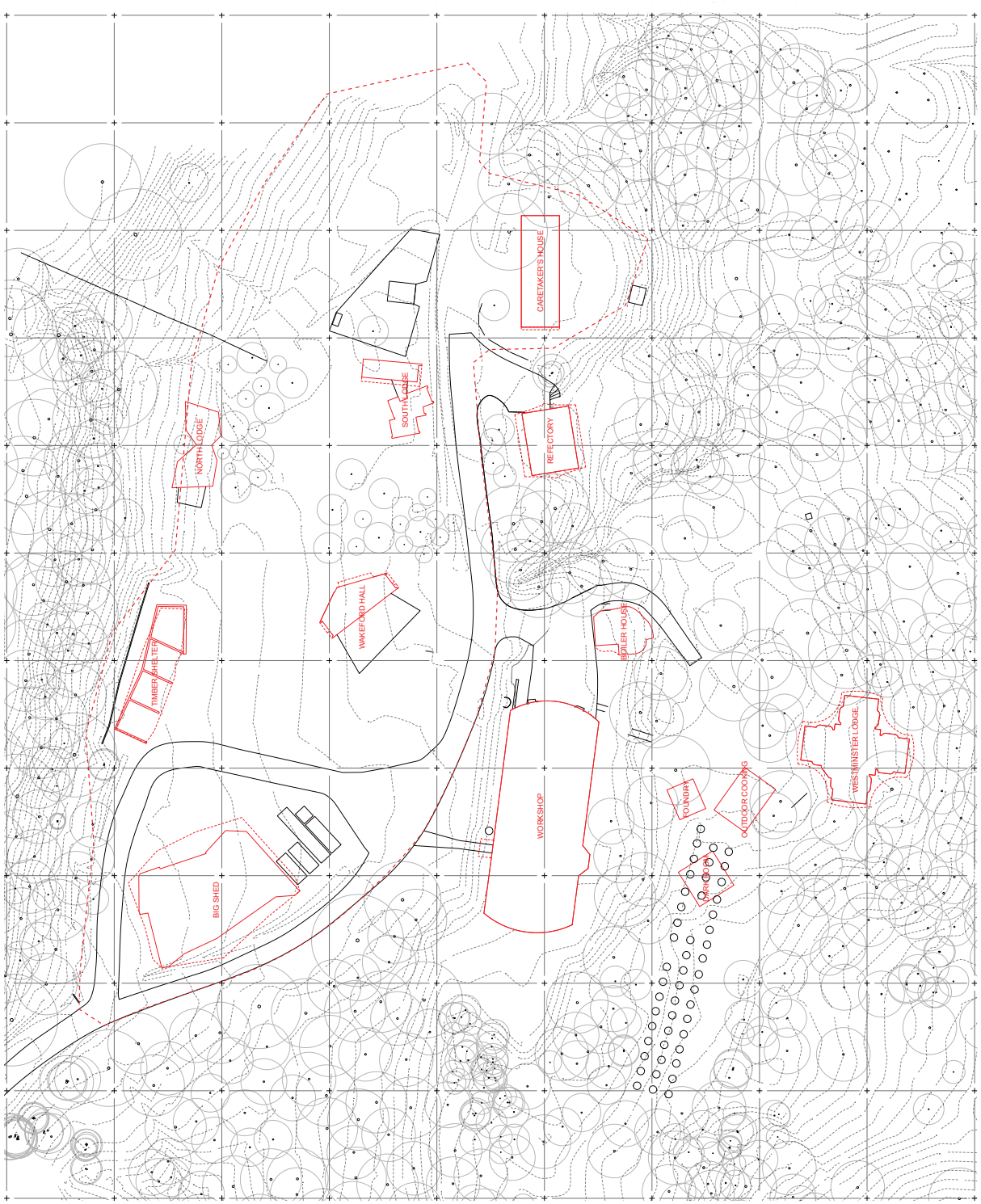
Think back to the successes and failings of each of your case studies - considering the configurations of spaces proposed in relation to their construction.

As you draw plans and various building shapes, consider how these relate to the systems like those you've developed in the last 6 weeks. Each of these systems will go through numerous further developments, but you should work with their inherent qualities and limitations.

As we return from the break a specific project budget will be confirmed. Throughout the work though, seek to make the most of products of the forest. Where more is needed than can be found here, look locally and for products with a previous life where possible.

Your building should intend to sit as lightly on the ground as possible. While it may be heavy in weight, it should avoid casting concrete and large quantities of steel in connecting to the ground. Wooden foundations in a wet ground conditions may be an interesting layer of research.

This project will be developed without pursuing planning permission. This means that it should be conceived from the start not to be reliant on central campus utilities such as hot water and mains power.



Existing Building

Building Permission Outline

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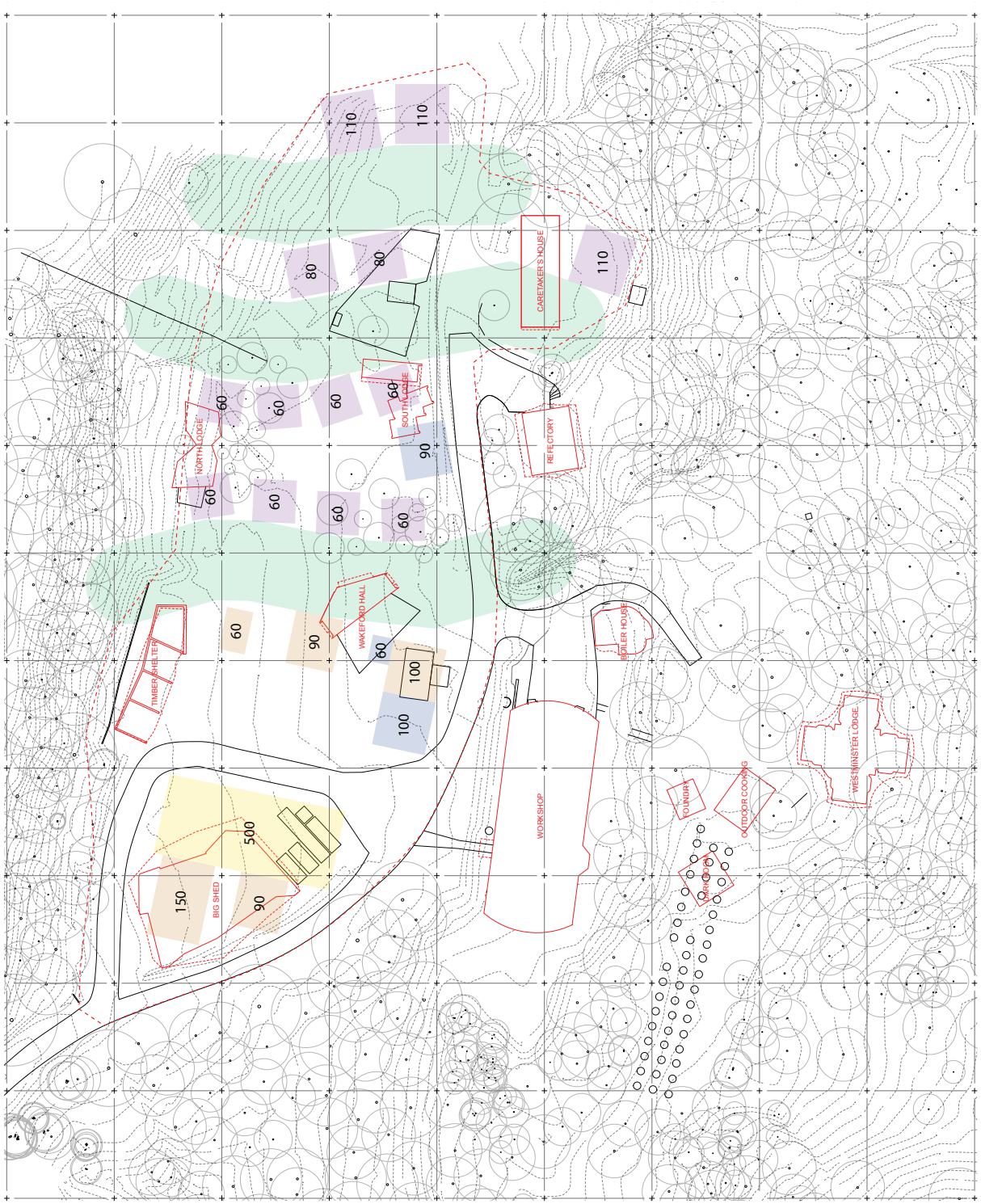

Existing Building
Building Permission Outline
Proposed Accomodation
Proposed Leisure
Proposed Workshops
Proposed Assembly Shed
Green Zones

1:1000 @ A4 | 20m Grid