Environmental Statement

Carbon Plantations Ltd. Westacre Farms.

NON TECHNICAL SUMMARY

Project Purpose

The Carbon Plantations Ltd (CPL) proposed project will establish 76 hectares of new woodland on the Westacre Estate in West Norfolk, consisting of plantations of a fast-growing non-native hardwood tree alongside new native woodland creation. The plantation tree will produce hardwood for the massively undersupplied UK hardwood market and sequester large quantities of carbon, contributing to the fight against climate change. The native woodland and associated open areas will deliver a significant biodiversity gain as well as increasing habitat connectivity and the quality of existing woodland features. The project will deliver a managed woodland project that secures an income stream through the sale of hardwood and carbon sequestered. The project displaces intensive agricultural cropping. The basis upon which this land use change is possible is entirely down to the economics of return that the project can generate for landowners. This is only possible as a result of the quantity of hardwood timber and carbon sequestered by Phoenix One. No other tree has, to date, been identified that can deliver to this level.

The non-native tree, Paulownia Phoenix One (a hybrid of *fortunei* and *elongata*), has been approved to be grown at scale in some European countries (Spain, Italy, Germany). The Forestry Commission (FC) Environmental Impact Assessment (EIA) screening process and associated opinion advised that the project required consent based on its nature and size. This requires the production of an Environmental Statement (ES).

The project will establish woodland on agricultural land. To conform to the UK Forestry Standard (the UK governments' approach to sustainable forestry) this mix will consist of 75% Phoenix One, 12% native woodland, 1% natural regeneration, 2% other non-native (Scots Pine) and 10% open areas. The native woodland will remain as a permanent feature. The open areas, Phoenix One understory, hedgerow boundaries and buffers will be managed to maximise biodiversity gain and this gain will be monitored. The Phoenix One will be grown as a plantation. It is established in year one and up to 10 years growth harvested in cycles. It then grows back from the root ball similar to a coppice. The intention will be to sell the wood into the UK hardwood timber market and used for construction, furniture, veneers, storage boxes and surf boards amongst other uses. It is light weight and structurally strong.

Management in the plantations includes pruning, targeted fertiliser placement and provision of water by drip irrigation in some years and harvesting. There will be a rigorous monitoring programme in place. Plantations have a life cycle of up to 85 years with the potential to remove after the 35 year lease period with the landowners finishes.

The project has successfully passed through the Forestry Commission Woodland Creation Planning Grant (WCPG) stage 1 and 2. It is also UK Forestry Standard (UKFS) compliant. The project is registered with the Woodland Carbon Code (WCC) and has secured UK Government Woodland Carbon Guarantee contacts to purchase carbon units produced.

Potential impacts

Through the process of the WCPG stage 2 some potential impacts were identified, this included thorough stakeholder consultation as per Forestry Commission guidance. Many potential issues were addressed (e.g., by removal of land parcels) or mitigated as part of that process resulting in UKFS compliance.

A scoping meeting was then convened with an agreed list of organisations and public bodies (many of whom had already been consulted with prior to this requirement). This resulted in an agreed issues log Annex 6.a "Scoping Meeting Issues Log" that would be considered as part of process.

There are 9 potential impacts that have been identified as a result of the WCPG stage 2 and scoping meeting processes. These have all been addressed within this ES.

- The invasiveness potential of Phoenix One to include competition with native flora and associated ecosystem change, Cost of control measures and the potential for introducing and hosting alien pathogens.
- Water reserves depletion affecting ground water and drinking water supplies.
- Landscape character change.
- Biodiversity changes on project sites and in the wider area.
- Degradation of soil carbon in peat soils.
- Damage to archaeological sites.
- Local residents' quality of life change.
- Carbon sequestration increases.
- Hardwood production increases.

Summary of impacts both positive and negative

There are 3 impacts identified that could have negative outcomes: invasiveness, landscape change and residents' quality of life. These have all been the subject of mitigation of impact and their potential likelihood.

The potential of invasiveness could be a considerable impact, however the likelihood of this impact is very low. There is no evidence, to date, of invasiveness of this clone in any plantations under management, however the planned monitoring and control measures are rigorous. CPL accept that the precautionary principle approach (the unknown unknowns) remains. Alongside Forestry Research and the Forestry Commission, a mitigation, monitoring and control programme will be developed to counter any potential future eventuality, some of which have already been designed into each plantation block. An ongoing Risk Assessment process incorporating the NNSS (Non-Native Species Secretariat), DEFRA, Academia and all commercial operations will constantly evaluate the new plantations.

The impact of landscape change has been rigorously assessed through an Outline Visual & Landscape Appraisal, including Zones of Theoretical Visibility, concluding that landscape change will not affect overall landscape character. There may be local landscape impacts, these have been mitigated as much as possible through project design, however some remain but are considered localised and of low overall impact.

The impact on local residents has been addressed through the consultation process. Concerns have been addressed with some degree of mitigating actions. There remains a change to the view for some and the effect on any individual will not be predictable.

The impact on water (irrigation and water balance) has been concluded as negligible.

The impacts on biodiversity, carbon capture and UK hardwood supply have been concluded as all very positive. The project brings significant positive impacts across all these areas.

Overall CPL conclude that the positive impacts are significant and near certain. These outweigh the low likelihood of any potential negative impacts.

ENVIRONMENTAL STATEMENT

1 Introduction

1.1 Reasons assessment were called

The Carbon Plantations Ltd (CPL) proposed project will establish new woodland consisting of plantations of a fast-growing non-native hardwood tree alongside new native woodland creation as well as new open ground areas. The plantation tree will produce hardwood for the massively undersupplied UK hardwood market and also sequester large quantities of carbon, contributing to the fight against climate change. The native woodland and associated open areas will deliver a significant biodiversity gain as well as increasing habitat connectivity and the quality of existing woodland features.

The non-native tree, Paulownia Phoenix One (a hybrid of *P.fortunei and P. elongata*), has been approved to be grown at scale in some European countries (Spain, Italy, Germany). It has not been subject to the traditional, but lengthy, 3 stage process for introduction of non-natives trees to the UK.

The opportunity this project represents requires the plantations to be planted in the short term. This would necessitate a change of land use and an assessment on the potential changes to local environments.

The Forestry Commission (FC) Environmental Impact Assessment (EIA) screening process and associated opinion advised that the project required consent based on its nature and size. This requires the production of this Environmental Statement (ES).

As advised by the FC, the project has followed a process of successfully completing Woodland Creation Planning Grants (WCPG) stage 1 and stage 2 and is now UK Forestry Standard (UKFS) compliant.

This **Environmental Impact Assessment (EIA) Environmental Statement** evidences the materials produced within WCPG stages1 & 2 as well as the outcomes from the EIA scoping meeting and engagements with the non-native risk assessment forum (NNRAF) process.

1.2 Scoping meeting conclusions

The scoping meeting was delivered on 7 June 2021. It included representatives from Natural England, The Environment Agency, Defra, NNRAF, Suffolk and Norfolk Country Councils, Forestry Research, the Forestry Commission and CPL. All participants are documented in Annex 6. b "CPL EIA Scoping Meeting Agenda and Participating Organisations".

The issues log has been accepted by all participants as a true and representative record of the meeting and is shown in Annex 6.a "Scoping Meeting Issues Log".

One participant reiterated some points already raised within the issues log as part of their response to agreeing the issues log. These have been noted as a foot note in the Annex.

The scoping points identified in the meeting to include or strengthen in the EIA statement were:

- Invasiveness.
- Flowering potential.
- The basis for Sterility.
- The lack of trial work in UK conditions on Phoenix One.
- The potential for neglect.
- Alternative species consideration.

- The monitoring framework and associated resources.
- Documenting mitigating actions.
- Water run off.
- Water supply.
- Landscape Visual Impact Assessment (LVIA).

The areas of biodiversity, archaeology, ground water and soils were not raised in the meeting. The extensive information supplied as part of the WCPG2 process covered these and will be referenced within this statement.

It was proposed that responses to the above bullets would be strengthened through:

- The engagement with NNRAF as part of an ongoing risk assessment process. This to address the issues on invasiveness, flowering, sterility.
- Forestry Research commissioned to produce a monitoring framework.
- Agreeing mitigating actions as part of the monitoring framework and or risk assessment and or risk log.
- Responses to the Environment Agency on water supply and run off.
- The commissioning of a landscape architect to produce an outline Landscape and Visual Appraisal (LVA).

In addition, to conform to the recently released England Peat Action Plan, the peat status of project sites would be confirmed with Natural England.

1.3 Summary of potential impacts (positive and negative)

The main potential impacts of the project are defined within:

- The invasiveness potential of the non-native tree. Potential impacts identified from invasiveness include
    - Competition with native flora and associated ecosystem change.
    - Cost of control measures.
    - Introducing and hosting alien pathogens.
- Water reserves depletion affecting ground water and drinking water supplies.
- Landscape character change.
- Biodiversity changes on project sites and in the wider area.
- Degradation of soil carbon in peat soils.
- Damage to archaeological sites.
- Local residents' quality of life changes.
- Carbon sequestration increases.
- Hardwood production increases.

2 Site Description

2.1 Project location

This project site, on Westacre Farms in west Norfolk, has been split into 2 blocks totalling 75.56 hectares, located either side of the settlement of West Acre and the River Nar.

2.2 Location Map

The site is detailed in Annex 1.a "Westacre Farms - Site Context Map".

2.3 Site context

The sites are gently undulating and made up of sandy clay loamy soils. Soil analysis are shown in Annex 2.a "Westacre Farms - Soil Analysis"

The sites largely comprise of underlying chalk geology covered with sandy soils of glacial origin. Shallow river valleys and dry tributary valleys cut through the Middle and Upper Chalk geology to give rise to a gently rolling landform.

The Outline LVA concluded that the woodland would have no material effect on the appreciation of geology. The site is at elevation of around 25m above sea level.

Annual rainfall is approximately 750 mm.

Despite the sites proximity to the River Nar valley sides, the aspect is not strongly characterised.

The site sits within and is part of a landscape supporting the functional land cover of intensive agriculture where arable cropping predominates. Arable cropping typically includes wheat, barley, rye, oats, Sugar beet, maize, potatoes, onions.

Fauna across the project site is characterised by a typical range of farmland and woodland birds. Of note in the wider area are Stone Curlews, however there are no recent records on the project site.

There is a deer population across the project sites, predominantly Red, Fallow, Roe, Muntjac.

The sites are land drained as per normal agricultural practice.

2.4 Land use

The entirety of the planted areas within the project will take place on arable fields. These fields have a long history of intensive cropping of cereal and root crops requiring substantial annual soil disturbance, in organic fertiliser, agrochemicals and fossil fuel burning to power required machinery.

2.5 Site designations

The following designations or priority habitats have been identified and appraised as part of the planning grant process with the Forestry Commission. Annex 2.i "Westacre Farms - Designations List"

- The River Nar & Castle Acre Common Sites of Special Scientific Interest (SSSIs) are the most significant environmental feature within 1km of the project sites due to their designation under national legislation. At the closest point the sites are 170 metres from the River Nar SSSI and more than 360 metres from Castle Acre Common SSSI.
- Areas of the project adjoin Roadside Nature Reserves.
- A cluster of County Wildlife Sites are situated approximately 600m to the south of the proposed woodland planting, these are:

    N. of Mill Covert (500)

Adj. River Nar (902)
West of Castle Acre (946)
Mill House and Covert (497)
Mill House Lake (893)
Adj. River Nar (895)

- The proposed planting sites are located 4+ km from the Breckland Farmland Site of Special Scientific Interest (SSSI), a component of the Breckland Special Protection Area (SPA).

2.6 New woodland creation category

The Forestry Commission "Low risk areas for woodland creation" maps https://www.forestergis.com/Apps/MapBrowser/ do not indicate these sites to be low-risk woodland creation areas because this category omits Agricultural Land Classifications of 3a and better.

2.7 Archaeology and the Historic Environment

The following features have been identified and appraised as part of the planning grant process with the Forestry Commission. Annex 5.g "Westacre Farms – NCCHE Consultation"

- Block 2 is situated adjacent to West Acre Priory and Square Barrow within the precinct Scheduled Monument.
- An Early Anglo-Saxon Cemetery is located within the southeast of Block 1 (HER3781).
- High House Park Grade 1 listed building.
- Historic boundaries including hedges and the lines of parish boundaries.

2.8 Landscape

The initial landscape analysis for the site is included in Annex 2.b "Westacre Farms Landscape Analysis"

The project sits within an area characterised by low, gently undulating plateau, largely covered with sandy soils of glacial origin, this is representative of much of proposed planting area, with elements of the valley sides of the River Nar, all of which is currently being used for intensive combinable and root crop production.

National Character Area Profile (NCAP) of 85. The Brecks.

The project areas contain intersecting hedge rows, with no small in-field ponds or individual in-field trees. Block 2 contains a small central 1.7ha deciduous spinney.

The surrounding landscape is primarily made up of arable land with regular intersecting hedgerows and in-field copses. A line of pylons and overhead wires follows a generally east-west route and crosses the valley at West Acre, immediately to the north of Block 2.

2.9 Water

There are no rivers or natural water bodies of scale within the project site areas. However the River Nar, a tributary of the River Great Ouse, dissects the two proposed planting sites.

Narford lake is approximately 1.3km upstream of the planting sites.

The project area lies within the catchment of the North West Norfolk Rivers. The groundwater body is the North West Norfolk Chalk. The waterbody is classified as having a 'poor' ecological status and a

'poor' chemical status. The quantitative status of the groundwater was also classified as 'poor' in 2019.

There are 2 known private groundwater borehole drinking water supplies within 1km of the site, as well as a public water supply borehole 8.5km away.

2.10 Settlement and Local stakeholders

The area surrounding the planting sites is sparsely populated with small, isolated settlements of relatively low population.

Local stakeholders have been identified and included in the consultation process.

3 Description of the proposals

3.1 Location

The location of project sites are shown in Annex 1.a "Westacre Farms - Site context Map".

3.2 Area statement

The site planting design conforms to UKFS with the Paulownia One constituting 75% of total areas and the remaining being split between native woodland (12%), Scots Pine (2%), natural regeneration (1%) and open areas (10%).

Westacre Farms:

		Open Area	***Native Planting***	***Other non-native***	***Natural Regen***	***Paulownia***	***Total***
Westacre	(Ha)	7.76	8.97	1.58	0.54	56.71	75.56
	(%)	10.27	11.87	2.09	0.71	75.06	100.00

3.3 Purpose and ambition of the project

The overall purpose of the project is to deliver a managed woodland project that secures an income stream through sale of hardwood and carbon sequestered.

In delivering this project ambition objectives across key areas are detailed as the following:-

Biodiversity:

- Maximise biodiversity net gain above the current base line being delivered through intensive agricultural practices.
- Increase the diversity of habitat within the local environment.
- Protect the local Ancient Woodland SSSIs above current measures to ensure the health and longevity of the habitat and species it supports.

Archaeology and the Historic Environment:

- Ensure the protection of known significant archaeological features through appropriate mitigation.

Landscape and visual:

- Minimise any visual impact of non-native tree species through effective project design.
- Mimic existing woodland species mixes to ensure the areas character profile is maintained and enhanced.
- Promote connectivity between woodlands where appropriate and possible to do so.

Water:

- Increase water use efficiency and sustainability above current practices.
- Reduce long-term water use below current rates associated with intensive agricultural practices.

Stakeholders:

- Encourage stakeholder engagement throughout the project design process.
- Minimise any negative impact by the project.

Timber:

- Maximise sustainable, consistent, and regular hard wood timber production from non-native tree species.

Carbon:

- Meet predicted carbon sequestration rates to generate income through the sale of carbon units.

3.4 Alternative site use

The alternative for the sites are to remain in intensive agriculture, particularly focusing on irrigated cropping to utilise the opportunity of available water.

The project displaces intensive agricultural cropping. The basis upon which this land use change is possible is entirely down to the economics of return that the project can generate for landowners. This is only possible as a result of the quantity of hardwood timber and carbon sequestered by Phoenix One. No other tree has, to date, been identified that can deliver to this level.

3.5 Project design

The design of the project has been informed by detailed Site Appraisal Plans. These have mapped on site features and surrounding features and landscapes. These are shown in Annex 1.b "Westacre Farms - Site Appraisal Plans"

Design Concept Plans have been produced that accommodate existing features, use the opportunity of the native and open areas to buffer and enhance existing features and include operational feature such as wood loading areas and water hydrants. These are shown in Annex 1.c "Westacre Farms - Design Concept Plans"

The final design plans for the project sites have been produced, building upon the initial Design Concept Plans, following incorporation of stakeholder and FC comments. These are shown in Annex 1.d "Westacre Farms - Final Woodland Creation Design Plans".

3.6 Project lifecycle

The overall programme will plant fast growing Hardwood trees alongside native trees and species rich open areas. A Carbon Mapping process will take place just prior to planting to act as a base for future calculations.

An optimum tree harvest cycle is anticipated every 9-10 years, however for the project to work, half of the plantation will be harvested after around year 5-6, effectively 'thinning' the woodlands in order that every subsequent 5 years optimum growth is achieved on half of the plantation cyclically. The Hardwood is essentially coppiced and regrows around 8 times before it exhausts itself and essentially fails after around 75-80 years. The management of the plantation would be classed as semi-intensive including some pruning, weed-suppression, irrigation, 2 to 3 fertiliser applications and up to 2 organic insecticide applications annually from May-September depending on the

conditions. The Grass under sown will require some cutting too as well as other aspects of woodland management. All activities will be overseen and dictated to the contractor (or farmer) by CPL under direction from their technical partners and agronomist. CPL will work under contract with a UK based Agronomist with intimate knowledge of local soils to evaluate the plantations at various key stages throughout the year. In a harvest year, harvesting could begin anytime from November to March. Trees would be felled and stacked by the access gateway ready for collection after a period of 'air drying', usually lasting a few months. Standard Term Woodland Insurance covering public liability and woodland destruction by fire will also be in place for the duration of the project.

A grass mix (see "site preparation" below) is sown in the first Spring at the same time as the Trees are, or soon after tree planting, to attract insects and birdlife. Apart from some irrigation in the first 3 years to assist establishment and 2 to 3 fertiliser applications, the plantations are left alone to grow and just be monitored.

Phoenix One is a fast growing non-native hybrid that delivers high wood and carbon sequestration yields. It is a deciduous hardwood that in 8 years of German trials has not produced flowers or pollen and is sterile. It grows from a root stock and is "coppiced" every 9-10 years. The tree will be grown in managed plantations, not dissimilar to poplars and will be secured within deer fencing.

The plantation cycle and associated landowner lease with CPL is for 35 years. After this period the trees could potentially be removed (subject to the regulatory requirements at the time), or the project lifecycle could be extended under landowner management conforming to the same regulatory requirements as under CPL management.

3.61 Site Preparation:

Detailed within Annex 3.a "Westacre Farms - Silviculture; Ground Preparation, Species Mix & Planting Design".

Ground preparation prior to planting will be assessed on a block-by-block basis with consideration of soil state and weather conditions. The below operational plan sets out the maximum extent of soil cultivations and has been planned with consideration of the UKFS aim around minimising short-term soil carbon loss whilst promoting early tree establishment and growth.

Prior to tree planting, a series of inspection pits will be dug across each block to assess the depth of plough pans and consequently the depth of any required sub soiling operations.

Detailed analysis work will then be undertaken to assess cation-exchange capacity, soil nutrients, soil carbon content in order to tailor site specific nutrient management and accompanying understory mixes.

Where necessary, a low disturbance sub-soiler and cultivation will be implemented shortly before planting. Sub-soiling to a depth no greater than that of routine cultivation operations associated with the sites former agricultural land use.

Much of the soil across this project has been degraded through years of modern agricultural production and has therefore lost integrity at depth, many of them creating a 'sedimented' layer rather than a true plough pan. The long-term ceasing of any cultivations as a consequence of the project will allow the soils to settle and re-generate, and this layer will not form and will be broken up as soils re-structure themselves. Paulownia is able to recover degraded soils through their long, dense root system avoiding erosion and the high nitrogen content of the leaf Annex 4.e "Portuguese Risk Analysis on the Introduction of Paulownia" Page 11.

3.62 Planting Technique & Tree Protection:

Notch planting method will be applied when planting the native element of the project, to provide effective soil root contact promoting root development. This efficient and speedy planting technique will allow the maximum number of whips to be planted in optimum conditions, encouraging a higher survival rate, and reducing replacement costs.

Native bare root stock will be planted when dormant, preferably in November to allow root establishment before the arrival of winter, making the tree more likely to survive any hot dry spells the following summer and reduce the impact of potential spring droughts.

Young Paulownia plants will be planted as plugs between April and June, this operation will be carried out by hand and involve planting individual plugs at set spacing in line with dripline irrigation runs. Irrigation will be used to wet the soil and assist planting where necessary. A combination of mulching and mulch mats will be used depending on location.

In all cases trees will be planted offset from the rip lines, preventing the cracks created by subsoiling opening in dry weather and potentially exposing the roots.

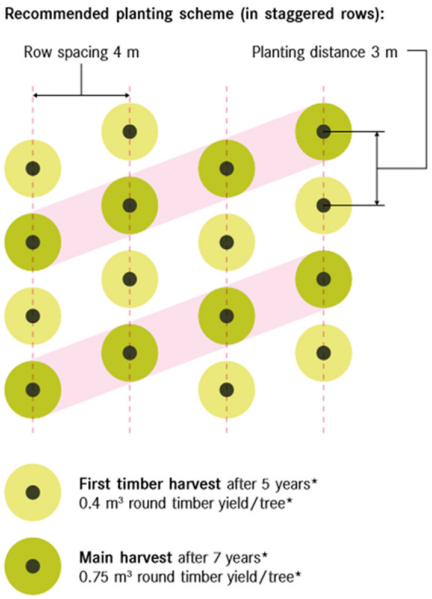
Within this project, deer fencing will be erected around the perimeter of the Paulownia planting, excluding areas of native planting and open area. This design strategy is intended to enable full access to the native element of the project, acting as a wildlife corridor from the rewilding project to the south of Block 1, through the project area and beyond to the north. The native trees will therefore be fitted with individual guards for protection from deer and rabbit.

Native planting areas will be protected against weed pressure through use of appropriate spot spray herbicide applications during the initial few years of growth, whereas Paulownia, the bark of which is more sensitive to chemicals, will have mulch mats placed around the plug during planting which will suppress weeds until tree height exceeds the threat.

Weed competition will be further reduced through use of an understory with mixes including Birdsfoot trefoil, White clover, Alsike clover, Knapweed, Kidney vetch, Timothy (low percentage for tussock formation), Slender Red fescue and Smooth stalked meadow grass. This understory is also intended to reduce potential soil run off. The intensive weed control schedule outlined in the WeGrow Plantation Maintenance & Growth Report will not be fully employed in these projects in order to achieve the biodiversity gains intended by the understory species mix Annex 3.e “WeGrow Plantation Maintenance & Growth Report” page 2.

3.63 Paulownia Planting Layout

The Paulownia element of the project will be planted at a very low stocking density as depicted in the illustration below. This spacing use equates to 825 trees/hectare. Harvesting will occur in alternating rows every 6 – 7 years, meaning established Paulownia is always present and evenly distributed across the site. This has biodiversity and visual landscape benefits.



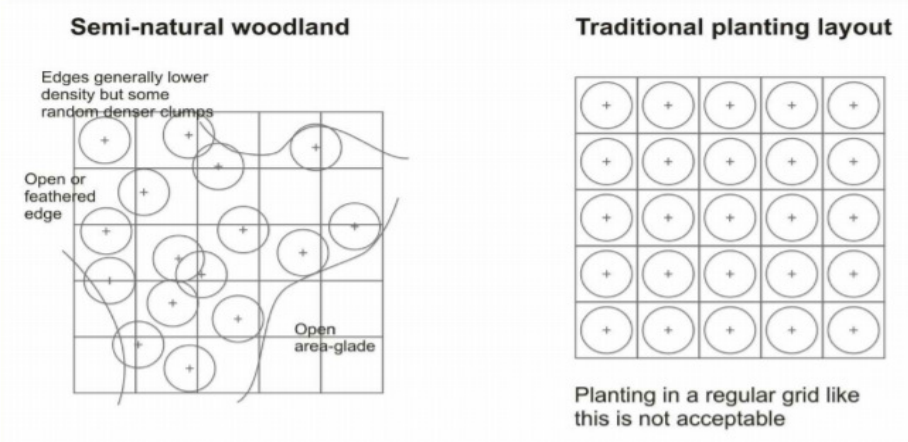
3.64 Native Planting Layout

Where appropriate, elements of 'clump planting' will be employed to prevent slower growing species becoming out competed and promote habitat diversity. Single species clumps and clumps comprising of complementary species of various form and size will be incorporated into the woodland design.

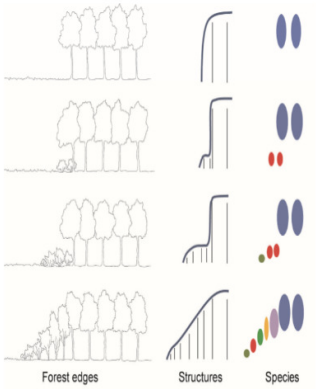
Tree spacing within clumps and in adjacent clumps will be varied to avoid the appearance of rows and grids as well as to provide a range of light infiltration in order to increase wildlife diversity. Clump definition will phase out and tree spacing become more regular in areas closer to Paulownia growth to prevent a strong visual distinction between woodland types.

The sketch highlights the use of clumping.

The below diagram illustrates the use of feathered edging and varied spatial distribution in comparison to conventional tree planting.



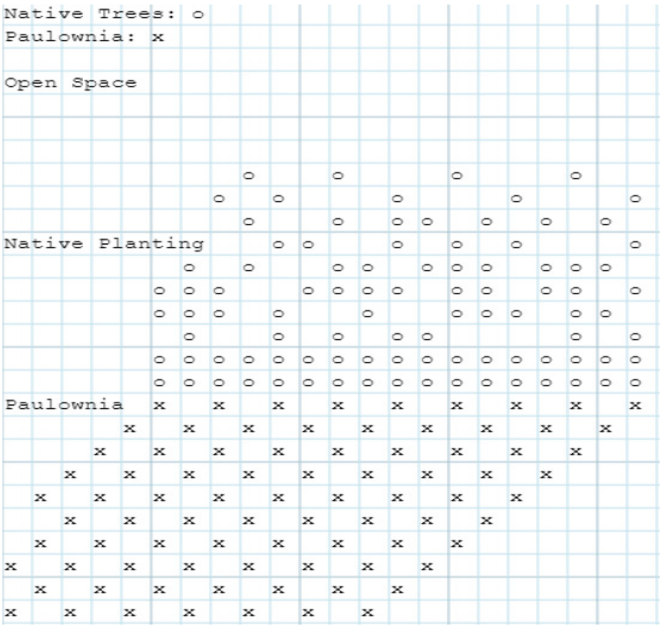
Native woodland edges will comprise of an evenly graded structure, as demonstrated in the lowest forest edge design option of the below diagram. This will be achieved through appropriate distribution of lower growing species on the woodland periphery with species hight gradually increasing to the interior of the woodland, providing a feathered edge effect.



As well as promoting visual qualities of the woodland due to increased space available for flowering, fruits/berries and foliage colours, this design feature will provide shelter functions and support a greater range of biodiversity.

3.65 Spatial Distribution:

In specific project areas where larger areas of open ground meet new native woodland planting, trees will be planted in a dispersed configuration, with stocking densities gradually increasing and becoming more unified before transitioning into the Paulownia planted areas. This will help to promote harmony between the new woodlands and surrounding landscape. The below diagram demonstrates the considered transition from open space through to native planting and the more regimented by sparse Paulownia.



3.66 Sourcing Stock

Paulownia Phoenix One plugs will be sourced from WeGrow – European market leader in supply of Paulownia stock and the developer of the Phoenix One variety suitable for sustainable growth in East Anglia and to ensure the highest quality of planting materials. All stock will be sourced in conformance with phytosanitary health legislation. Further information around WeGrow can be found on Page 46 of Annex 4.e "Portuguese Risk Analysis on the Introduction of Paulownia"

3.67 Native Planting

An appropriate species mix, and origin/provenance of stock will be used to ensure the woodlands future suitability to East Anglia. The diversity of the native species mix has been maximised to maximise biodiversity gain and as a mitigation to expected changes in climate.

Efforts will be made to source a portion of the native stock from origins up to 2 degrees south of the project site, particularly those species identified to be vulnerable in the Forest Research 2080 Ecological Site Classification (ESC) output. This should not only limit risk but enhance growth rates and result in woodland more adaptable to climate changes. Due to earlier flushing of southerly stock and increased risk from frost damage, a significant proportion of the species mix will be sourced more locally.

The project will aim to source no more than a third of native stock from a single region, maximising the long term prospects of the woodland as far as possible.

The native woodland mix has been selected using ESC (Ecological site classification) predictions across a baseline, 2050 and 2080 scenarios. These are shown in detail within Annex 2.c "Westacre Farms ESC Output inc. DAMS Scores (2050 & 2080 AWC)"

3.68 Native Woodland Planting Species Mix

Species	*Native Status*	*Species Code*	*Yield Class (ESC)*	% of Area
Pedunculate Oak	Native	POK	7	41.2
Silver Birch	Native	SBI	9	5.9
Hazel	Native	HAZ		5.9
Hornbeam	Native	HBM	10	11.8
Field Maple	Native	FM	8	5.9
Wild Cherry	Native	WCH	10	5.9
Hawthorn	Native	HAW		8.8
Wild Crab Apple	Native	CAP		5.9
Dogwood	Native	DOG		2.9
Small Leaved Lime	Native	SLI	8	2.9
Beech	Native	BE	6	2.9

In addition to the above the non native Scots Pine is also included at 15% total non Paulownia planting.

3.7 Project operational activities

The Paulownia will be irrigated by a drip irrigation system. This highly efficient system allows for placement of water at the tree roots.

The native element of the project will not be harvested, aside from thinning, and instead managed to maximise biodiversity gain.

Harvesting of the Paulownia elements of the project will be dictated by ground conditions and minimising damage to the understory. Mechanical harvesting will be favoured where plantations grown in a uniformed manor, however hand harvesting carried out by skilled in-house teams is possible and will be carried out where required.

Brash from Paulownia harvesting will be chipped onsite and use as a mulch/humus. Depending on the quality and value, any excess chip may go into the composite wood industry. The level of chipping required at harvest is however relatively low in comparison to traditional conifer timber harvesting.

Hand pruning of Paulownia trees will take place several times a year for the first 3 years of growth. This will be timed in order for de-budding to be left on the floor, whilst larger branches will be chipped onsite and again used as a mulch Annex 3.e “WeGrow Plantation Maintenance & Growth Report” page 2.

Each Paulownia tree will be geo located in year one, and any failed stock will be replaced with the new tree being incorporated into the next applicable harvest cycle, a maximum of 6 years away.

Paulownia leaf drop occurs at first frost, where they will be left on site as humus for their high protein value. With a low C:N ratio they will break down swiftly with the understory will reduce any potential leaching of N & P. The captured nutrient will be utilised for early growth the following season Annex 4.e “Portuguese Risk Analysis on the Introduction of Paulownia” Page 35.

These aspects of maintenance of plantations are covered in Annex 3.e “WeGrow Plantation Maintenance & Growth Report” page 2.

3.8 Materials residues and emissions

The construction phase of the project will be characterised by site preparation and then plantation establishment.

Sites, as existing agricultural fields, will require no change to existing base line i.e., no clearance or invasive practices aside from a routine soil cultivation (using an agricultural tractor) in line with exiting annual agricultural practice.

Startup activities will include site fencing will be delivered using mechanical and manual labour with standard agricultural machinery and planting of the tree plugs will be via manual labour supported by agricultural equipment for transport.

Emissions from the above will relate to diesel engine combustion and in line or less than for previous cropping regimes.

Access tracks around and within the plantations will be unsealed dirt tracks. They will have relatively limited traffic and most will be of a light vehicle in nature. Any water run-off would be absorbed within the surrounding planted understory or open areas.

Loading areas will be substantiated with hard core where appropriate and required.

Water will be precisely delivered through drip irrigation aligned with crop needs and uptake. This will not result in any excess residues.

All leaf biomass and wood chippings from harvest operations will remain on site to break down and contribute to organic matter build up to levels as appropriate for each tree.

3.9 Associated works

Irrigation piping will be enabled to project sites from existing farm infrastructure.

Around the site perimeter a 1.8m high deer fence will be erected to the specification provided in the Forestry Commission Technical Guidance 'Forest Fencing'. Wooden, creosote treated fence posts will be used, without planned use of a strutted stake assembly since the sites are not in particularly exposed locations, do not experience heavy deer pressure or sit on soft soils. Single width netting is planned, with use of spiral wire preformed fence connectors. Small river gates hinged on a wooden pole are planned where fence lines cross small water courses. A lack of PROWs and public access to the sites negates the need for stiles, ladders and dog latches anywhere along fence lines. The line of the fence shall be cleared of debris and be smooth enough to allow the bottom of the fence to seat with the ground and avoid gaps through which deer could enter underneath the fence.

The project sites are self-contained.

4 Prediction of impacts

4.1 Impact 1: Invasiveness

4.11 Change from existing or baseline

Paulownia Phoenix one is not currently grown commercially in the UK.

As a non-native tree, evidencing and information collation is required to demonstrate appropriateness and gain approval to grow in the UK. This information also informs any predicted change from baseline.

The focus of this exercise is in in collating evidence in the following areas in order that a balanced view can be formed on any invasiveness risk associated with growing Phoenix One in managed plantations:

- The sterility of the Phoenix One cultivar.
- The potential for Phoenix One to establish in UK managed and unmanaged conditions.
- Plantation management requirements to demonstrate agronomic and operational control and plantation design to ensure adequate thresholds for buffering and monitoring.
- The potential for Phoenix One as a food source, host, symbiont or vector for other damaging organisms (insect, fungal, viral).
- Phytosanitary certification to ensure sterility of plant materials entering the UK.
- Adoption of a Forestry Commission approved monitoring framework.

Evidence across these areas was summarised in WCPG2 paper Annex 3.f "Phoenix One Sterility and Invasiveness Summary".

This paper set out the evidence to support the complete lack of flower or seed production in Phoenix One in 8 years of trial work, supporting sterility. It describes the highly controlled and exacting planting breeding process and the rigor of the phytosanitary controls. The paper summarises how plantations would be managed to reduce suckering and how the trees are harvested every 6-7 years, a number of years before any reproductive stimuli would normally be triggered. Integral to plantations design would be extensive buffering and sucker monitoring zones to ensure that there were isolation from external features minimising vegetative propagation risks. The basis of suggested monitoring parameters are also stated.

This document references the supporting papers:-

Annex 4.a "Paulownia Elongata Risk Assessment - Hawai Import".
Annex 4.b "Paulownia Fortunei Risk Assessment - Hawai Import".
Annex 4.c "Phytosanitary Certificate".
Annex 4.d "Portuguese Risk Analysis on the Introduction of Paulownia - Ecological Characterisation".
Annex 4.e "Portuguese Risk Analysis on the Introduction of Paulownia".
Annex 4.f "Portuguese Risk Assessment for Phoenix One".
Annex 4.g "Prof. Dr. Ralf Pude, University of Bonn - Phoenix One Sterility Statement".
Annex 4.h "University of Bonn Phoenix One Sterility Report".

The "Annex 3.f "Phoenix One Sterility and Invasiveness Summary" set out the status of information at the time of WCPG2 (March 2021).

This information was based on 7 years of scientific evidence (this is now 8 years) and feedback from European plantations that demonstrates Phoenix One performance in European climatic and growing conditions. CPL appreciates evidence from the UK is absent but given that this is not

available have evidenced data from Europe aligning as closely as possible climatic and agronomic conditions.

After WCPG2 and UKFS compliance the process has further evolved.

The scoping consultation meeting raised questions on invasiveness (encapsulating sterility, neglect), lack of UK trial work and monitoring. Captured in Annex 6.a "Scoping Meeting Issues Log".

The approved issues log from the scoping meeting indicates that the invasiveness aspects would be addressed through the Defra GB Non-native Risk Analysis Forum (NNRAF) risk assessment process.

It is proposed that the monitoring aspects are addressed through a monitoring framework based on a draft framework authored by Forest Research Annex 7.a "SRF Monitoring Framework".

Trial work for new forestry species normally takes many years (20 or 30). This timescale for Phoenix One would not allow this project to proceed and the opportunity for delivering to carbon and UK hardwood requirements (see section 4.8 and 4.9) would be lost. CPL propose that the data from European plantations in addition to the detailed monitoring and mitigation plans would serve to negate the requirement for many years of traditional forestry trial work. CPL does accept that this does not align with the preferences of one scoping meeting consultee who responded as such in the issues log sign off process.

A risk register has been compiled, with expert input from the John Innes Centre. Version one submitted to the Non-Native Risk Assessment Forum (NNRAF) process for review. Comments were received, considered and incorporated into a version 2.

The risk assessment process now focuses on the hybrid Phoenix One (as opposed to other Paulownia varieties) and a managed plantation approach. It aligns identified potential risks with CPL mitigating actions as to be agreed.

This risk assessment is included in Annex 4.j "GB Non-Native Species Risk Analysis Phoenix One Vs 2".

NNRAF have provided the following comments in relation to this second draft of the Risk Assessment:

- The risk assessment is draft and not yet considered fit-for-purpose by the NNRAF. The NNRAF understand that the FC still wish to consider the draft assessment – in which case they advise that their comments should be taken into account whenever it is used.
- The NNRAF have provided their comments in two parts. The first provides their comments for the FC (and anyone else reading the risk assessment) to take into account when considering the risk assessment. The second provides more detailed comments on the updated assessment for the risk assessor to consider and to respond to. These more detailed comments may also be of interest to the FC and other readers of the risk assessment. These are included as Annex 4.p "Paulownia Phoenix One - RAv2 NNRAF Comments on Draft Risk Assessment" and Annex 4.q "Paulownia Phoenix One - RAv2 Draft Risk Assessment"
- The NNRAF's comments should remain and be considered with the draft risk assessment whenever it is being used.

The Forestry Commission have indicated, being conversant and aware of the NNRAF process, that the ES should be prepared and submitted on the understanding that the risk assessment process will be an ongoing activity. CPL remain committed to work with this ongoing process.

Additional supporting papers have been researched that strengthen the evidence that, to date, there are no reports of Phoenix One exhibiting invasiveness traits. These papers include:
Annex 4.k" A case for the Non-Invasiveness of Paulownia".
Annex 4.l "Paulownia in China – Zhu et al".
Annex 4.m "Comparison of Influrescence and Infructescence Within Different Paulownia Genotype Lines".
Annex 4.n "Paulownia Invasive or Not (Gillard)".
Annex 4.o "Berg et al 2019 - Survivorship attained diameter height and volume of three Paulownia Species USA".

In summary the evidence provided sets out the case that managed plantations of Phoenix One present a very low risk of becoming invasive, that management actions will be designed to further minimise risks and that a rigorous, Forestry Commission approved, monitoring plan with mitigating actions would be implemented.

In this case CPL believe that the change from baseline would be negligible.

4.12 Nature of the change

The change from baseline would be negligible.

4.13 Confidence level of prediction

CPL is confident given the alignment of information sources supporting the non-invasiveness position. CPL does recognise that concerns have been raised over the limit of this information being 8 years and that 12 years of information would be required for greater confidence.

4.14 Relationship to standards/policies

The plantation design is UKFS compliant.

A draft monitoring framework has been designed by UK Forest Research will be implemented to a standard acceptable to the FC

The NNRAF process has been followed resulting in the production of a draft 2 risk assessment report, version 3 is currently underway.

4.15 Basis for predictions

Predictions are drawn from the scientific publications, researched papers and risk assessments contained within the annexes. The technical experience of the plant breeder, WeGrow, is also evidential.

4.16 Method of impact identification

CPL will commit to carry out monitoring of the plantation sites and will ensure that adequate resources are in place to deliver this obligation. These have been included in the financial model and further Resources are to be invested for this purpose exclusively.

CPL proposes to use the draft framework from Forest Research as the basis for production of a monitoring plan with some further discussion around how a more stratified approach focusing on monitoring the heterogeneity within project sites could be adopted. The intention being to reduce sampling frequency whilst maintaining monitoring integrity.

A copy of the draft monitoring framework produced by Forest Research is include in Annex 7.a "SRF Monitoring Framework.

4.17 Uncertainties and unknowns

There is uncertainty over Phoenix One flower or seed production attributes beyond the 8 years of published trials data as discussed in earlier sections.

There is uncertainty of Phoenix One adaption to UK conditions as discussed in earlier sections.

The plantation designs, plantation buffering and plantation monitoring all contribute towards minimising impacts of the uncertainties described,

4.2 Impact 2: Water

4.21 Change from existing or baseline

The impact of water usage by the project has been assessed across irrigation demand, on water resource balances and effects on private water supplies as identified in the WCPG2 scoping work.

Irrigation

Plantations in Spain indicate that commercially grown Paulownia trees require between 7 and 10 litres of water each per day during the initial establishment stage. Once established, water demand in the first three years drops to an average of between 4l and 6l per day during the growing season. In much of the UK there is insufficient rainfall to meet this demand and supplementary irrigation is required at key times using SMD meters (Soil Moisture Deficit).

The residual estimated irrigation demand on light soils in the east of England is 451m3/ha in year 1 rising to 715m3/ha in year 3. This compares favourably with the irrigation demand of vegetable crops in similar conditions. Peak, year 3, Paulownia irrigation demand is about 30% that of main-crop potatoes grown in similar conditions and average annual demand over a 10 year cropping cycle is about 40% that of a typical commercial carrot/potato rotation.

The above is included within an irrigation report produced by Paul Bradford MCIWEM C.WEM in Annex 3.b “CPL Report - Paulownia Irrigation Demand” specifically for this project. This report concludes water requirements to be considerably under that of conventional root crops creating a positive position to the existing baseline of agricultural cropping. This is a positive impact.

This water is supplied via an efficient trickle irrigation system and subject to existing abstraction licencing with the Environment Agency.

Water resource balance

The Environment Agency, Forestry Commission and academia have carried research into the impact of forestry on water resources. This is important because much of East Anglia is in water resources deficit as a result of historic over abstraction. The research shows that all types of woodland significantly increase infiltration rates, by between 17% and 60%, but that this benefit can be offset by increased rainfall interception and evapotranspiration (ET) from the canopy. Interception and ET is broadly determined by tree type, canopy size and planting density. Mature coniferous forestry with its dense canopy and long growing season has a significant adverse impact on water resources whereas broadleaved woodlands have a more nuanced effect. Studies show that beech and ash can increase groundwater recharge, in comparison to grassland, by between17% to 25%, but mature oak, which is better adapted to scavenging water during prolonged periods of drought can reduce recharge in dry conditions by between 16% and 45%.

On balance, the evidence suggests that Paulownia may have a benefit on the overall water resource balance. This is articulated in a paper by Paul Bradford in Annex 3.g "High Level Water Balances".

The trees are grown at a low density and are maintained in an immature state, only reaching full canopy cover for 2 year period before they are cut. Recharge rates under juvenile deciduous trees have been found to be 3 to 4 times greater than for mature trees and separate research concludes that 'groundwater recharge can be enhanced under moderate planting densities'. Paulownia has a short growing season and because it is native to high rainfall regions, is not adapted to scavenge deep groundwater.

With summer rainfall predicted to drop by up to 57% in the summer and increase by 33% in the winter, by the 2070's (UKCIP high emissions scenario), landscape scale, flood attenuation and water retention features we become increasingly important. Paulownia plantations reduce flood flows by increasing infiltration rates and soil water storage capacity. Soil carbon storage under Paulownia can increase by up to 5%. As well as reducing atmospheric carbon, this improves the health, structure and water holding capacity of the soil. An increase in the amount of organic matter in the soil of 1%, one can increase the quantity of water held per Ha by 222m3/ha. Given that the project is expected to increase the percentage of organic matter in the soil by up to 5%, we could potentially store an additional 1110m3 of water per Ha. Much of this water is prone to run-off in conventional agricultural systems, so the plantations reduce the risk of both flood and drought and topsoil erosion. Monitoring to assess the changes to environmental water fluxes, carbon sequestration and habitat improvement as a result of the plantations will be incorporated into the project design.

A further water report contained in Annex 3.c "Paulownia Water Use Report" adds to this logic by assessing the balances between infiltration, soil water storage, transpiration and interception and concludes that we do not see the plantations making significant losses to the re charge systems rather by making the rainfall 'effective' we will change the nature of the re charge and eventually hopefully store water for later use, rather than drawing on valuable aquifer reserves.

We believe that the analysis articulates that the change from existing baseline is negligible, most probably positive.

Private water supplies

In addition to the 2 private groundwater borehole drinking water supplies and public water supply borehole identified by the Environment Agency, consultation with West Norfolk District Council Food & Health & Safety Team provided the location and further details of 6 private water supplies. These water supplies are located a considerable distance from the project site, and all are sourced from groundwater via boreholes/springs and therefore are highly unlikely to be impacted by the project. Annex 5.p "Westacre Farms - West Norfolk District Council - Private Water Supplies" confirms this position.

Other

The acidification of surface water is not an issue for this site as demonstrated by the FC Land Information Search undertaken as part of Woodland Creation Planning Grant Stage 2. This is documented in Annex 1 "Approved Woodland Creation planning grant stage 2"

The Environment Agency expressed no concern over local water dependent protected sites Annex 5.a "Westacre Farms - Environment Agency Response". Natural England highlighted potential

sensitivities of local water dependent protected sites to certain activities involving the drainage or modification of watercourses, none of which the project intend to engage in.

The scoping meeting issues log raised two points on water:

The Environment Agency raised a question on prevention and mitigation for water run-off. CPL responded with a description that management of the woodland planting would include an understorey, this to be established at the beginning of the woodland creation process, providing a solid environment to manage run off and will ensure bare ground is not left thus minimising the risk. A key point of the project is soil stabilisation and improving degraded soils over the existing industrial agricultural use currently practiced on the field parcels. This response was included in the accepted issues log from the meeting.

Suffolk CC raised a question on the source of irrigation water. The CPL response was that Irrigation will be provided by existing abstraction licenses, currently undergoing trickle irrigation variations. No further source irrigation water would be required. This response was included in the accepted issues log from the meeting.

4.22 Nature of the change

The requirement for irrigation water will be around 60% less than for existing agricultural cropping. This driven by less consumption and greater efficiency in application.

Water resource balance will remain in a similar position as for the current agricultural cropping.

4.23 Confidence level of prediction

The confidence level for irrigation water is high and within CPL project control.

The confidence level for water resource balance is high but subject to greater variability and will be the subject of ongoing monitoring.

4.24 Relationship to standards/policies

Irrigation is subject to abstraction licensing by the Environment Agency that align with the EU water framework directive. Trickle license variations will be in place.

4.25 Basis for predictions

This report provides a synthesis of known baseline irrigation requirements and UK specific agro-climate and soil type factors. It uses the methodology set out in the Environment Agency's 'Optimum Use of Water' Guide as a template for estimating the 'design dry year' Paulownia irrigation requirements for any given agro-climatic zone and soil type in England and Wales.

4.26 Method of impact identification

The project intends to utilise the EAs new groundwater modelling initiative, involving the monitoring of specific boreholes close to the planting sites and early detection of any adverse impacts to groundwater.

4.27 Uncertainties and unknowns

The changing nature of ground water baselines as wider water usage and the climate changes will be a consistent unknown.

4.3 Impact 3: Landscape character change

4.31 Change from existing or baseline

The landscape character analysis was originally set out in the WCPG2 papers Annex 1.a "Westacre Farms - Site Context Map", Annex 1.b "Westacre Farms - Site Appraisal Plans" and Annex 2.b "Westacre Farms Landscape Analysis".

The scoping meeting generated an action to carry out landscape analysis work covering all proposed planting blocks in addition to that carried out as part of Stage 2 of the WCPG. The project is not located within any nationally designated landscapes or areas categorised as having a sensitive landscape by the local authority, and aside from the novel species use the proposals are not particularly complex. The Forestry Commission did not therefore request the completion of a full Landscape Visual Impact Assessment (LVIA), but did ask that for any reasonable gaps in the materials already undertaken that are essential for the Forestry Commission to assess compliance with the UK Forestry Standard to be filled. These included:

- Analysis of impacts by Local Authority Character Areas.
- Analysis of zones of theoretical visibility and identification of sensitive receptors.
- Visual impact depictions of the sensitive receptor views.

The above was delivered in the form of an Outline Landscape & Visual Appraisal, included in Annex 2.f "Outline Landscape & Visual Appraisal", which concluded that the project will have limited influence on landscape character, with only marginal, localised impacts, many of which have been mitigated as part of project design.

The subsequent Outline LVA has had no influence on project design, as the finalised UKFS compliant Stage 2 proposal balanced the requirements of many stakeholders whilst working within the parameters of the financial timber model. In summary, the conclusions drawn from the Outline LVA were not significant enough to displace existing design justification from consultee responses and previous landscape analysis work.

This has been completed and is included on Annex 2.f "Outline Landscape & Visual Appraisal". This further informs this impact assessment

The conclusion of the assessment is that there will not be a landscape character impact but that there will be some local impacts, many of which have been mitigated as part of project design.

Description of Baseline & Wider Landscape Context:

The Northern planting block is made up of a single large field, with a hedgerow boundary and small central 1.7ha deciduous spinney. The Southern planting area consists of 3 smaller adjoining field parcels with intercepting boundary hedgerows. The River Nar, a tributary of the River Great Ouse, dissects the two proposed planting sites. The proposed field parcels have previously been part of an intensive cereal and vegetable growing rotation.

The project areas fall within several landscape assessments on National & District level. On a National level, the project is spread across the National Character Area (NCA) profile (formerly Joint Character Areas (JCA)) 76: North West Norfolk and 85: The Brecks. The NCA 76 is characterised by some significant belts of mixed woodland and plantation and large-scale rectangular fields, with well-trimmed hawthorn hedges and mature hedgerow trees. The NCA 85, also known as Breckland, consists of a low, gently undulating plateau, largely covered with sandy soils of glacial origin.

Norfolk do not have a county-wide character assessment, but instead have the Breckland Landscape Character Assessment, published by Breckland District Council, and the King's Lynn and West Norfolk LCA (2007) covering the adjacent district area. Of the landscape types identified within the districts, Westacre has potential links to aspects of D1: Swaffham Heath, E6: North Pickenham Plateau, F1: River Nar Valley, I9: Little Massingham and Castle Acre Rolling Open Farmland, G3: Gayton and East Winch Farmland with Woodland and Wetland and J3: Great Massingham Plateau Farmland.

The project encompasses various aspects of Swaffham Heath, particularly the northern boundary of this character area which is defined by the Nar Valley, as well as the free draining sandy soils supporting the functional land cover of arable and large-scale arable fields delineated by hedgerows in variable condition with occasional hedgerow trees and thorn hedges.

The landscape in the vicinity of Block 2 exhibits many of the features of the wider North Pickenham Plateau and is considered representative of this character area, with particular reference to areas of mature mixed plantation woodland and a relatively remote and peaceful landscape with little movement.

The planting sites shares key characteristics with the River Nar Valley, comprised of the floodplain and valley sides of the River Nar and adjoining the north-western corner of Block 2, with this particular area containing a high proportion of woodland, as well as the designed landscape associated with Narford Hall.

I9: Little Massingham and Castle Acre Rolling Open Farmland encompasses the extensive areas of undeveloped land around the sites, contributing to a landscape which often feels remote and peaceful. Similarly, G3: Gayton and East Winch Farmland with Woodland and Wetland possesses a peaceful character away from main transport corridors.

The project site differs to some extent from J3: Great Massingham Plateau Farmland, which although is the most elevated landscape type within the district study area, is largely characterised by a strikingly flat terrain providing long distance views and a strong sense of exposure.

A line of pylons and overhead wires follows a generally east-west route and crosses the valley at West Acre, immediately to the north of Block 2, a prominent and distracting feature within the local landscape.

<u>Minimising Change from Baseline:</u>

Landscape sensitivity has been a crucial factor throughout the planning and design process, with key targets around minimising adverse visual impacts, maintaining existing landscape character profiles and promoting landscape scale woodland connectivity. This has been achieved through early identification of more localised landscape character and enclosure patterns, a considered approach to LCA identity and an understanding of how the project can contribute to NCA objectives where possible and appropriate.

Landscape analysis was undertaken to identify localised sensitivities and explore options for the NCA to be maintained through specific aspects of design and landscape enhancement. This analysis also identified Public Rights of Way for most appropriately placing native planting belts to provide a visual buffer from the potentially regimented appearance of the plantations, most notable in Block 2, where West Acre FP6 and RB7 follow a southward route up the valley side, 150m to the west of Block 2 at its closest point. In other areas of the project, native boundary belts have been incorporated to reinforce the existing level of enclosure and promote a sense of connectivity between landscape features whilst increasing the species and age class diversity of woodland.

Field boundaries within and around the planting sites mainly consist of hedgerows and ditches, a mixture of ancient and planned countryside. The large field sizes and modest height of hedges make for a relatively weak pattern of enclosure. The condensed planting sites make for a relatively low impact to the wider landscape enclosure. Open ground buffers of 6 metres either side of internal and external historic boundaries will help to preserve the current landscape pattern.

An outline Landscape and Visual Appraisal (LVA) has been used to further assess and develop a landscape baseline for the site, bringing in elements of visual appraisal with additional consideration of landscape-related designations and how the setting of these may be impacted by the project.

The project would have no material effect on the appreciation of geology, soils or watercourses on any of the blocks. The proposed sites are all currently in agricultural use for arable or vegetable production, and the proposed woodland would have no direct effect on the character of any of the Breckland Landscape Character Assessments.

In reference to 85: The Brecks, agricultural intensification and improvement have in some places resulted in the loss and damage to landscape features, including traditional infield coppices and shelter belts, something the project design aims to improve through the incorporation of field boundary native woodland planting.

The King's Lynn and West Norfolk LCA management objective around conserving hawthorn hedgerows (demarcating fields) and hedgerow trees as landscape features and wildlife corridors has been accommodated through project design. The scale of the proposed woodland is such that it would have no material effect on the characteristic topography of the area defined in the LCA, and the layout of the woodland would retain the simple, geometric field pattern.

Although the proposed woodland will be of a greater scale to existing blocks on the valley side, in regard to visibility, both Blocks 1 & 2 would have limited effect on cross valley views, with some new horizons formed in views along the valley. The new planting will more likely be experienced in context with other existing woodland locally.

In relation to LCA 76: North West Norfolk, the primary effect would be a change in land use from a large-scale arable and grassland landscape to woodland, which isn't considered to impact many of the key characteristics associated with this LCA. Furthermore, the overall pattern of fields with hedges and woodland coverts will be retained through the project layout and placement of open space.

A significant emphasis of the native planting silvicultural elements has been put on landscape character, in particular softening the visual appearance of both Paulownia and new native planting. This has been achieved in a number of ways detailed in Annex 3.a "Westacre Farms - Silviculture; Ground Preparation, Species Mix & Planting Design", including graded edge structure, achieved through appropriate distribution of lower growing species on the woodland periphery. As well as dispersed planting configuration, with stocking densities gradually increasing and becoming more unified before transitioning into the Paulownia planted areas. This is intended to promote harmony between the new woodlands and surrounding landscape.

Positive Change Contributions:

The third Statement of Environmental Opportunity outlined in NCA 76: North West Norfolk includes "*expanding and improving connectivity between broadleaved woodlands for the benefit of wildlife, strengthening landscape character, and improving recreational opportunities."* This SEO will be

effectively achieved on both planting Blocks, through the use of continuous boundary belts and the specific linking of existing woodlands within Block 2.

Similarly, NCA 85: The Brecks 3rd Statement of Environmental Opportunity (SEO) hinges around the management of forest plantations for climate change adaptation and regulation, with a noted example to achieve this being to "*Explore the potential for new woodland types, including species more resilient to potential challenges of climate change and new tree diseases"*.

The unique mosaic of arable farmland, river valleys and woodland belts which characterises the local landscape provides a distinct sense of place. This will be enhanced through the addition of native boundary belts. Irregular open areas and corridors incorporated into the project design will contribute to the 'spirit of place', further enhanced by the links to wider landscape woodland.

4.32 Nature of the change

The nature of both the project and the landform that it's situated within make the potential effect on the landscape character baseline established in 4.31 above more likely to be direct, in the form of impacts to the local landscape, as opposed to indirect and related to character changes beyond the boundary of a character area/landscape type. Furthermore, due to the intricacies associated with landscape character assessments, and the variety of competing stakeholder interests in the project design, the project will have both positive and negative impacts on landscape character, contributing to certain elements and detracting from others.

Taking into consideration all elements that form landscape character, including natural, physical and cultural features, the net effect of this proposal on the landscape character profiles outlined above would be positive and long lasting.

4.33 Confidence level of prediction

The confidence level of these predictions is considered high, partly due to the highly analysed and documented nature of landscape character profiles allowing for a comprehensive baseline to be established, as well as the emphasis put on landscape character preservation during project design. The outsourcing of additional Landscape and Visual Appraisal work enabled potential effects to be considered in context to the wider landscape.

4.34 Relationship to standards/policies

The project design process has complied with the National Planning Policy Framework (NPPF)[1] para 174 which recognises the importance of understanding the local landscape character.

As part of the initial landscape analysis and subsequent Outline Landscape and Visual Appraisal, NCA profiles were heavily utilised, documents amended from JCAs as required under Natural Environment White Paper 2011, Biodiversity 2020, and the European Landscape Convention 2007.

In addition to this, the project meets the UK Forestry Standard requirements around sensitive woodland design in relation to landscape character types.

4.35 Basis for predictions

The LVA utilises key landscape and visual receptor as a method for analysing effects and determining predictions on specific local landscape points. Visual influence, indicative zones of theoretical visibility (ZTVs) were also generated and used as a tool for predicting likely extent of

changes against the landscape character. Visualisation software has been used to demonstrate the visual effect of the project from specific viewpoints at various ages.

National and District level landscape character assessments, encompassing natural, physical and cultural features were used as a baseline for measuring scope of predictions against.

4.36 Method of impact identification

Ongoing monitoring of native elements of project to ensure predicted tree heights are met and associated screening delivered. Initially, any failed native stock will be replaced to ensure native belts provide full extent of intended visual buffering.

4.37 Uncertainties and unknowns

Whilst Paulownia Phoenix One has many similarities with existing local woodland and trees, their form and foliage colour hasn't before been seen in the North West Norfolk NCA, the visual contrast of which presents a level of uncertainty, particularly during summer months.

Though yield class, planting density and location provide an indication of tree height at particular ages, an exact height cannot be guaranteed. An average height of 5m at 10 years was used as a basis for native planting height in visualisation models, a reduction from predictions to reduce risk around this uncertainty.

The visual change associated with the Paulownia coppicing regime employed is predicted to have a lower impact than that of traditional clear-fell regimes, however, the scope of landscape variation that coppicing will create is not fully known.

4.4 Impact 4: Biodiversity changes on project and surrounding sites

4.41 Change from existing or baseline

This project, to establish high carbon sequestration woodland, has been designed throughout to ensure an overall biodiversity gain. The planting areas replace intensively farmed crops with associated agrochemical inputs, these crops having been grown as a monoculture with very little diversity being allowed to flourish. This is generally reflected through declining soil health, low invertebrate levels (particularly insects), seed and pollination sources and associated farmland fauna and flora.

Project sites have been carefully selected to ensure that no existing biodiverse habitat (priority habitat) have been included within the project.

This project will deliver biodiversity benefit through a range of habitat creation zones including native woodland creation (12% of project area, 9 ha), natural regeneration (1% of project area, 0.5ha), other non-native (Scots Pine) (2% of project area, 1.6ha), open space (10% of project area, 8 ha), Paulownia and associated understory (75% project area, 56 ha).

The project adheres to the Lawton review principles of positive biodiversity change through creating a bigger better and more connected landscape.

Promoting habitat connectivity was a key principle for this project. Large areas of open space and native woodland planting have been allocated to the linking of the rewilding project to the south with the existing infield coppice and beyond. Wildlife corridors extend to 20+ metre native planting belts running the perimeter of project blocks. Deer fencing has been positioned accordingly, allowing wildlife free movement across open area and native elements of the project.

Existing features have been expanded e.g. native woodland spinney using the 14% native/ Scots pine establishment to mirror what is already there and improve resilience (climate and disease), the 10% open areas have been used to create large habitat corridors across the project site and preserve all historic boundaries (hedges, ditches). This builds on and enhances the size of these existing features.

The conversion or arable land into woodland will reduce risk to the River Nar & Castle Acre Common SSSIs through a number of means. Nitrate as a diffuse pollutant associated with arable cropping practices will cease, and improved soil structure and organic matter will in time increase soil stability and water holding capacity. The effect of this being reduced run off leading to a reduction in dissolved nutrients which can potentially pollute water courses. Soil run-off will be reduced via the grass/clover sward established across the project sites, sediment pollution is identified as a sensitivity in the 'The River Nar – Water Framework Directive Local Catchment Plan'.

The project will create new habitats and target maximising the quality of these. Native woodland – planting mixes will mirror local context as well as building in future resilience. To achieve this, tree mixes will normally include: Pedunculate oak 41%, hornbeam 12%, Scots pine 2% and mixed native broadleaved species 45% (to include in the mix hazel, silver birch, field maple, wild cherry, hawthorn, wild crab apple, dogwood and small leaved lime). In open areas and Paulownia understory the low shading of the Paulownia trees will allow for the establishment of a biodiverse understory alongside the other, sunny aspect, open areas across the project sites. The principle across these areas will be to establish and manage a diverse flora that delivers food sources to insects and birds (pollination and seeds). Mixes will include: Birdsfoot trefoil, White clover, Alsike clover, Knapweed, Kidney vetch, Timothy (low percentage for tussock formation), Slender Red fescue, Smooth stalked meadow grass. Existing features, primarily hedges and woodland will receive open area buffers to improve the quality of these features and prevent encroachment by farming operations.

The project design has focused on joining up existing features and creating new wildlife corridors between habitats. The external perimeters to the project totals 6.4 km of biodiversity interface with the surrounding farmland. The addition of internal connectivity features increases this further to 7.1 km. In total 7.7 ha of pollination and seed rich buffers will be created and managed. The native woodland has been used in a number of cases to link existing woodland, and reduce islandisation potential, the deer fencing sited to ensure free flow of wildlife.

Overall, the change from existing baseline will be very positive.

A number of specific biodiversity areas were assessed around features on and adjoining this project site.

- Points raised within Natural Englands initial response to consultation have been broken down and considered as follows: Annex 5.s "Westacre Farms - Natural England Response to WCPG Stage 1 Consultation"
    a. New drainage infrastructure will not be installed anywhere on the sites, neither will any existing drainage system be altered or diverted.
    b. Regarding the modification of watercourses including banks & beds – The proposed planting sites include no watercourse either on or adjoining them, therefore realignment, damming and dredging practices will not take place.
    c. Management of aquatic & bank vegetation for drainage will not occur as the project does not encroach onto any areas of aquatic or bank vegetation or maintain any such features under its control.

d. Infilling or digging of ditches, dykes – All existing boundaries and features within the project sites including any ditches and hedges will be protected through incorporation of open area buffers on either side.
e. Alterations to water levels & tables, water utilisation – Although the species of Paulownia being grown requires water above that provided naturally in the UK, irrigation during the initial years of establishment will be satisfied under current license & annual water use. Further information in Section 4.2.

- The Breckland Farmland SSSI was identified during screening and subsequently raised by Natural England during initial consultation (WCPG Stage 1) Annex 5.s "Westacre Farms - Natural England Response to WCPG Stage 1 Consultation" for the projects potential for impacting on the functionality of the SPA in supporting Stone Curlew. The proposed planting sites are located 4+km from the SSSI, further to this no Stone Curlew nesting sites are recorded on the estate or within 1km of the proposed planting sites by the RSPB. The farm staff at Westacre also confirm that they have not observed any Stone Curlew activity on or in close proximity to any of the proposed planting sites.

- County Wildlife Sites (CWS) were identified during initial site screenings. When consulted (WCPG Stage 2) on the project, Norfolk Wildlife Trust expressed their support for woodland creation close to the CWS Annex 5.e "Westacre Farms - Norfolk Wildlife Trust Response". Areas of the project site adjoining Roadside Nature Reserves have open native woodland incorporated against the project boundary for maximum biodiversity gain

Across the above specific biodiversity areas identified we believe that there will be no impact on biodiversity.

The potential for impact on wider biodiversity priority sites has been assessed by a habitat risk assessment delivered by the Forestry Commission in conjunction with Natural England. This looks at threats to European protected sites.

4.42 Nature of the change

A specific target on Westacre will be the opportunity to increase the size, resilience and quality of existing woodland and link with the rewilding scheme that this project borders. This will expand the re wilding (and biodiversity) footprint.

The estate has records of Turtle Dove and the project will target habitat creation for this declining species through hawthorn feathering around new and existing woodland edges, targeting achieving the 4m wide 3m minimum criteria for turtle dove nesting habitat.

Where project areas are in the vicinity of butterfly rich habitats the pollinator mixtures will be enhanced to offer butterfly feedstock to align with the fly times of local species.

4.43 Confidence level of prediction

The confidence level is high given the degree of positive land use change and the low existing baseline.

4.44 Relationship to standards/policies

The opportunity this project presents to achieve a big biodiversity gain is significant and supports the direction of travel as set out by UK Government net zero commitment by 2050 and biodiversity gain targets.

4.45 Basis for predictions

Predictions are based on a range of research and documented evidence that records and demonstrates an increase in biodiversity as a result of soil organic matter improvement, enhancing floral diversity and scale, protecting and enhancing existing features, The project delivers across all these aspects.

4.46 Method of impact identification

These are set out in detail in Annex 3.d "Westacre Farms - Biodiversity Report Summary".

The project will measure

- Invertebrates through pit fall trapping
- Floral diversity through quadrat sampling
- Soil biodiversity through fumigation extraction of soil microbial biomass
- Soil carbon through isotope techniques
- Hedgerow biodiversity using the Defra hedgerow survey handbook
- Pond biodiversity using the Norfolk biodiversity information service pond survey
- Birds biodiversity using a common bid survey methodology as proposed by the RSPB

4.47 Uncertainties and unknowns

The ability to establish a biodiverse understory in the Paulownia plantation may require some experimentation with floral species mixes to determine the most effective and sustaining understory. The project will look at understories in European plantation as well as those that thrive in ancient UK woodland as part of determining the most appropriate site-specific mix.

4.5 Impact 5: Degradation of soil carbon in peat soils

4.51 Change from existing or baseline

The potential for peat soils to lose their carbon stocks through drying out, or the opportunity for them to be restored and sequester increased atmospheric carbon is recognised in the England peat action plan https://www.gov.uk/government/publications/england-peat-action-plan

Planting trees on peat may cause peat soils to dry out.

Natural England have confirmed that the project site does not contain any fields with peat levels above the threshold of concern or where peat levels are capable of restoration.

This impact is not therefore relevant.

4.52 Nature of the change

N/A

4.53 Confidence level of prediction

N/A.

4.54 Relationship to standards/policies

The England peat action plan https://www.gov.uk/government/publications/england-peat-action-plan.

4.55 Basis for predictions

Natural England assessment

4.56 Method of impact identification

N/A.

4.57 Uncertainties and unknowns

N/A.

4.6 Impact 6: Damage to archaeological and historic sites

4.61 Change from existing or baseline

The project sites generally have a very low level of underground archaeology, presenting little in the way of constraints to planting location. Potential site-specific constraints did however include a large Early Saxon Cremation Cemetery in the south-eastern corner of Block 1, High House Grade 1 listed building to the North of Block 1 and West Acre Priory scheduled monument to the northeast of Block 2.

Initial consultation with Norfolk Local Authority Historic Environment Team and subsequent reports for each planting block revealed a number of local findspots without cause for mitigation. However, located in the southeast corner of Block 1 is HER3781, the site of a large early Anglo Saxon cremation cemetery, discovered in the mid-19th century Annex 5.j "Westacre Farms - NCCHE Archaeology Report". This area, stretching to 0.7 hectares will be retained as an area of unplanted, open ground. Further to this, the area will be maintained by topping 6 monthly to prevent the development of scrub. The area will not at any stage be used operationally is a timber extraction or loading point.

Consideration has been given to the protection of historic boundaries including hedges and the lines of parish boundaries. All boundaries including those internal to the planting blocks have had a 6-metre open ground buffer incorporated into the project design. This includes the boundary between the parishes of Narford to the west and West Acre which follows the south-western field boundary of Block 2. The planting sites sit entirely within the HLC Enclosed Agriculture (Typically Pre-Modern Form), described as gradually enclosed predominantly for agricultural use with fields being established on former rough ground. Maintaining field boundaries will preserve field shape and form, in this case 19th century earlier recti-linear field patterns.

A report produced by Historic England raises the importance of maintaining the setting of West Acre as set out as a priority in Guidelines for character area 19. Little Massingham & Castle Acre in the Kings Lynn & West Norfolk Landscape Character Assessment Annex 5.c "Westacre Farms - Historic England Report". Historic England do not consider the project to pose a significant impact on views into West Acre Priory from the adjacent publicly accessible roads and footpaths. Historic England did however recommend that consideration is given to the use and placing of the native broadleaf component of the woodland with respect to the setting of the south-eastern approach to High House Park, something which was achieved through effective placement of native planting during project design.

Given the accommodation of consultee concerns as part for the initial design the project represents no significant change to the existing baseline position.

4.62 Nature of the change

N/A.

4.63 Confidence level of prediction
High confidence.

4.64 Relationship to standards/policies
Norfolk Local Authority Historic Environment Team and Historic England policy.

4.65 Basis for predictions
Mitigation as part of project design.

4.66 Method of impact identification
N/A.

4.67 Uncertainties and unknowns
None.

4.7 Impact 7: Local residents' quality of life changes

4.71 Change from existing or baseline
The change to baseline will be as a result of land use change on the fields in the vicinity of local residents. Agriculture cropping and associated management regimes will be replaced by woodland and associated management regimes.

Effects on local residents could fall under visual effects, healthy environment, road congestion and noise pollution.

The visual landscape will change.

Biodiversity levels will change.

The plantations, aside from at the harvest period every 6-7 years, are self-contained. The harvest cycle will involve the transport of wood from the site. This is unlikely to very different from usual traffic from agricultural machinery. There is likely to be no change from a road traffic/congestion perspective.

The management practices that can generate noise, disturbance and residues will change.

4.72 Nature of the change
The visual aspect will change from agricultural cropping to a mix of Paulownia plantation, native woodland an open space.

The landscape architect report Annex 2.f "Outline Landscape & Visual Appraisal" predicts these changes.

The biodiversity of the local area will increase as described in the biodiversity section of the report. There is much evidence that connections and interactions with nature improve human wellbeing. This is a positive impact.

The level of agrochemical inputs, fossil fuels, noise pollution and congestion from agricultural machinery will reduce as intensive cropping management is replaced by extensive woodland management. This is likely to have positive effects on air quality, lesson run off from fields and lesson disturbance for local residents.

West Acre village has suffered historically from soil run off, particularly associated with Block 2, with high volumes of heavily silted surface water running through the village causing problems of

siltation. The woodland and associated understory will reduce some of that flow from the slopes to the south of the village, providing a positive impact.

Local residents were consulted through Parish Council channels, who provided a collective response Annex 5.g "Westacre Farms - West Acre Parish Council Response".

Overall, West Acre Parish Council are in support of the project and have sought community involvement in the planting of native buffers. The PC did feel that the perimeter native planting belt in Block 1 should continue its path along the southern boundary adjoining Lynn Road. Something which has been accommodated within the project design

4.73 Confidence level of prediction

The confidence in the physical nature of change is high.

There is no basis for predicting confidence in the subjective nature by which residents interpret and internalise the changes.

4.74 Relationship to standards/policies

The design of the project conforms to UKFS. Integral to achieving this standard and within the methodology is a requirement to understand and address where possible local stakeholder views.

4.75 Basis for predictions

The LVA provides a pictorial representation of landscape change.

The woodland design plans depict the design of the plantations, native woodland and open areas. They also capture mitigating actions resulting in design change as a result of stakeholder feedback.

Local stakeholder feedback record annotates potential impacts.

4.76 Method of impact identification

It will be important to maintain a mechanism for communication and feedback with and from local residents as the project develops. This will allow for impacts (positive and negative) to be understood and if required addressed where possible.

4.77 Uncertainties and unknowns

The timeline for any impact (positive or negative) to manifest itself is not certain and should be managed through the mechanism for impact identification.

4.8 Impact 8: Carbon sequestration increases

4.81 Change from existing or baseline

The UK is committed to net zero carbon emissions by 2050. This is a front-line Government policy.

Achieving this ambition will be through a reduction in greenhouse gas emissions, clean technologies being adopted, carbon capture techniques and an increase in carbon sequestration.

Carbon sequestration, within the Westacre land area context, could be driven through new woodland creation, peat land restoration and better soil management.

Trees store carbon because they use CO2 in the process of photosynthesis to feed their growth (produce wood), woodland soil is also rich in organic materials and therefore carbon stocks.

All this means that UK forestry is a net carbon sink, currently estimated at around 18MtCO2e.

However, even today tree cover in the UK is far lower than its closest neighbours – just 13% compared to the European average of 38%.

The Government has set itself a target of establishing 30,000 ha of new woodland in England by 2025 as outlined in the 2020 budget statement. The figures are associated with the Government's commitment to the Committee on Climate Change's net zero projections https://www.theccc.org.uk/publication/net-zero-the-uks-contribution-to-stopping-global-warming/ advocating the need for 30,000 ha of new trees being established in the UK every year to 2050, to take woodland cover in the UK from 13-17%.

June 2021 statistics on new woodland creation from Forest Research indicate that targets are not being achieved.

https://www.forestresearch.gov.uk/tools-and-resources/statistics/statistics-by-topic/woodland-statistics/

The Committee on Climate Change (CCC) 2021 progress report to Parliament indicated that the Forestry Commission's target for increasing the area of forest under active management had been missed

https://www.theccc.org.uk/wp-content/uploads/2021/06/Progress-in-adapting-to-climate-change-2021-Report-to-Parliament.pdf

There is a pressing need to harness the benefits that woodland can deliver and pressingly within a short-term timescale as the world faces dramatic climate change inpats. Traditional and historical forestry models are being realigned to deliver to the challenge.

Yield class (YC) is a measure used in UK forestry to gauge the productivity of trees and it can, therefore, also be used, as the CCC does, as an indicator of how much carbon they are absorbing. As yield class is based on the annual volume of timber being added by a tree on a particular site under specific conditions. The faster the tree grows, the higher the yield class and the higher the carbon storage.

Agricultural baselines for carbon sequestration are very low. These are particularly low for light, sandy loam mineral soils as represented by the soils in this project. These soils will have organic matter content or 2 – 3%. Soil management will not be focused on practices that build soil carbon by ensuring winter green covers, incorporation of crop residues and non-inversion tillage techniques. These are outlined in the soil association article "Seven ways to save our soils" https://www.soilassociation.org/media/7458/7_ways_soils_final.pdf.

Even with these practices soil carbon sequestration is estimated to deliver around 0.5t/ha per year of addition carbon captured and stored. In most situations agricultural practice will not contribute to carbon sequestration and thus climate targets.

Woodland carbon capture is much more positive. Traditional native woodland can deliver 8 – 12 t per ha averaged over a 35-year period. Paulownia, in a managed plantation, is predicted to deliver 7 x the carbon capture rates of native woodland at over 65t/ha/year. This project across Westacre Farms and the mix of 75% Paulownia, 12% native/Scots pine woodland (unharvested) and 10% open area is predicted to deliver approximately 103,000 tonnes of captured carbon over the 35-year lifecycle.

This is a huge change form a baseline that, given continuation of current agricultural cropping practice, would be predicted to deliver between 0 and 1500 tonnes over the same period.

4.82 Nature of the change

The change would be through a capture of atmospheric carbon. Predicted as 103,000 tonnes. This carbon would be stored in the soils that the project manages and the timber from the commercially managed woodland.

4.83 Confidence level of prediction

Highly confident. The carbon sequestration predictions have been researched and evidenced, subject to commercial due diligence and form a significant basis for the investment case and business model.

4.84 Relationship to standards/policies

- The UK is committed to net zero carbon emissions by 2050. This is a front-line Government policy.
- The UK Forestry standard (UKFS) determines the species mix in the woodland areas. This project is UKFS compliant. https://www.gov.uk/government/publications/the-uk-forestry-standard
- The UK Woodland carbon code (WCC) determines the framework for carbon sequestration predictions and carbon yield. This project is registered with the WCC. https://woodlandcarboncode.org.uk/
- The Woodland Carbon Guarantee (WCaG) is the UK government reverse auction process that contracts to purchase sequestered carbon units that are compliant with WCC and received offers in the auction processes. https://www.gov.uk/guidance/woodland-carbon-guarantee. All of the project area on Westacre Farms has achieved a contract offer in this process.

4.85 Basis for predictions

The carbon predictions have been produced using the Forestry Commission Woodland Carbon calculation spreadsheet as required to register the project with the WCC. This spreadsheet was modified, in consultation with the FC, to accommodate Paulownia that does not a present have a yield class assigned.

Although ESC does not provide an assessment for Paulownia, UK trials and research carried out by the producer WeGrow support species suitability. Carbon calculations used for the Woodland Carbon Guarantee scheme demonstrate the high yield class (& timber production) potential of the tree.

The site has a DAMS score of 12 (sheltered) and therefore does not limit the intended species mix, all of which have a very high DAMS suitability score for the site. As demonstrated in the ecological site classification (ESC) outputs Annex 2.c “Westacre Farms ESC Output inc. DAMS Scores (2050 & 2080 AWC)”

4.86 Method of impact identification

The WCC process subject to validation, by a FC approved verifier, to ensure that the project sites are established as per the agreed plans. After every 5 years the carbon capture is calculated by a verification visit by the FC approved verifiers. The Soil Association and the Organic farmers and Growers are the current approved verifiers.

CPL will also me measuring the soil carbon impacts by using an isotope-based methodology (https://www.omniaprecision.co.uk/terramap/ This will baseline active soil carbon. CPL will revisit and ground truth geo located sites every 4 years to assess the increasing levels. C:N ratio will be

tracked inn a similar way to the above analysis showing the changes in soil ratios as the system begins to 'settle' from modern arable production

4.87 Uncertainties and unknowns

The plantation growth of the Paulownia element will be subject to UK climate and growing conditions that have been untested to date. Carbon modelling has however been based on similar climatic and management conditions in Europe and is expected to yield similar results.

4.9 Impact 9: UK Hardwood production increases

4.91 Change from existing or baseline

The UK is one of the largest net importers of forest products by value in the world, second only to China. In total, 80% of the nation's wood is imported.

The UK timber sector is predominated by softwoods. There are also issues with the uses that wood products are being put to. From a carbon accounting perspective, there is a considerable difference between wood used in construction, which may last a century or more, and wood used in fencing, which may last 15 years. Evidence also suggests that at least half of UK-grown wood was being used in relatively short-term applications, such as paneling, fencing and pulp. A further quarter was being burned for energy. These short-term end uses release the carbon captured on wood negating some of the benefits of woodland as a carbon mitigation strategy. This is a complex area are discussed within a RSPB report on Woodlands for Climate and Nature http://ww2.rspb.org.uk/Images/Forestry%20and%20climate%20change%20report%20Feb%202020_tcm9-478449.pdf

The commercial production of Paulownia offers a different opportunity. Paulownia is a hardwood with a very high tensile strength to weight ratio. It is generally used as a plywood, a veneer, for making furniture, storage crates, musical instruments, surf boards and in the construction industry. These in general are long term applications for the wood produced.

This project will produce approximately 49,300 Tonnes of Paulownia timber over the 35 years. This is a very positive impact.

4.92 Nature of the change

The present land use agricultural cropping produces no timber.

4.93 Confidence level of prediction

The confidence level is high. The timber production models has been researched and evidenced, subject to commercial due diligence and form a significant basis for the investment case and business model.

4.94 Relationship to standards/policies

The Uk Forestry standard (UKFS) determines the species mix in the woodland areas. This project is UKFS compliant. https://www.gov.uk/government/publications/the-uk-forestry-standard

4.95 Basis for predictions

Although ESC does not provide an assessment for Paulownia, UK trials and research carried out by the producer WeGrow support species suitability. Carbon calculations used for the Woodland

Carbon Guarantee scheme demonstrate the high yield class (& timber production) potential of the tree.

The site has a DAMS score of 12 (sheltered) and therefore does not limit the intended species mix, all of which have a very high DAMS suitability score for the site. As demonstrated in the ecological site classification (ESC) outputs Annex 2.c “Westacre Farms ESC Output inc. DAMS Scores (2050 & 2080 AWC)”

The timber production models has been researched and evidenced, subject to commercial due diligence and form a significant basis for the investment case and business model. Due to Paulownias' versatility and light strength to weight ratio coupled with its fast growing nature, it lends itself for the most suitable timber for future markets in mostly non-decorative hardwood, including all sustainable uses.

The harvest cycle is based on 8 harvests within the 35-year project timeline. Each harvest will be of 50% of the plantation. This means that any individual tree is harvested every 9 years.

The native plantings will remain indefinitely.

4.96 Method of impact identification.

The sale of the Paulownia timber is underwritten by a floor price for 10 years. The quantity of sale will be recorded as a measure of output and impact.

4.97 Uncertainties and unknowns

The plantation growth of the Paulownia element will be subject to UK climate and growing conditions that have been untested to date. Timber modelling has however been based on similar climatic and management conditions in Europe and is expected to yield similar results.

The price of hardwood timber is underwritten by a floor price for the first 10 years and likely to increase.

5 Significant impacts and mitigation

5.1 Impact 1: Invasiveness

5.11 Approach to evaluation

CPL has consulted and worked with the Forestry Commission throughout the WCPG1 & WCPG2 process to ensure a project design that allows for invasiveness risks to be minimised.

The Non-Native Risk Assessment Forum (NNRAF) process, introduced at a later stage in project formulation, has also been embraced to accommodate a wider perspective on the parameters to evaluate.

The above dialogue together with the feedback from the scoping meeting puts CPL in a strong position to understand all perspectives and collaborate on evaluation design and deliver ongoing evaluation of project sites.

The draft monitoring framework, designed by Forest Research, will form the basis for that evaluation of any impacts.

5.12 Thresholds of concern

These will be clarified and documented within the monitoring framework

5.13 Avoidance/reduction/remediation/compensation

Project designs and plantation management, described earlier in this statement, have been formulated and will be delivered to ensure avoidance and reduction measures are an integral part of design and ongoing plantation management. These include site selection framed within avoidance of sensitive features, buffers and sucker monitoring zones, operation practice to minimize apical dominance suppressing suckering and physical destruction of any identified potential invasiveness features.

If a threshold of concern was crossed appropriate and proportional actions would be taken such as destroying problem trees. These to be agreed within the monitoring framework.

5.14 Expected effectiveness of mitigating proposals

These are expected to be highly effective.

5.15 Residual impacts

CPL recognise some residual concerns that cannot be addressed at this point in time (and without several further years of trial work in UK conditions). CPL is committed to long term transparent monitoring and will indemnify any mitigation that may become necessary.

5.2 Impact 2: Water

5.21 Approach to evaluation

CPL will agree with the Environment Agency key monitoring parameters.

An initial suggested set of monitoring parameters would be:

- Rainfall – Open and below canopy.
- Baseline evapotranspiration (ET) demand – Penman Monteith (ETo) (wind speed, solar radiation, humidity, barometric pressure).
- Plant actual ET estimate (ETc).
- Irrigation application rates .

- Soil water content at different depths (5, 10, 20, 30, 50 and 100 cm).
- Runoff/infiltration estimates –baseline and under forestry.

To enable comparison with the baseline of agricultural production these parameters would be monitored within plantation and then in a suitable local location outside. This would need to be across a number of years to accommodate annual climatic variance.

The range of parameters, methodology of approach would be finalised and agreed with the Environment agency.

5.22 Thresholds of concern

The thresholds of change from the baseline would be agreed with the Environment Agency.

5.23 Avoidance/reduction/remediation

Please see the Ecological Site Classification output in Annex 2.c "Westacre Farms ESC Output inc. DAMS Scores (2050 & 2080 AWC)" the highlighted native species mix have been chosen based on their overall suitability, including water use and drought tolerance. They therefore have no additional water demand through irrigation

5.24 Expected effectiveness of mitigating proposals

The information collated across all water areas has outlined a high likelihood that there will be no change or a positive change against baseline.

Irrigation and associated abstraction licensing is subject to Environment Agency control and the "hands off" mechanism that would be brought into play in extreme circumstances to manage abstraction quantities.

Water resource balance change would be determined over an extended timescale to accommodate annual fluctuations. It would also need to be against the background of groundwater baseline change as the climate changes. The timescale for meaningful evidence is likely to be 10 plus years.

Ultimate mitigate would be a reduction in plantation size/density or in plantation management. This would affect the economic returns and business model that underpins the project and all alternatives for mitigation would be explored if and when this point was reached.

5.25 Residual impacts

None likely.

5.3 Impact 3: Landscape character change

5.31 Approach to evaluation

Prior to more detailed site-specific design options, screening and consultation took place to identify and finalise suitable planting sites and areas. Landscape formed an integral part of this stage, with potential sites chosen away from statutory and local authority landscape designations.

The first step in the design process involved the development of Site Context Map to (Appendix 1.a) highlight any significant environmental features, settlements, roads and other infrastructure. This was followed by a more detailed Site Appraisal Plan (Appendix 1.b), involving the evaluation of landscape survey information, and representation in a map-based format with more detailed features depicted on the site. Consideration of the 7 forestry design principles was also taken at this stage.

Following a more detailed synthesis exercise pulling together various sources of information and survey data, a Design Concept Plan (Appendix 1.c) was produced to demonstrate a viable woodland design option, and an Outline Landscape & Visual Appraisal then carried out on that design.

5.32 Thresholds of concern

The thresholds of change from the landscape character profile baselines have been established through landscape analysis carried out as part of Stage 2 of the WCPG, which concluded the level of change as being UK Forestry Standard compliant, and subsequently through the Outline Landscape & Visual Appraisal, which also identified limited concern around change from baseline.

5.33 Avoidance/reduction/remediation/compensation

Mitigatory factors associated with preserving landscape character are focused around planting location, layout, species mix and design, all of which are implemented at the outset and are to an extent irreversible. Consequently, all efforts regarding landscape character have been invested into the avoidance of adverse impacts, with little scope for remedial action or successive compensation.

5.34 Expected effectiveness of mitigating proposals

A combination of CAD visualisations, comprehensive evaluation of project design against landscape character profiles, as well as the level of informed mitigatory design built into project layout and silviculture elements provides a high expected effectiveness of mitigating proposals.

5.35 Residual impacts

Despite the requirement to produce a UKFS compliant woodland proposal whilst meeting the hardwood timber output necessary for the projects financial structure and fulfilling the conditions of various statutory and non-statutory consultees, the final project design accommodates the majority of landscape character requirements. Residual impacts associated with landscape character which haven't been addressed in the project design to some extent are minimal.

5.4 Impact 4: Biodiversity changes on project sites

5.41 Approach to evaluation

Consultation feedback from the Environment Agency Fisheries, Biodiversity and Geomorphology Team response (Natural England have not provided feedback on this matter) supports our intention to monitor across 4 project biodiversity areas:

a) Plantation understorey
b) Native woodland plantings
c) Bare areas/Buffer strips
d) Hedgerows

Across these ecosystems we will evaluate invertebrates, floral diversity, soil microbial biomass, soil carbon, birdlife.

A more detailed description is set out in Annex 3.d "Westacre Farms - Biodiversity Report Summary"

5.42 Thresholds of concern

None identified

5.43 Avoidance/reduction/remediation/compensation

The River Nar & Castle Acre Common SSSIs, the most significant environmental features in proximity of the project sites, were identified as at potential risk during the initial site screening processes, with site locations then chosen accordingly. Hydrological connectivity between the proposed project sites and the SSSIs considered to be unlikely due to a distance of more than 170 metres from the River Nar SSSI and more than 360 metres from Castle Acre Common SSSI. Native buffer strips of 20+ metres and open area buffers of 6 metres intercept the SSSIs from the non-native element of the project, mitigating any unlikely runoff that could occur.

Natural England raised points raised during consultation around Drainage, Modification of watercourses, Alterations to water levels & tables, Management of aquatic & bank vegetation for drainage and Infilling or digging of ditches, dykes have all been incorporated to project design and ongoing management, with no such activities taking place throughout the project lifecycle.

The conversion or arable land into woodland will reduce risk to the SSSIs through a number of means. Nitrate as a diffuse pollutant associated with arable cropping practices will cease, and improved soil structure and organic matter will in time increase soil stability and water holding capacity. The effect of this being reduced run off leading to a reduction in dissolved nutrients which can potentially pollute water courses. Soil run-off will be reduced via the grass/clover sward established across the project sites, sediment pollution is identified as a sensitivity in the 'The River Nar – Water Framework Directive Local Catchment Plan'.

Where Roadside Nature Reserves have been identified as adjoining the project site, native woodland will be placed alongside such feature in order to promote habitat diversity and maximise biodiversity gain, an approach supported by the Wildlife Trust.

Identified during scoping and also raised by Natural England is risk associated with the potential invasiveness of the non-native tree species and its potential impact on the local SSSIs. The project has integrated more localised mitigatory measures in the form of 4- 6 metre open ground buffers around all Paulownia planting areas which will be routinely inspected for any suckering and managed accordingly.

5.44 Expected effectiveness of mitigating proposals

The mitigations are expected to be very positive and effective in maintaining biodiversity. Connectivity of woodlands will be increased and resilience improved.

5.45 Residual impacts

None identified.

5.5 Impact 7: Local residents quality of life changes

5.51 Approach to evaluation

The local stakeholder consultation process undertaken as part of WCPG2 captured feedback on the project proposals. The full details of the scheme were shared allowing for the opportunity for direct feedback by local residents. These are detailed in Annex 5.r "Westacre Farms - Stakeholder Consultation Log Summary"

5.52 Thresholds of concern

The main threshold identified related to the proximity of trees to properties. This could be quantified. Concerns over the change in view from properties is not a threshold that is easily quantifiable and a more subjective measure.

5.53 Avoidance/reduction/remediation/compensation

In all cases an action has been taken to attempt to accommodate local residents (Parish Council) concerns as raised.

These are detailed in the Annex 5.r "Westacre Farms - Stakeholder Consultation Log Summary".

The range of actions to address local residents feedback include:

- Reducing areas of Paulownia and increasing in native planting and open areas to improve visual aspect.
- Relocating the placement of native planting buffers.

5.54 Expected effectiveness of mitigating proposals

The mitigating proposals will help maintain views, reduce project proximity to properties through buffering (an improvement over existing crop production that is closer to property boundaries)

5.55 Residual impacts

The views for some will be changed.

Biodiversity in the vicinity will increase.

6 Summary statement of the significant impacts

There are 3 impacts identified that could have negative outcomes : invasiveness, landscape change and residents' quality of life. These have all been the subject of mitigation of impact and likelihood.

The potential of invasiveness could be a considerable impact, however the likelihood of this impact is very low. There is no evidence, to date, of invasiveness of this clone in any plantations under management, however the planned monitoring and control measures are rigorous. CPL accept that the precautionary principle approach (the unknown unknowns) remains.

The impact of landscape change has been rigorously assessed through an Outline Visual & Landscape Appraisal, including Zones of Theoretical Visibility, concluding that landscape change will not affect overall landscape character. There may be local landscape impacts, these have been mitigated as much as possible through project design but some remain but are considered localized and considered of low overall impact.

The impact on local residents has been addressed through the consultation process. All concerns have been addressed with some degree of mitigating actions. There remains the change to the view for some and the effect on any individual will not be predictable.

The impact on water (irrigation and water balance) has been concluded as negligible.

The impacts on biodiversity, carbon capture and UK hardwood supply have been concluded as all very positive. The project brings significant positive impacts across all these areas.

Overall CPL conclude that the positive impacts are significant and near certain. These outweigh the low likelihood of potential negative impacts.

7 Consultees

Consultees as part of WCPG2 consisted of 6 organisations and local residents represented through the Parish Council. Responses are listed in Annex 5.r "Westacre Farms - Stakeholder Consultation Log Summary".

Additional organisations participated in the scoping meeting as recorded in Annex 6.b "CPL EIA Scoping Meeting Agenda and Participating Organisations".

8 Annex List

		Annex
Primary Outputs	Forestry Commission Approved Woodland Creation Planning Grant Stage 2	1
1. Visual Outputs	Westacre Farms - Site Context Map	1.a
	Westacre Farms - Site Appraisal Plans	1.b
	Westacre Farms - Design Concept Plans	1.c
	Westacre Farms - Final Woodland Creation Design Plans	1.d
2. Survey/Analysis Outputs	Westacre Farms - Soil Analysis	2.a
	Westacre Farms - Landscape Analysis	2.b
	Westacre Farms ESC Output inc. DAMS Scores (2050 & 2080 AWC)	2.c
	Westacre Farms - RSPB Stone Curlew Nest Records	2.d
	Outline Landscape & Visual Appraisal	2.f
	LVA Zones of Theoretical Visibility	2.g
	LVA Visuals	2.h
	Westacre Farms - Designations list	2.i
	Westacre Farms - NCCHE Archaeology Report	2.j
3. Key Supporting Documents	Westacre Farms - Silviculture; Ground Preparation, Species Mix & Planting Design	3.a
	CPL Report - Paulownia Irrigation Demand	3.b
	Paulownia Water Use Report	3.c
	Westacre Farms - Biodiversity Report Summary	3.d
	WeGrow Plantation Maintenance & Growth Report	3.e
	Phoenix One Sterility and Invasiveness summary	3.f
	High Level Water Balances	3.g
4. Invasiveness/Sterility Material	Paulownia Elongata Risk Assessment - Hawai Import	4.a
	Paulownia Fortunei Risk Assessment - Hawai Import	4.b
	Phytosanitary Certificate	4.c
	Portuguese Risk Analysis on the Introduction of Paulownia - Ecological Characterisation	4.d
	Portuguese Risk Analysis on the Introduction of Paulownia	4.e
	Portuguese Risk Assessment for Phoenix One	4.f
	Prof. Dr. Ralf Pude, University of Bonn - Phoenix One Sterility Statement	4.g
	University of Bonn Phoenix One Sterility Report	4.h

	GB Non-Native Species Risk Analysis Phoenix One Vs 2	4.j
	A Case for the Non-Invasiveness of Paulownia	4.k
	Paulownia in China – Zhu et al	4.l
	Comparison of Influrescence and Infructescence Within Different Paulownia Genotype Lines	4.m
	Paulownia - Invasive or Not (Gillard)	4.n
	Berg et al 2019 - Survivorship attained diameter height and volume of three Paulownia Species USA	4.o
	Paulownia Phoenix One - RAv2 NNRAF Comments on Draft Risk Assessment	4.p
	Paulownia Phoenix One - RAv2 Draft Risk Assessment	4.q
5. Consultee Responses	Westacre Farms - Environment Agency Response	5.a
	Westacre Farms - RSPB Response	5.b
	Westacre Farms - Historic England Report	5.c
	Westacre Farms - Norfolk Wildlife Trust Response	5.e
	Westacre Farms – West Acre Parish Council Response	5.g
	Westacre Farms - West Norfolk District Council - Private Water Supplies	5.p
	Westacre Farms - NCCHE Consultation	5.q
	Westacre Farms - Stakeholder Consultation Log Summary	5.r
	Westacre Farms – Natural England Response to WCPG Stage 1 Consultation	5.s
6. Scoping Meeting	Scoping Meeting Issues Log	6.a
	CPL EIA Scoping Meeting Agenda and Participating Organisations	6.b
7. Other	SRF Monitoring Framework	7.a