

City of London Corporation Committee Report

Committee(s): Epping Forest and Commons Committee – For Decision	Dated: 23/01/2025
Subject: Carbon Removals Project Workstream on Epping Forest & Buffer Lands Leaky Dams (SEF 03/25)	Public report: For Decision
This proposal: <ul style="list-style-type: none"> delivers Corporate Plan 2024-29 outcomes 	Leading Sustainable Environment; Flourishing Public Spaces; Providing Excellent Services Diverse Engaged Communities
Does this proposal require extra revenue and/or capital spending?	No
If so, how much?	N/A
What is the source of Funding?	Carbon Removals (Climate Action Strategy)
Has this Funding Source been agreed with the Chamberlain’s Department?	Yes
Report of:	Katie Stewart, Executive Director, Environment
Report author:	Heinz Traut, Carbon Removals Project Manager, Natural Environment Division

Summary

This report provides an update on the Carbon Removals project within the Climate Action Strategy; specifically focusing on the implementation of leaky dams, a natural barrier made from woody materials and laid in a water channel, in Epping Forest and Buffer Lands. The primary objectives of this initiative are to enhance the Forest's resilience against drought, protecting our current carbon sequestration rates, and to promote biodiversity in these areas. Furthermore, the report seeks delegated authority to make practical decisions regarding the project's execution, as the scale has increased from 186 to potentially up to 300-400 dams compared to the original estimate by the EF Biodiversity Officers. A hydrological consultant would be appointed to ensure the proposals are thoroughly assessed to deliver the objectives, whilst protecting and enhancing the Forest's qualifying features and preventing any impact on public access and recreation.

Furthermore, the report includes a proposal to initiate discussions with experts for a potential beaver reintroduction feasibility study in 2025, with similar objectives to the leaky dams, aiming to enhance Forest resilience and biodiversity.

Recommendation(s)

Members are asked to approve:

1. Option 1 (paragraph 9) comprising:
 - Approve, in principle, the implementation of the project described in this report, with up to 400 leaky dams installed at Epping Forest and Buffer Land;
 - Authorise the Superintendent, in consultation with the Chair and Deputy Chair, to decide on the final number and locations of the leaky dams subject to recommendations from expert studies;
 - Authorise the Carbon Removals (CR) Project team and Epping Forest (EF) Conservation team to begin discussions with academic and expert partners to outline the scope of a proposed beaver feasibility study in 2025.

Main Report

Background

1. The 2023 Arcadis Climate Change Vulnerability Assessment report¹, commissioned by the City of London Corporation (CoLC), highlighted the importance of addressing climate change impacts to protect biodiversity and enhance Forest resilience from the Urban Heat Island Effect. It noted that dry summers caused by climate change are creating challenges for tree hydration, leading to tree drought stress, reduced growth, weakened defence mechanisms, increased susceptibility to pests, leaf loss, and potential death due to inadequate water supply. The report recommended Natural Flood Management (NFM) measures, such as man-made leaky dams and fallen trees along ditches, to slow water flow, retain moisture, and improve habitat diversity.
2. Anecdotal evidence from the EF Arboriculture manager and Biodiversity Officer indicates that the Forest is suffering from drought stress, which is exacerbated by artificial drainage ditches. This issue was particularly severe in 2022, lending support to Arcadis' proposal for NFM interventions. Furthermore, this observation is corroborated by preliminary satellite (NDVI infrared light) analysis of tree photosynthesis over the last three decades, indicating drought stress in the Forest.

¹ [1. Arcadis Rescoping Report Final.pdf](#)

3. NFM measures, such as leaky dams (Appendix 1), are designed to work with nature by mimicking the actions of beavers to create leaky dams. These structures:
 - Encourage/increase soil infiltration
 - Slow the flow of water within a catchment
 - Enhance/create more diverse habitats
 - Improve and retain soil
 - Improve water quality
 - Store/sequester carbon
 - Reduce flood risk downstream
 - Increase drought resilience
 - Reduce impacts of drought and wildfires
 - This, in turn, boosts biodiversity.

4. The Arcadis report also suggested innovative interventions that go beyond traditional practices, such as leaky dams, to significantly increase the long-term resilience of green spaces. These include exploring the feasibility of reintroducing beavers in enclosures to create and maintain leaky dams.

5. The Carbon Removals Project funding will enable large-scale deployment of leaky dams utilising wood from activities undertaken in the Forest. This initiative may receive additional support from the Environment Agency's (EA) Natural Flood Management Fund, facilitating the project's expansion, pending a decision (expected in January 2025) on the Expression of Interest (EOI) submitted by Essex County Council (ECC) (working in collaboration with the Carbon Removals Team).

6. The EA NFM Phase 3 Fund, part of the Thames Regional Flood and Coastal Committee (TRFCC) NFM programme, would provide £200,000 of Local Levy funding to support two catchment-scale NFM projects. Lead Local Flood Authorities (LLFAs) can apply for this funding, and other organizations may partner with them to deliver the project.

Current Position

7. The Epping Forest Biodiversity Officer originally proposed potential locations for leaky dam installation based on their knowledge of the Forest and watercourses. The Corporate GIS Officer used a map-based scoping exercise to model the potential locations for leaky dams. Specifically, the DEFRA NFM opportunity map was utilised and applied GIS filters for slope, proximity to infrastructure, and veteran trees. This approach helped identify optimal locations for the leaky dams, ensuring they would be effective, while avoiding areas that could be negatively impacted. The leaky dam plan will be designed to avoid any negative impacts as far as reasonably possible and will not affect public access or require any areas of the Forest to be enclosed. The draft plan (Appendix 2) requires further refinement to consider environmental and practical limitations.

8. An EOI for £200k was submitted to TRFCC on the 8 November 2024 for the EA's NFM programme. ECC, the Lead Local Flood Authority (LLFA) for the relevant area, is acting as the lead applicant, and will work with the City Corporation on project delivery. The outcome of the EOI is expected to be announced in January 2025. If successful, an outline Business Case will be developed by the CR Team, in collaboration with officers, legal and relevant stakeholders.
9. The London Borough of Waltham Forest (LBWF) are also a Lead Local Flood Authority (LLFA) for leaky dams within their geographical area. LBWF will collaborate on the design and development of this project and explore the possibility of mobilizing local volunteer groups to assist with the project works. Both ECC and LBWF are in favour of this collaboration, recognizing its potential to significantly contribute to local flood mitigation strategies.

Options

10. Officers have identified the following options:

- Option 1: (Recommended)
 - Agree in principle to the implementation of the project described in this report, with up to 400 leaky dams installed at Epping Forest and the Buffer Land, and authorise the Superintendent, in consultation with the Chair and Deputy Chair, to decide on the final number and locations of leaky dams.
 - Authorise officers to outline the scope of a beaver feasibility study.
- Option 2: (Not recommended)
 - Not to approve, in principle, the implementation of leaky dams at Epping Forest and the Buffer Land but for officers to present a scaled back version to the Superintendent.
 - Authorise officers to outline the scope of a beaver feasibility study.
- Option 3: (Not recommended)
 - Not to approve, in principle, the implementation of leaky dams at Epping Forest and the Buffer Land.
 - Not to authorise officers to outline the scope of a beaver feasibility study.

Proposals

11. From January 2025, the CR team will conduct field visits with the EF Conservation team to identify and address any potential practical or environmental limitations, consider locations previously identified by the EF Biodiversity Officer, and further refine the leaky dam deployment plan. Site visits will consider factors including but not necessarily limited to soil conditions, vegetation, statutory designations and the presence of wildlife, public access and recreation, ensuring that the leaky dams are placed in the most effective and environmentally sensitive locations. Locations will also be shared and reviewed

with EF's Superintendent, Head of Conservation, Head of Operations and Head of Business Development.

12. Appoint a hydrological consultant early 2025, following consultations with several hydrologists. This will ensure that plans are thoroughly assessed and optimized for water retention, flood mitigation, whilst avoiding negative environmental impacts.
13. Provided the TRFCC NFM grant EOI is successful, develop an Outline Business Case for the leaky dam plan in collaboration with officers, ECC and LBWF and submit the OBC to the TRFCC within the first three months of 2025.
14. Establish a formal agreement outlining roles and responsibilities (see Legal implications below) early in 2025 to manage the governance and procurement protocols for the leaky dam project, in partnership with ECC as the lead NFM grant applicant and LLFA. If the grant is not successful, the team may need to scale back some leaky dams and prioritize others. Nevertheless, the project will still proceed, albeit on a potentially reduced scale.
15. In collaboration with the EF Conservation team, prepare and apply for the relevant permissions to ensure compliance with various environmental and planning regulations. Adjust plans as needed following consultation. It is envisaged that the following permissions and consents may be needed ahead of project implementation:
 - a. Flood Risk Activity Permit (FRAP) - Environment Agency (EA)
 - b. Site of Special Scientific Interest (SSSI) consent – Natural England (any works being undertaken on the EF SSSI will require consent from NE under the Wildlife and Countryside Act 1981 (as amended)))
 - c. Ordinary Watercourse Consent – ECC and LBWF (must be sought in consideration of Flood and Water Management Act 2010 and section 23(1) Land Drainage Act 1991)
 - d. Habitat Regulations Assessment (HRA) screening – Natural England
 - e. Environmental Impact Assessment (EIA) screening- Local Planning Authority (LPA)
 - f. Planning Permission- Local Planning Authority- consultation to be undertaken with the LPA to determine if the proposed works fall within the definition of development for the purposes of section 55 Town and Country Planning Act 1990.
16. The CR team will collaborate with the EF Arboriculture and EF Conservation teams to plan the use of wood from arboricultural and pollarding works for leaky dam construction. This process will span the project's delivery period, with dams being constructed by appointed contractors, starting in early to mid-summer 2025

and concluding by March 2027, the end date for both the CR project and the Natural Flood Management (NFM) grant.

17. The CR team will implement a monitoring strategy that leverages telemetry² technology. This will involve using advanced sensors to gather real-time data on tree drought stress and soil moisture loggers to assess the efficacy of the leaky dams.
18. The CR team proposes to commence discussions early in 2025 with experts and academics to scope out a proposed feasibility study on beaver reintroduction to consider the suitability of Epping Forest and Buffer Lands.

Key Data

19. The provisional EF leaky dam plan, consisting of 374 dams, could offer an attenuation value of up to 10,808 cubic meters, potentially benefiting 2,345 households at risk of flooding.
20. Dry summers caused by climate change are creating challenges for tree hydration and plants (e.g. horsetail and ferns) that require wetter habitats to thrive. By creating more wet habitats, it will support a diverse range of species and promote biodiversity.
21. Leaky dams have shown positive impacts in various local projects. The Bentley Priory SSSI and Park Wood project, delivered by Thames21, demonstrated significant ecological benefits. Surveys indicated improvements in water retention, reduced flood risks, and enhanced habitats for wildlife. The River Pinn project, where volunteers helped implement NFM techniques, including leaky dams, successfully reduced flood risks and improved the ecological health of the river. Leaky dams were also used at Hainault Forest, by the Woodland Trust, and at Harlow in Parndon and Risdon Woods by ECC.
22. The Arcadis report estimated the 681.31 t CO₂e/ha/year to be at risk due to the Urban Heat Island Effect and Drought Tolerance:
 - Epping Forest Beeches 159.60
 - Epping Forest Broadleaved 459.61
 - Epping Forest Buffer Land 62.10
23. Based on literature documenting significant leaf fall and mortality due to drought, a 10% risk from leaf loss preventing carbon sequestration was determined. This risk combines the Urban Heat Island Effect (UHIE) and Soil Vulnerability, each contributing 5%, totalling 10%.

² Telemetry is the process of recording and transmitting the readings of an instrument from remote or inaccessible points to receiving equipment for monitoring, display, analysing and recording.

24. Beavers: recent reintroductions have demonstrated their effectiveness in creating leaky dams, for example, at Spains Hall³, Essex and Forty Hall Farm⁴ in Enfield and Greenford, Ealing⁵.

Corporate & Strategic Implications

Charity Implications

25. Epping Forest is a registered charity (number 232990). The proposals set out in this report will impact on land held by the City Corporation in its capacity as Conservators of Epping Forest and trustee of the Epping Forest charity. Charity Law obliges Members to ensure that the decisions they take in relation to the Charity are taken in the best interests of the Charity and in accordance with their powers. It is considered that the proposals in this report align with the objects of the Epping Forest charity and the purposes outlined in the Epping Forest Act 1878. This includes keeping the Forest unenclosed for public recreation, and (as far as possible) preserving its natural aspect and protecting the timber and other trees, pollards, shrubs etc growing on the Forest.

Strategic implications

26. Leading Sustainable Environment: The deployment of leaky dams enhances hydrology and biodiversity, supporting a sustainable environment.

27. Providing Excellent Services: Leaky dams mitigate flood risks and improve water management, ensuring community safety and well-being.

28. Flourishing Public Spaces: These structures enhance the natural beauty and ecological health of public spaces, promoting outdoor activities, education and tourism.

29. Diverse Engaged Communities: The installation of leaky dams also provides opportunities as a volunteer activity.

Financial implications

30. All costs for NFM interventions will be covered by the Carbon Removals project budget (£160k), with potential scaling up and savings through a successful (£200k) application to the TRFCC's NFM Phase 3 grant. A budget of £20k will be drawn down in 2025/26 for the beaver feasibility study.

Resource implications

31. The project will be overseen by the Carbon Removals team, who will collaborate with the appointed contractor, and the Conservation and Arboriculture teams at

³ [New beavers released in Essex as ground-breaking Natural Flood Management programme expands](#)

⁴ [Beavers are back in Enfield | Enfield Council](#)

⁵ [The Ealing Beaver Project – Bringing Beavers Back to London](#)

Epping Forest to plan the availability of wood from operations and dam installations. This coordination by the CR team will be managed with minimal demand on local teams, while ensuring close collaboration, as contractors will be employed for project delivery. Wood for leaky dam construction will come as a by-product from the Forest arboricultural and conservation activities.

Legal implications

32. As the project develops, officers will identify relevant environmental and planning regulations, and ensure compliance with these (for example, as listed in paragraph 14).
33. To manage the governance and procurement of the leaky dam project, if the TRFCC NFM grant is awarded, alongside ECC as the lead NFM grant applicant and LLFA, City of London Corporation (COL) will establish a formal agreement outlining roles and responsibilities, ensure compliance with flood risk management regulations, and adhere to the new Procurement Act (as relevant) effective from February 2025. ECC, as the LLFA and lead TRFCC grant applicant, will oversee the project's compliance with flood risk management regulations, submit the grant application, and monitor that all legal and regulatory requirements are met.
34. The Epping Forest Act 1878 requires the Conservators to keep Epping Forest unenclosed and unbuilt on as an open space for the recreation and enjoyment of the public and to (as far as possible) preserve the Forest's natural aspect and protect the timber and other trees etc growing on the Forest (see section 7).
35. Section 33 provides a range of express powers to support the Conservators' management of Epping Forest which include the power: to fell, cut, lop and manage the timber and other trees (s.33(1)(i)); to ... drain, level and improve the soil and subsoil, so far as in their judgment may be necessary or desirable for the purposes of management (s.33(1)(ii)); and to make ponds and to enlarge, clean out and maintain or fill up ponds, streams, watercourses, and springs (s.33(1)(v)).
36. Proposed locations on the Buffer Land will need to be assessed against any relevant restrictions on title, and in light of current or proposed uses of the sites (including, for example, having regard to any existing public rights of access).

Risk implications

37. The CR team will commission a hydrologist to assess and inform our deployment plan and technical specifications of interventions, mitigating any unintended negative environmental impacts. Additionally, the team will work closely with the two Lead Local Flood Authorities (LLFAs) in the respective counties to ensure optimal dam placements and design.

Climate implications

38. By retaining more water in the landscape, leaky dams help maintain higher soil moisture levels, supporting vegetation growth, enhancing carbon sequestration, and boosting biodiversity. This increased moisture also mitigates drought and heat stress, enhancing ecosystem resilience to climate change. Additionally, leaky dams reduce flood risks and improve water quality, benefiting both the environment and local communities.

Equalities implications

39. Due regard has been given to potential equality implications which includes taking into consideration any impact on groups with protected characteristics. After consideration of the same it has been concluded there are no equality implications arising and all duties in this regard have been appropriately executed with no further action required at this time.

Security implications

40. None

Conclusion

41. As extreme rainfall events are expected to become more frequent due to climate change, along with more pronounced summer droughts, it is crucial to ensure that the Forest remains resilient to these changes. NFM initiatives will improve hydrology, increase biodiversity, and enhance carbon sequestration. The collaborative efforts with the EF Conservation Teams, hydrological consultants, and Lead Local Flood Authorities will ensure that the leaky dams are strategically placed and designed to maximize their environmental benefits, ultimately contributing to a healthier and more resilient ecosystem.

Appendices

- Appendix 1: illustration of a leaky dam
- Appendix 2: Indicative and draft leaky dam deployment plan

Background Papers

[New beavers released in Essex as ground-breaking Natural Flood Management programme expands](#)

[Beavers are back in Enfield | Enfield Council](#)

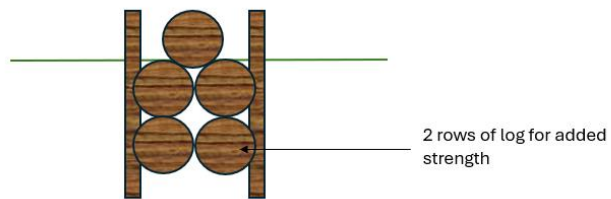
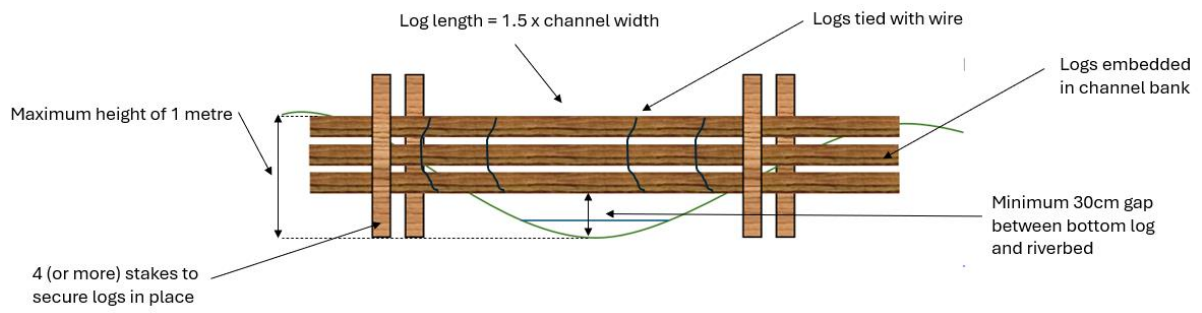
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Appendix 1: illustration of a leaky dam.



Appendix 2: Indicative and draft leaky dam deployment plan.

