Flaxley Mill

Waterwheel

Heritage, Design & Access Statement

CES Ltd

27 Feb 2024

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1. Proposal

1.1. The proposal is to reinstate the 4m diameter overshot waterwheel that will use water from Westbury Brook located at Flaxley Mill, a former textile and corn mill in the Abenhall - Flaxley Valley near Mitcheldean, in order to generate electricity for the property.

1.2. The waterwheel installation will utilise the existing legacy infrastructure at the property that includes two mill ponds linked by the Brook. The proposal does not require any changes to the pond, leat or flows and shall utilise 100% of the flow currently passing through the leat into the former wheel pit.

Installation of a 4m Diameter Waterwheel and Electrical Generator.
Intake Location : OS Grid Reference SO 67802 15929
Waterwheel Location : OS Grid Reference SO 67802 15929
Discharge Point : OS Grid Reference SO 67802 15929

1.3. The proposal is consistent with National commitments for the reduction of green house gases and shall contribute to such reductions. The installation of the waterwheel in the context of the existing infrastructure is considered to have a negligible impact on water resources and ecology at the site.

2. Background

2.1. Flaxley Mill is a former textile and corn mill dating back beyond the 18th Century. It is located immediately downstream of the famous Gunns Mills armaments factory and paper mill, Figure 1.

2.2. Both Gun's Mill and Flaxley Mill were fed by Westbury Brook and its tributaries, spring fed watercourses taking their head about 1km upstream and to the West of Guns Mill.

2.3. Whilst the waterwheel is no longer present at Flaxley Mill, Westbury Brook continues to flow through the upper and lower ponds before flowing into the former wheel pit where it flows in a easterly direction towards the River Severn.

3. Statutory Considerations and Report Constraints

3.1. The scale and type of the proposed scheme is below the threshold and out-with developments requiring an Environmental Impact Assessment under the Town and Country Planning (Environmental Impact Assessment) Regulations 2011. However, in support of applications to the Planning Authority and Environment Agency, an Environmental and Ecological Risk Assessment has been undertaken to assess potential impacts from the proposed waterwheel power scheme. The review encompasses geomorphology, conservation, water quality, ecology, biodiversity and hydrology for the proposed development. The assessment gives due consideration to the requirements of the Water Framework Directive, River Basin Management Plans, Joint Nature Conservation Committee UK Biodiversity Action Plan and Local Action Plans for land , water and ecology associated with this development.

3.2. This Heritage, Design and Access Statement has been compiled from an initial desk top study utilising information held by statutory and Non Government Organisations and a baseline field assessment site walk over. In addition to the site walk over a number of visits were undertaken to obtain spot gauging data in order to determine the flow within the beck and undertake an Environmental and Ecological Risk Assessment for the site.

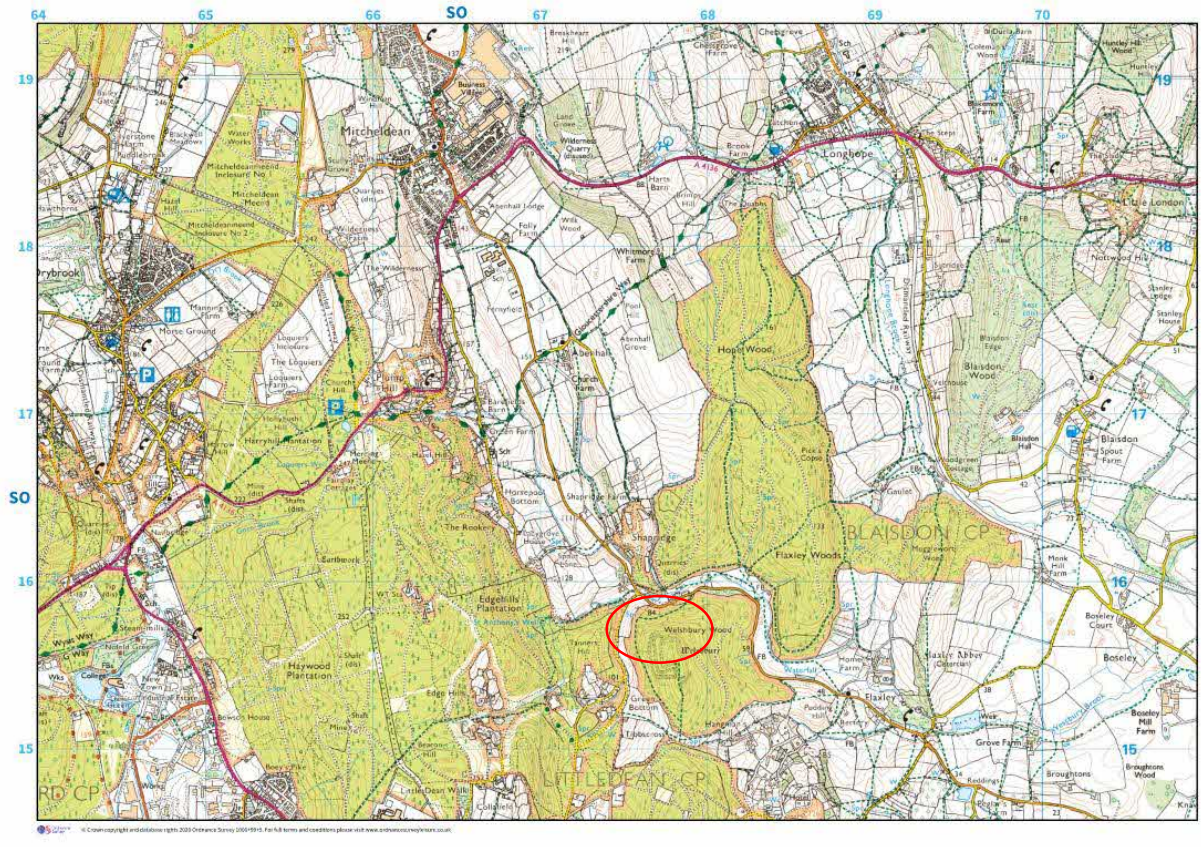

Figure: 1	Flaxley Mill General Location Map

4. Location and Geographical Setting

4.1. Flaxley Mill is located at the North West fringe of the Forest of Dean in Gloucestershire approximately 2.5km to the North East of Cinderford and 3km due South of Mitcheldean as detailed in Figure 1 and is set between Welshbury Woods to the South and Flaxley Woods to the North.

4.2. As can be seen in Figures 2 and 3, Westbury Brook enters the property from the West and flows Eastward supplying two mill ponds. From the upper Mill Pond the Brook flows eastward to a second smaller concrete lined pond directly before the former waterwheel and wheel pit.

4.3. A bypass channel runs parallel to the main watercourse from the upper pond to the confluence between it and the Brook downstream of the former Mill Buildings. The flow in the bypass channel is composed of slight groundwater seepage from the upper pond along with flow from ephemeral streams from Shapridge and spring/groundwater seepage from the slopes of Flaxley Woods.

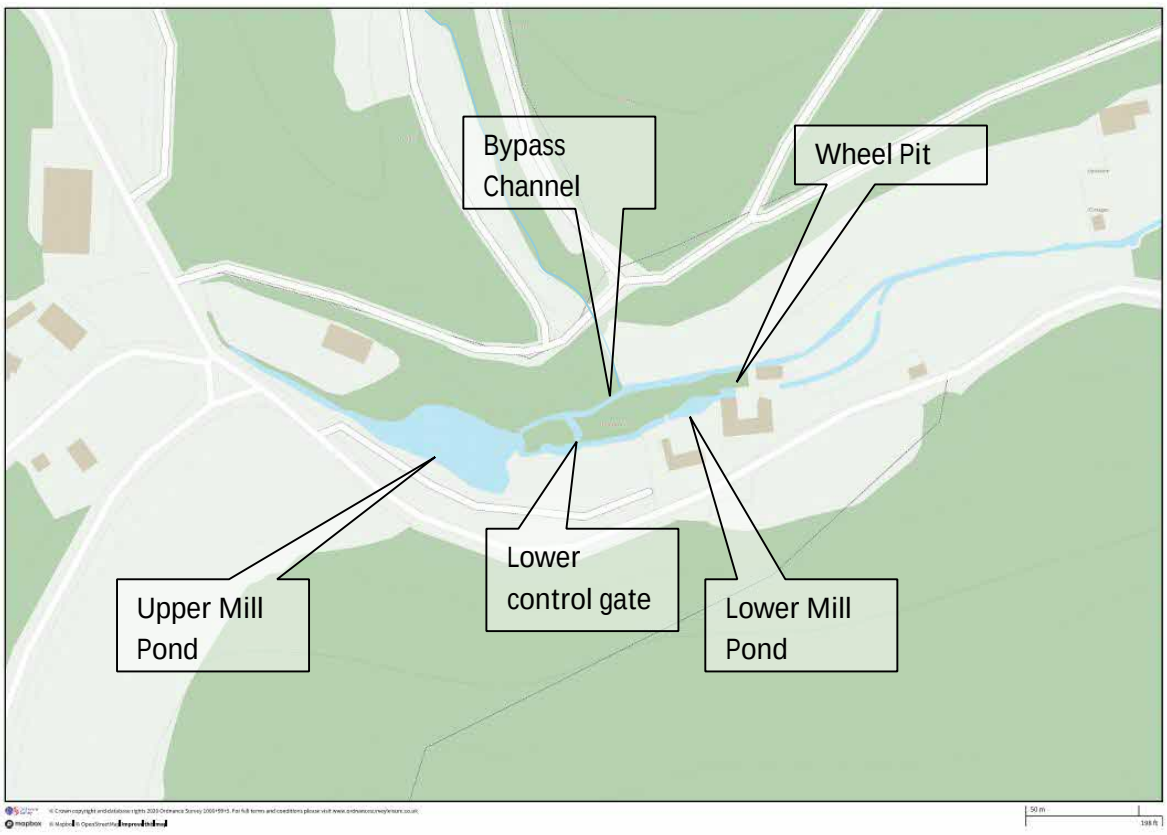

Figure: 2	Flaxley Mill Site Map

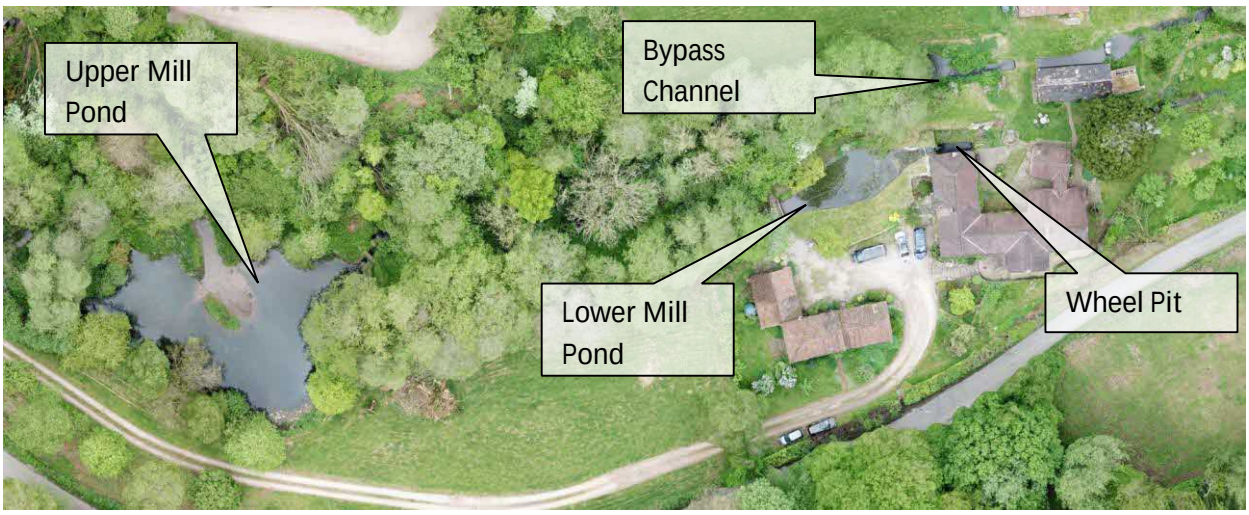

Figure: 3	Flaxley Mill Features Map

4.4. The Mill is located in the floor of a valley with moderately inclined slopes having farmed timber plantations to the North and South and with agricultural grazing land to the West. Set within the moderately inclined slopes there are steeper valley sections that increase the potential for flashy river conditions due to increased surface run off in these steeper sloped zones. From Figure 4 the valley floor can be seen extending to the East typified with a similar mosaic of agricultural land in the valley bottom before opening out beyond the village of Flaxley onto the open plains of the Severn Valley and beyond to the Vale of Berekley to the South East.

4.5. Westbury Brook is classified as an Ordinary Watercourse with flood risk management responsibility resting with lead local flood authorities, district councils and internal drainage boards. Westbury Brook remains non main river until reaching its confluence with the River Severn south of Westbury on Severn, detailed in Figure 5, where responsibility for main river management falls to the Environment Agency to carry out maintenance, improvement or construction work.

Figure: 4	Flaxley Mill Site Map

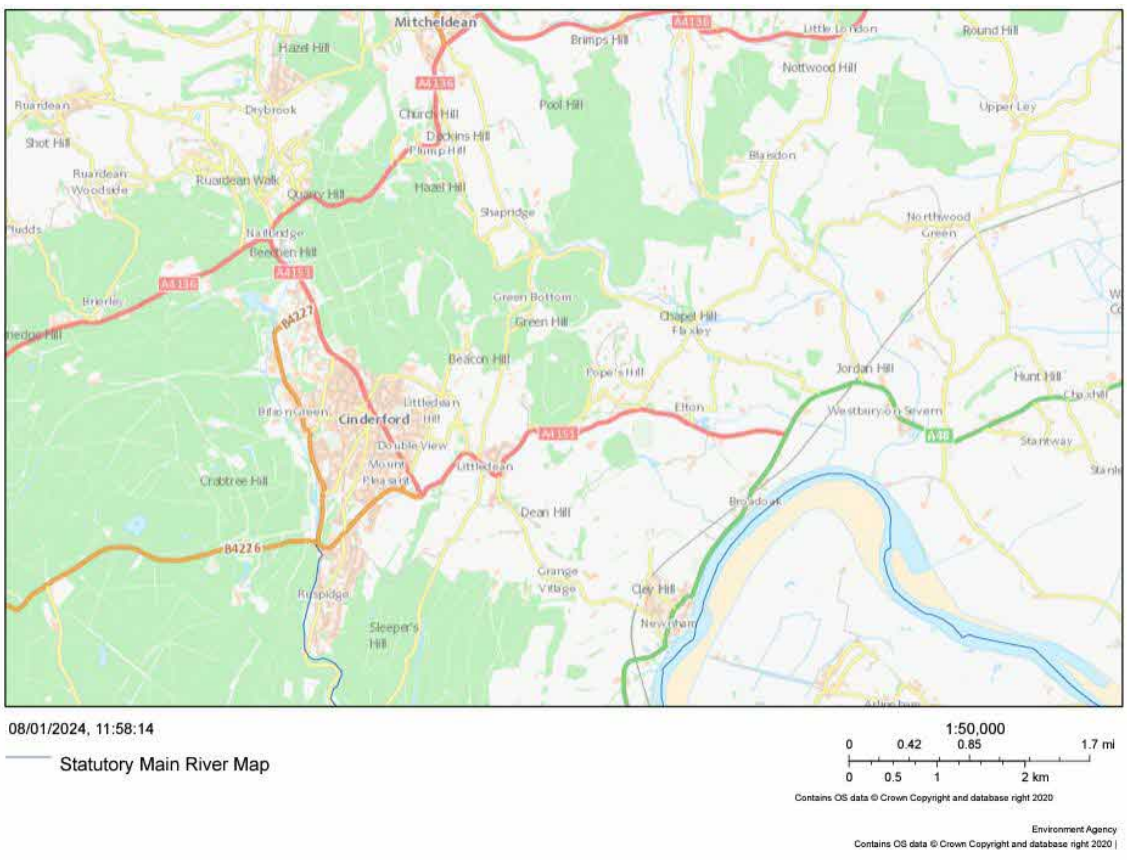

Figure: 5	Main River Map

5. Historical and Archaeological Considerations

5.1. A search of the Historic England Archive datasets have identified statutory archaeological and historical features in proximity to the site as outlined in Figure 6 and Table 1, however the heritage assessment has revealed that there are no designations applying to or influencing Flaxley Mill.

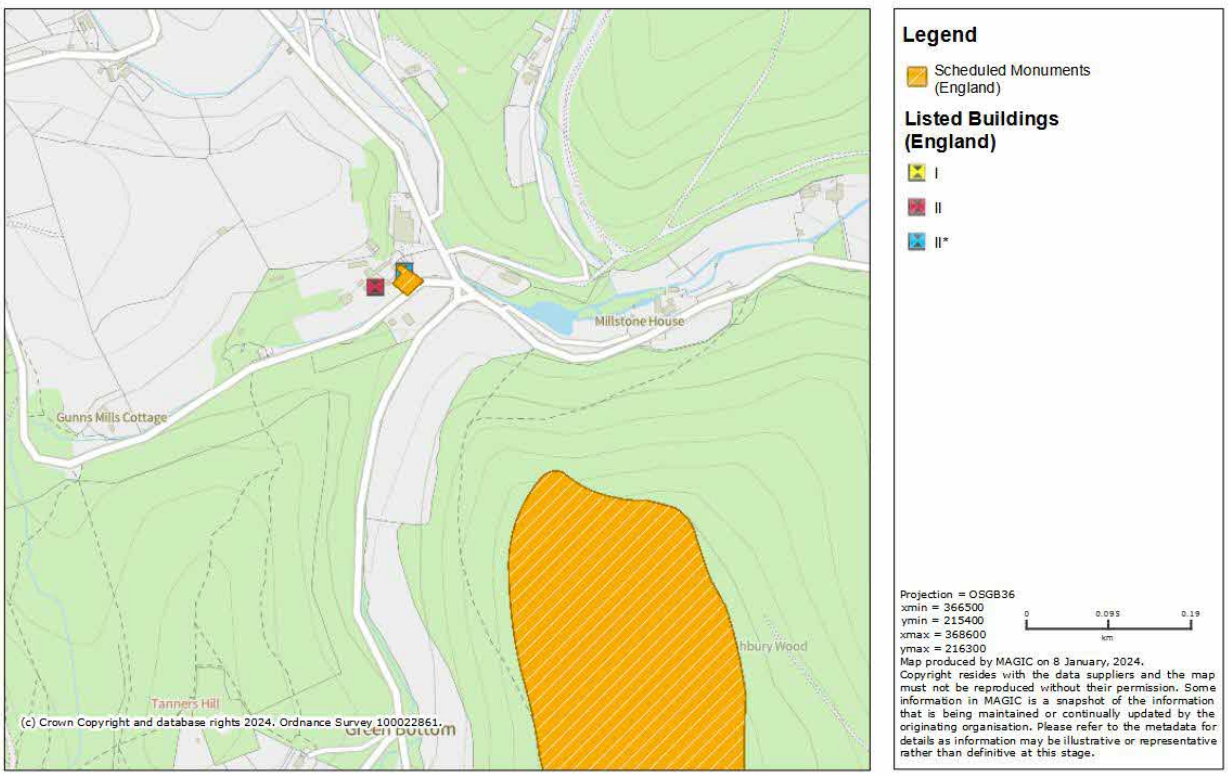

Figure: 6	Scheduled Monuments and Listed Buildings Location Map

Location	Heritage Category	Grade	Entry Number
Gunns Mills furnace	Scheduled Monument		1002080
Mill at Gunns Mills	Listed Building	II*	1186479
Gunns Mills House	Listed Building	II	1186868
Welshbury hillfort and associated earthworks	Scheduled Monument		1018158

Table 1	DEFRA site check results – Flaxley Mill

5.2. The neighbouring Gunns Mills, at Flaxley, in the Forest of Dean was a major industrial site from the 17th Century. Originally built as corn and fulling mills the site later became an

armaments factory with associated blast furnace in 1629, although long gone, the wheel pit shows evidence of a 22' diameter water wheel that was used to power the bellows for the blast furnace. It was converted into a paper mill in the 18th century and operated as such until the late 19th century. A small water wheel was installed in the early 20th century to operate a cider press.

5.3. The historic catalogue indicates that Flaxley Mill was also a former fulling and corn mill from the mid 17th Century and is shown as an operational mill in the 1881 Ordnance Survey extract, Figure 7. The Mill is noted to be disused by the 1922 Ordnance Survey edition. The Mill and its associated buildings are now given over to residential use. The wheel pit now missing its waterwheel, contained an overshot wheel approximately 4.5m in diameter.

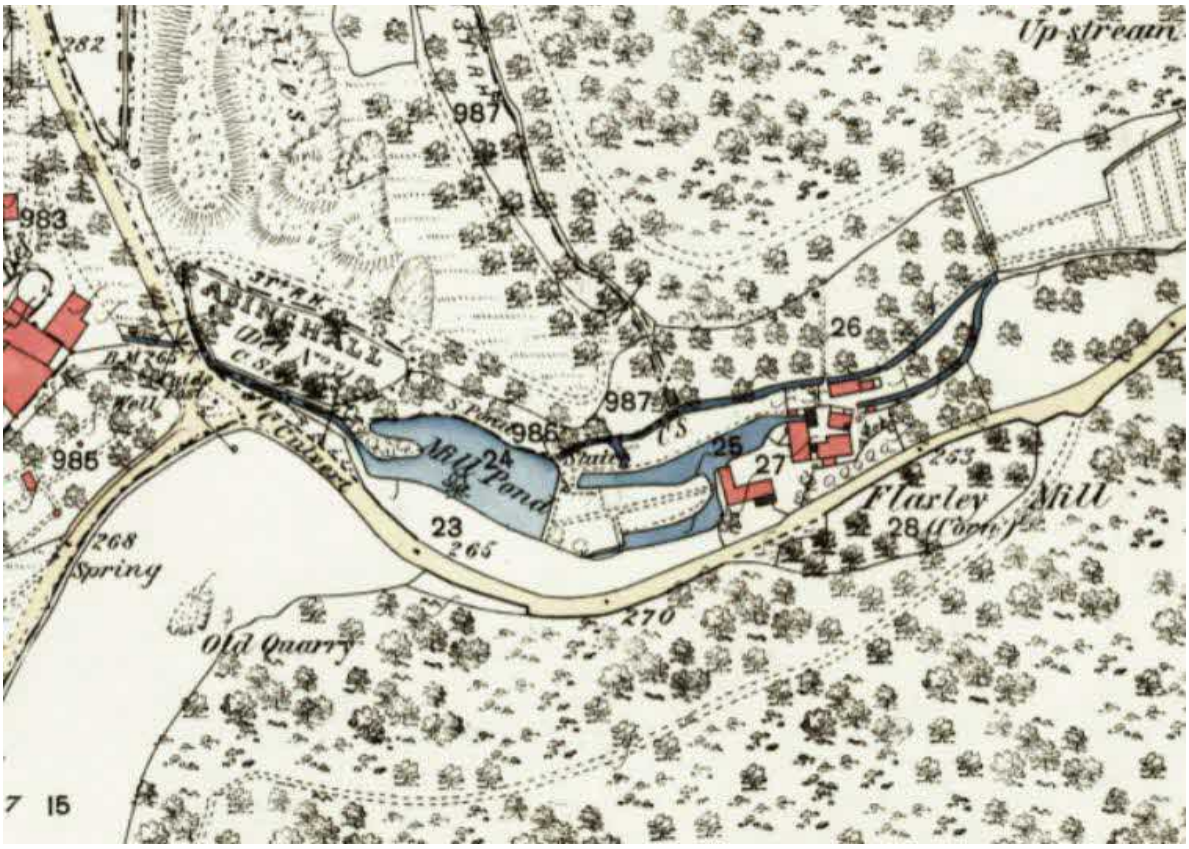

Figure: 7	Extract From Ordnance Survey, 25 inch Surveyed: 1878 to 1879

5.4. Westbury Brook is recognised as having powered a number of watermills along its course and water wheels were common place in the historical architecture. The proposal aims to reintroduce missing and traditional elements of the historic vernacular but sympathetically introduce modern engineering for power generation and carbon reduction rather than milling.

6. Heritage

6.1. Located to the East of the Wye Valley AONB, Flaxley Mill is located in a region having both an important industrial and agricultural history. Fast flowing streams cascading off the surrounding plateau were harnessed to power numerous waterwheels and mills. Iron, copper and tin works consumed large quantities of charcoal made from timber sourced from the surrounding forests. Today, the woodland and water that powered the historical industry now provides a picturesque backdrop for this industrial heritage.

6.2. The legacy of early industrialisation around the coal fields and mineral deposits of the Forest of Dean are reflected in the numerous mills and industrial buildings scattered around the surrounding landscape. The neighbouring Gunns Mills and Flaxley Mill itself are examples of where these structures have either fallen into disrepair or have found themselves being repurposed, the latter applying to Flaxley Mill.

6.3. The distinctive landscape is a mix of Carboniferous limestone and coal measures and Devonian sandstone and mudstone forming rugged valleys running out from the Forest of Dean plateau to gently rolling improved farmland to the lowland Severn Vale to the East. In contrast to the North and West settlements are heavily influenced by the navigable River Wye and are dispersed linearly along the rivers reach.

6.4. Beyond the Wye Valley and around the Forest of Dean there is a settlement pattern of small villages, hamlets and dispersed farmsteads, and a network of minor secondary roads. Habitats range from grazing farmland and blocks of conifer and mixed woodland on the steeper slopes of the radiating valleys from the Forest of Dean plateau to high quality arable farmland on the shallower graded plains in the valley floors and Vale.

6.5. The tourism industry plays a significant part in the local economy, particularly in the Forest of Dean and surrounding settlements, by contrast, the sparsely populated areas are more dependent on farming.

6.6. The A40, A4136 and A48 represent the major roads through the Forest of Dean running generally in a East -West direction linking Gloucester, Ross-on-Wye and Monmouth to Newport and Cardiff.

6.7. It is considered that there is limited capacity to accommodate change in communities without compromising landscape character. Upland limestone is particularly vulnerable to neglect and loss of diversity. The Forest fringe and valleys have a high visual sensitivity, with a strong sense of remoteness. The area's water bodies are vulnerable to pollution and are heavily influenced by agricultural operations.

6.8. The economy relies on tourism and retail, which generally offer only low paid part-time and seasonal employment. Many jobs are low skilled and employers have problems recruiting locally. The agricultural sector has experienced decline and farm diversification schemes

are becoming more common. While some farms are increasing in size, there is also a trend towards smaller holdings and hobby farming.

6.9. The traditional settlement pattern and variable public transport in some areas means that many people rely on private transport. Frequent bus services are often not commercially viable.

6.10. Planning strategies aim to protect open space and sports facilities from development, and support improvements to existing facilities.

6.11. The area is also typical of operational woodland managed by Forestry England and the Forest of Dean limits extend to the open vistas to the East and North West. The Forest of Dean is a major attraction in the area for tourism and outdoor pursuits with a number of the forest tracks providing walking and cycle access.

6.12. The Wye Valley AONB is unique among the 46 Areas of Outstanding Natural Beauty and 14 National Parks in England, Wales, Northern Ireland and Scotland in being the only protected landscape to straddle a national boundary; being 64% in England and 36% in Wales.

6.13. Areas of Outstanding Natural Beauty share equal status with National Parks in terms of scenic beauty and landscape protection. This was reinforced in the National Planning Policy Framework (NPPF para 115) and Planning Policy Wales (PPW para 5.3.6).

6.14. The primary purpose of Areas of Outstanding Natural Beauty (and National Parks) is to conserve and enhance natural beauty.

6.15. In pursuing the primary purpose;

- Account should be taken of the needs of agriculture, forestry and other rural industries, and of the economic and social needs of the local communities.
- Particular regard should be paid to promoting sustainable forms of social and economic development that in themselves conserve and enhance the environment.
- Recreation is not an objective of designation, but the demand for recreation should be met in an AONB so far as this is consistent with the conservation of natural beauty and the needs of agriculture, forestry and other uses.

6.16. Natural Beauty is defined as “flora, fauna and geological and physiographical features” in the Countryside Act 1968. These aspects of natural beauty are the components that make a landscape so scenic and distinctive; the wildlife, trees and plants, and the shape of the land with its rivers and hills and rock outcrops. However, since 1968 the recognition and understanding has developed that 'natural' landscapes Wye Valley AONB Management Plan 2015-2020 of the British Isles are in fact the product of millennia of human intervention.

Therefore landscape is about the relationship between people and place; the interaction between nature and culture.

6.17. Whilst the site is beyond the boundary of the AONB, the core values of protecting landscape, nature and culture are embodied in the Gloucester, Cheltenham and Tewkesbury Joint Core Strategy 2011 - 2031 (JCS) which sets out the long-term vision and objectives for the area together with strategic policies for shaping new development and locations for new development up to 2031.

6.18. It states that new developments will have been built to the highest possible standards of design and focused on protecting the quality and distinctiveness of each community. Established in sustainable locations, without increasing the risk of flooding, they will have been designed with sensitivity towards existing villages, towns and cities and with respect for the natural and built environment.

6.19. The waterwheel reinstatement and associated power generation is designed to be sympathetic to and maintaining the beauty and physical landscape of the area in the careful selection of materials, general design and location that is not visually intrusive to the local landscape. The waterwheel and electrical generator represents a modern yet sympathetic contrast to former industrial development in the valley. Ii is considered that the proposed hydro development retains the historical context of an industrial feature that was distinctive in character and remains a prominent historical record within the area of Shapridge and Mitcheldean.

6.20. The industrial past of the valley is shaped by mining and forestry activities that remain visible in the form of former industrial buildings and existing managed coniferous and mixed woodland. The proposal compliments and embodies the ambition of Strategic Objectives 4 - 6 and SD3, SD4, and SD6 Policies of the JCS. The waterwheel reinstatement maintains the heritage and tradition of industrial development within the valley using hydropower as a sustainable means of energy production and thereby meeting the challenges of climate change.

6.21. In summary the waterwheel reinstatement satisfies the following parts of the JCS:

- Strategic Objective 4 – Conserving and enhancing the environment
  - Protects and enhances the JCS area's unique historic environment and archaeological heritage
  - Conserve, manage and enhance the area's unique natural environment and great biodiversity, including its waterways and areas of landscape and biodiversity importance, and maximise the opportunities to use land to manage flood water
  - Supports green infrastructure and improves existing green infrastructure within urban and rural areas to provide movement corridors for people and wildlife

- Strategic Objective 5 – Delivering excellent design in new development
  - Providing well-located infrastructure which meets the needs of residents
  - Creating a strong sense of place through high quality and inclusive design that respects and enhances local distinctiveness

- Strategic Objective 6 – Meeting the challenges of climate change
  - Make the fullest contribution possible to the mitigation of, and adaptation to, climate change and the transition to a low-carbon economy
  - Making the best use of land by maximising the use of previously-developed land
  - Reducing the use of fossil fuels
  - Promoting the efficient use of natural resources and the production and consumption of renewable energy and the decentralisation of energy generation
  - Encouraging and facilitating low and zero-carbon energy development
  - That existing infrastructure is adequately protected from the threat of flooding

- Policy SD3: Sustainable Design and Construction
  - Contributes to the aims of sustainability by increasing energy efficiency and avoiding the unnecessary harm to the water environment
  - The development is designed to use water efficiently, will not adversely affect water quality, and will not hinder the ability of a water body to meet the requirements of the Water Framework Directive
  - Incorporates the principles of waste minimisation and re-use
  - Stated annual Carbon Dioxide (CO2) emissions savings

- Policy SD4: Design Requirements
  - Responds positively to and respects the character of the site and its surroundings, enhancing local distinctiveness
  - Having appropriate regard to the historic environment
  - Appropriate use of vistas, landmarks and focal points

- Policy SD6: Landscape
- Protects landscape character for its own intrinsic beauty and for its benefit to economic, environmental and social well-being
- Has due regard to the local distinctiveness and historic character of the different landscapes in the JCS area
- Will make a significant contribution to the character, history and setting of a settlement or area

7. Visual Impact

7.1. Overall there is not considered to be any significant visual impact to the surrounding landscape from the installation of a waterwheel at Flaxley Mill.

7.2. The proposed waterwheel design is outlined in Figure 8, it should be noted that construction of the waterwheel is limited to the existing historic wheel pit and is an in line structure utilising existing flows. From the lower pond unrestricted water will pass through a short open channel approximately 2m in length from the existing discharge point to the top of the waterwheel, from here it will flow to the exiting wheel pit. There will be no effective interruption to flow. The system will utilise the static head between the point where water exits the pond and enters the wheel pit.

7.3. It is not proposed to introduce any additional impounding works or increase flows to the waterwheel or its intake point. The system proposes to take 100% of free flowing water without installation of any new weirs or addition of any impounding structures.

7.4. Flaxley Mill is only visible from the forest track of Westbury Wood and unclassified Shapridge to Flaxley road and forest tracks of Flaxley Wood at the Shapridge end of the forest.

7.5. The wheel pit is located on the northern elevation of the property and is screened from the forest track of Westbury Wood and unclassified Shapridge to Flaxley road by the property.

7.6. Approximately 75% of the waterwheel sits within the existing wheel pit walled structures, the remaining 25% will be screened by garden features and trees within the grounds of the property from the tracks in Flaxley Woods.

7.7. The waterwheel will be neither imposing or out of character with the surrounding landscape and industrial heritage of the immediate area and shall enhance the existing historic structures reminiscent of the Mills former use.

7.8. The proposed location for the waterwheel and electrical generator does not significantly encroach upon open space, nor does it adversely affect the landscape setting or the character and appearance of the area. It is therefore considered to be in accordance with the aims of the JCS Objectives and Policies.

8. Design

8.1. Intake Location : SO 67799 15928
Waterwheel Location : SO 67801 15929
Discharge Point : SO 67801 15929
Hydrostatic Head : 4m
Max Abstraction : 0.2 m^3/sec
Depleted Reach : 0m

8.2. The waterwheel is of an overshot design and reflects the qualities of modern engineering steel construction but retains the visual characteristics of a traditional iron waterwheel.

8.3. The design takes advantage of the original infrastructure supplying water to the wheel pit and former waterwheel along with the associated foundation structures for the wheel.

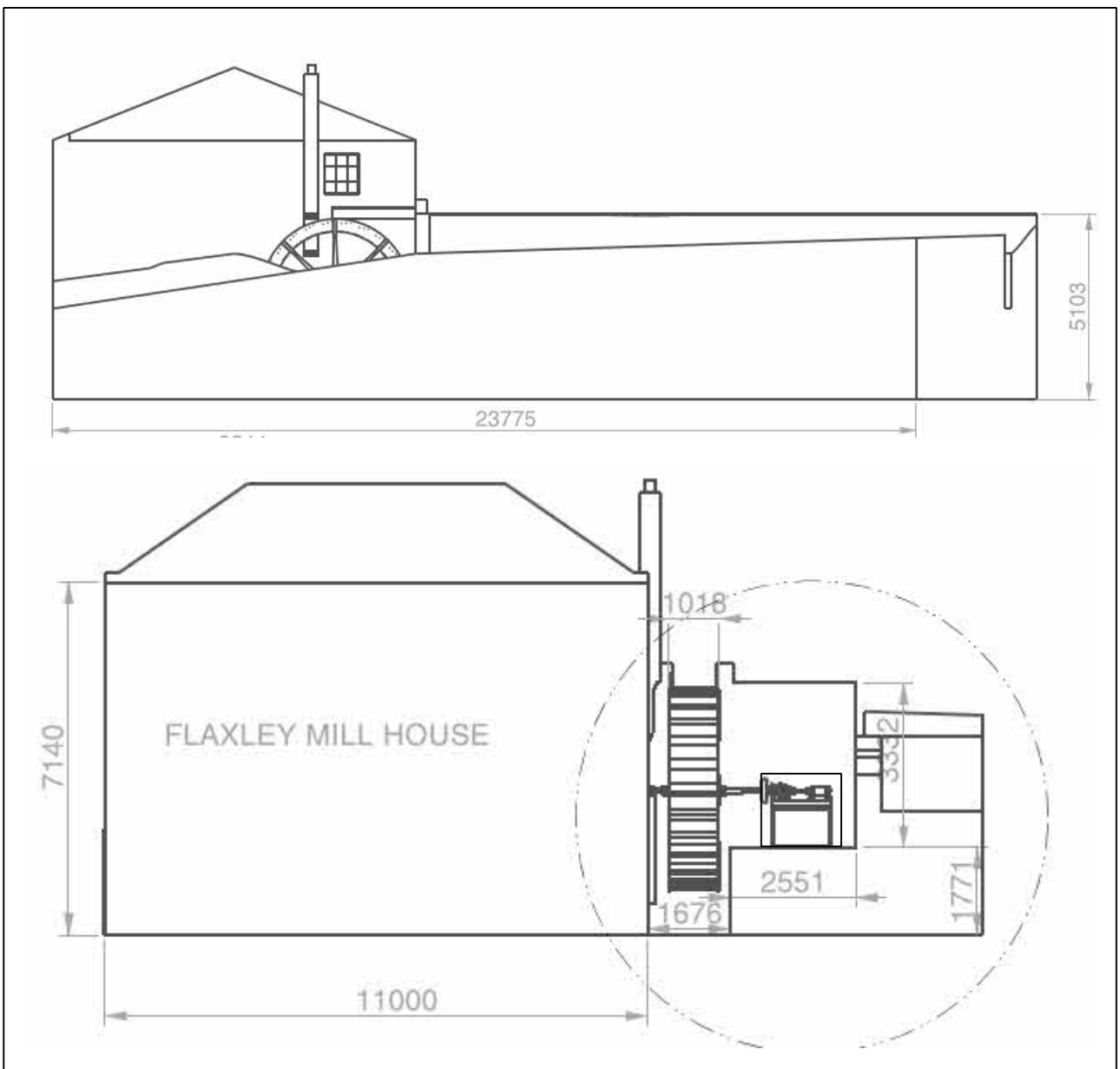

Figure: 8	Proposed Waterwheel

8.4. The image at Figure 9 provides an indication of a reinstated waterwheel of the same design and size located at another former Mill where restoration of the buildings has taken place.

Figure: 9	Waterwheel of Same Design and Scale in Similar Setting

8.5. The waterwheel is composed of a main shaft, two outer rims connected via a series spokes and buckets mounted between the rims. The shaft is connected to generator via a gearbox. The generator and gearbox are housed in a sound reducing weatherproof container, the container is fabricated from steel and painted grey.

8.6. The wheel has been manufactured by Smith Engineering of Maryport Cumbria and shall be pre-assembled into two sections. These sections will be transported to site and shall be craned into place and joined together to form the completed wheel.

8.7. The free falling water that currently flows from the lower pond into the wheel pit will flow into a newly installed short elevated launder that extends from the wheel pit back wall to the top of the waterwheel. The water will fill the buckets and discharge into the wheel pit as it rotates.

8.8. An armoured LV electricity cable will be installed and shall link the generator to the property fuse box.

9. Access

9.1. The property is accessed via a private driveway that runs parallel to the unclassified Flaxley to Mitcheldean highway. All works shall be off road and accessed via the property driveway, there will be no impact on road users or walkers in the vicinity of Flaxley Mill during the installation and operation of the waterwheel.

9.2. The access is sufficient to accommodate the truck that will be used to transport the wheel to site and crane the components into place.

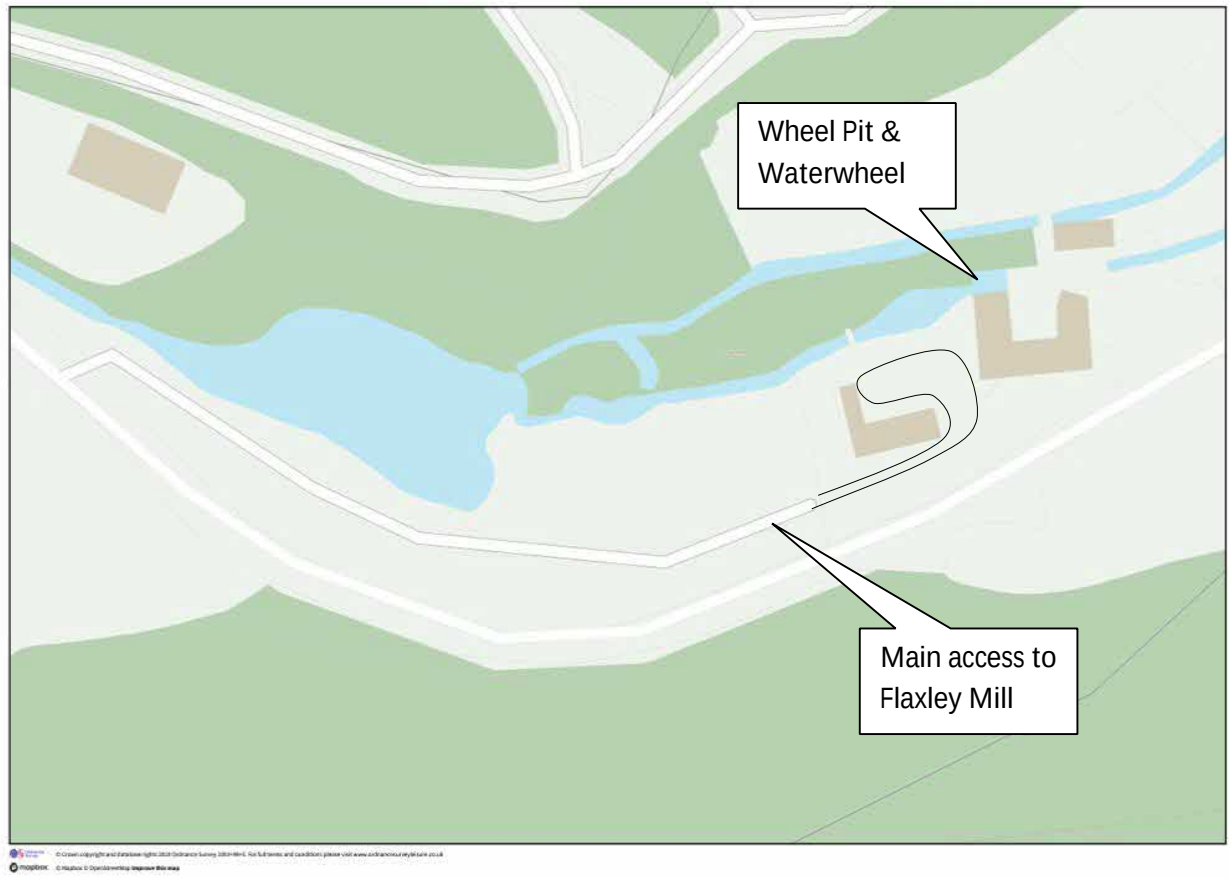

Figure: 10	Property Access

10. Conclusion

10.1. It is considered that the proposed waterwheel is consistent with the heritage and historical architecture of the surrounding area and the original use of Flaxley Mill and the proposal will therefore enhance the property and demonstrate sustainable energy production.

10.2. It is assessed that there will be no ecological impacts from the installation and operation of a waterwheel and that the enhanced levels of maintenance by the property owner have and will continue to improve water quality and biodiversity.

10.3. There will be little or no visual impact as a consequence of the construction and the waterwheel will for the most part only be visible to the property owner.

10.4. The property is served by excellent off road access that does not impact highways or footpath use.

10.5. The installation of the waterwheel is consistent with the Councils planning policies and objectives for sustainable construction and development.

Prepared By:

[redacted]

E F Wallace BSc(Hons), MSc

Environmental & Hydrology Consultant
Carbon & Environment Solutions Ltd