Water Resources Benefits of Working with Natural Processes

GIS Dataset User Guide

January 2025

Prepared for:
Water Resources East

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1 Introduction

This document is a user guide to accompany the suite of working with natural processes (WWNP) GIS datasets produced as part of the nature-based solutions (NBS) mapping and modelling project for Water Resources East covering their region.

More detailed documentation of the methodology and technical assumptions in producing these datasets are provided within the project technical report for the Water Resources Benefits of Working with Natural Processes project carried out for the Environment Agency in 2021[1].

2 Working with Natural Processes Features

A set of water resources beneficial measures for WWNP has been developed based on a literature review, site visits, conceptualisations by groundwater specialists, and a range of spatial data. They have been derived by combining locations where it is advantageous to work with natural processes (as initially defined by the Environment Agency's Evidence Directory[2]) and areas where promotion of such measures is likely to benefit the recharge of aquifers of varying importance. The underlying data include key physical properties of the national groundwater vulnerability map, such as depth and cover of drift, and the presence of primary, secondary or perched aquifer types. Avoiding the enhancement of recharge where pollution could create disbenefits (such as within Source Protection Zone 1/1c or in the vicinity of landfill sites), the new measures represent a screening dataset for locating a range of NBS interventions that could enhance water resources. The following measures are available as spatial datasets and have all been attributed with specific hydrogeological properties which can be used to identify and screen recharge in an advantageous location, with the potential for identifying multiple benefits.

The measures help to signpost where the water resources benefits of WWNP might be most advantageous based on detailed national datasets, but they can be considerably improved through catchment walkovers, local knowledge and engaging with landowners to identify genuine opportunities for land use change.

- Runoff Attenuation Feature (WWNP_RAF)
    - *These include small-area measures to intercept or divert water onto the floodplain and are most beneficial where the soil is permeable and there is an underlying aquifer. Strategies could involve large woody barriers, gully blocking, bunds and small-scale floodplain reconnection measures.*

- Mid-upper Catchment Storage (WWNP_CS)
    - *These include more expansive areas than runoff attenuation features, where storage and attenuation of hillslope flow pathways would be most beneficial over permeable soils and underlying aquifers. Strategies could involve large woody barriers, riparian planting and small/medium-scale river restoration measures.*

- Mid-upper Catchment Riparian Zone (WWNP_RZ)
    - *These include measures to intercept or attenuate minor watercourse corridors above the floodplain, particularly where the soil is permeable and there is an underlying aquifer. Strategies could involve large woody barriers, riparian planting, rewilding and small/medium-scale river restoration measures.*

- Lower Catchment Floodplain Reconnection (WWNP_FROP)
    - *These include measures to intercept or divert water onto the floodplain in areas deemed at a national scale to have a lower watercourse connectivity and associated flood risk and are most beneficial where the soil is permeable and there is an underlying aquifer. Elevated groundwater levels within the lower catchment may seasonally reduce recharge capabilities. Strategies could involve large woody barriers, floodplain reconnection, wetland and storage area development and medium-scale river restoration measures.*

- Lower Catchment Floodplain Zone (WWNP_FZ)
    - *These include more expansive areas than floodplain reconnection measures, being within the wider floodplain, and may be of seasonal benefit if sited over underlying aquifers. Elevated groundwater levels within the lower catchment may seasonally reduce recharge capabilities. Strategies could involve floodplain planting, wetland development and medium/large-scale river restoration measures.*

- Slowly Permeable Soils (WWNP_SPS)
    - *These include areas of impeded soil permeability and superficial till cover where land cover management strategies may include improving soils, de-compacting, crop cover and type management, and planting of less dense*

woodland such as shelterbelts or wood pasture to increase infiltration rates. High density woodland should be avoided.

- Arable and Grassland Land Cover Management (WWNP_LCM)
  - *These include more expansive areas than slowly permeable soils, defining areas or arable or grassland where land cover management strategies may include de-compacting, crop cover, and type management, and planting less dense woodland such as shelterbelts or wood pasture to increase infiltration rates. High density woodland should be avoided.*

3 Feature Attribution and Recommendations

Each WWNP feature has been attributed with superficial recharge (**SF_Re**) and bedrock recharge (**BR_Re**) potential classes. The maximum potential recharge (**Max_Re**) documents the highest recharge class between both the superficial and bedrock classes. These attributes can be used to screen WWNP measures and identify areas which may benefit from enhanced aquifer recharge, providing the soil permeability is suitable for the WWNP measure.

The recharge potential classes provided do not account for groundwater levels. It is important to note that elevated groundwater levels (potentially only seasonally) may limit the recharge potential of any WWNP measure and is an important consideration together with local knowledge. Users should always be aware of communities at risk in the vicinity of proposed measures, especially if historical flooding stems from groundwater.

A range of additional attributes provide further context to the WWNP features within their immediate vicinity.

Attribution of the agricultural land classification grade (**alc_grade**) provides further context and constraints for screening WWNP measures.

Attribution of the proximity to source protection zones (**spz_number**) are important considerations to identify when proposing WWNP which may influence groundwater quality. Expert hydrogeological advice should be sought within these zones and Environment Agency guidance followed[3].

Attribution of proximity to Sites of Special Scientific Interest (**sssi_name**) and Groundwater Dependent Terrestrial Ecosystems (**gwdte**) may highlight multiple benefit opportunities, although expert ecological advice should be sought to identify any impacts of proposed WWNP measures that affect the locally specific ecosystem and its function.

4 Example Figures

The figures below provide an example of WWNP features with their 'fill' defining their type and their 'outline' defining their maximum recharge potential.

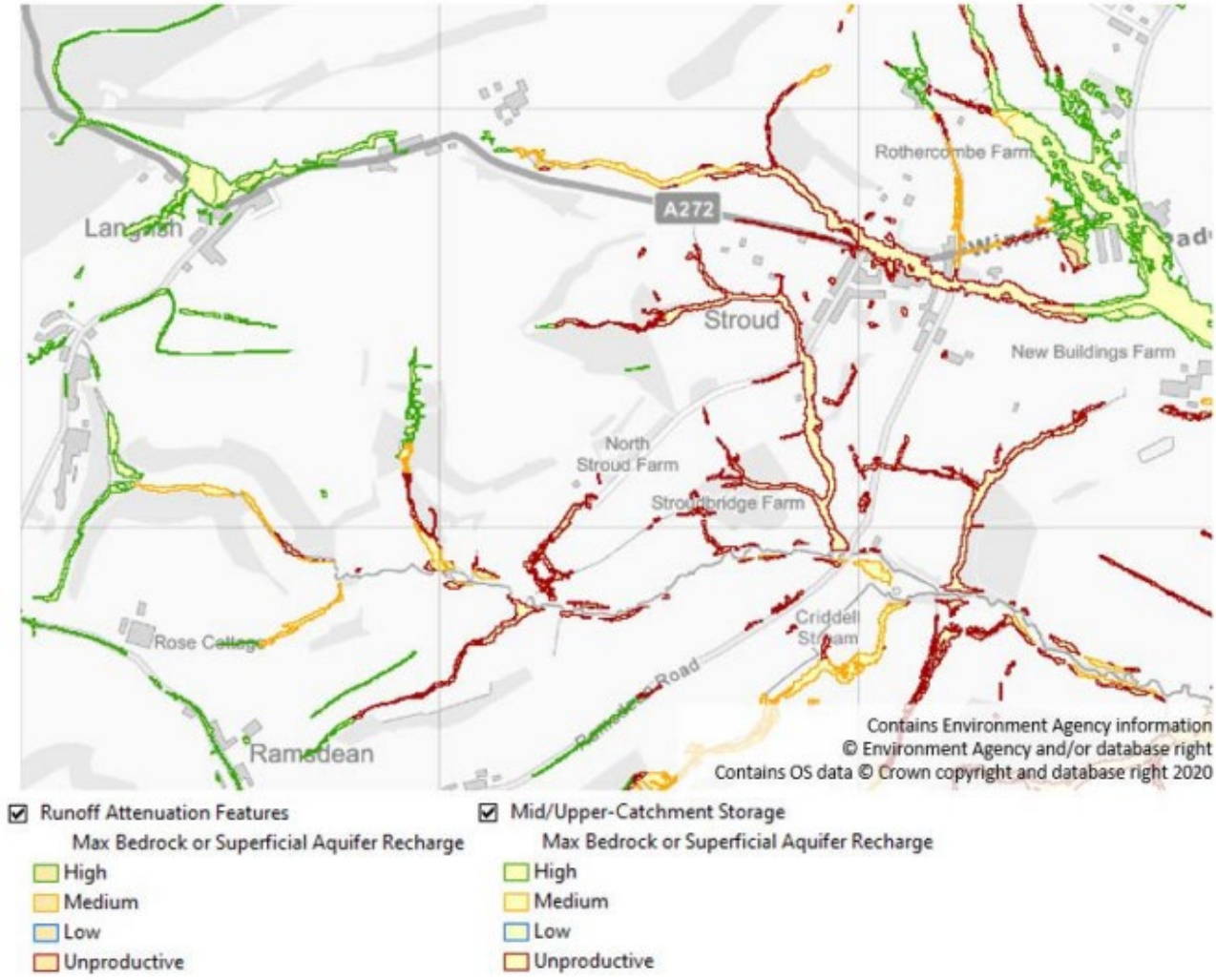


Figure 4-1: Runoff Attenuation Features and Mid/upper Catchment Storage maximum aquifer recharge potential. Reproduced with the permission of the British Geological Survey © UKRI 2025. All Rights Reserved.

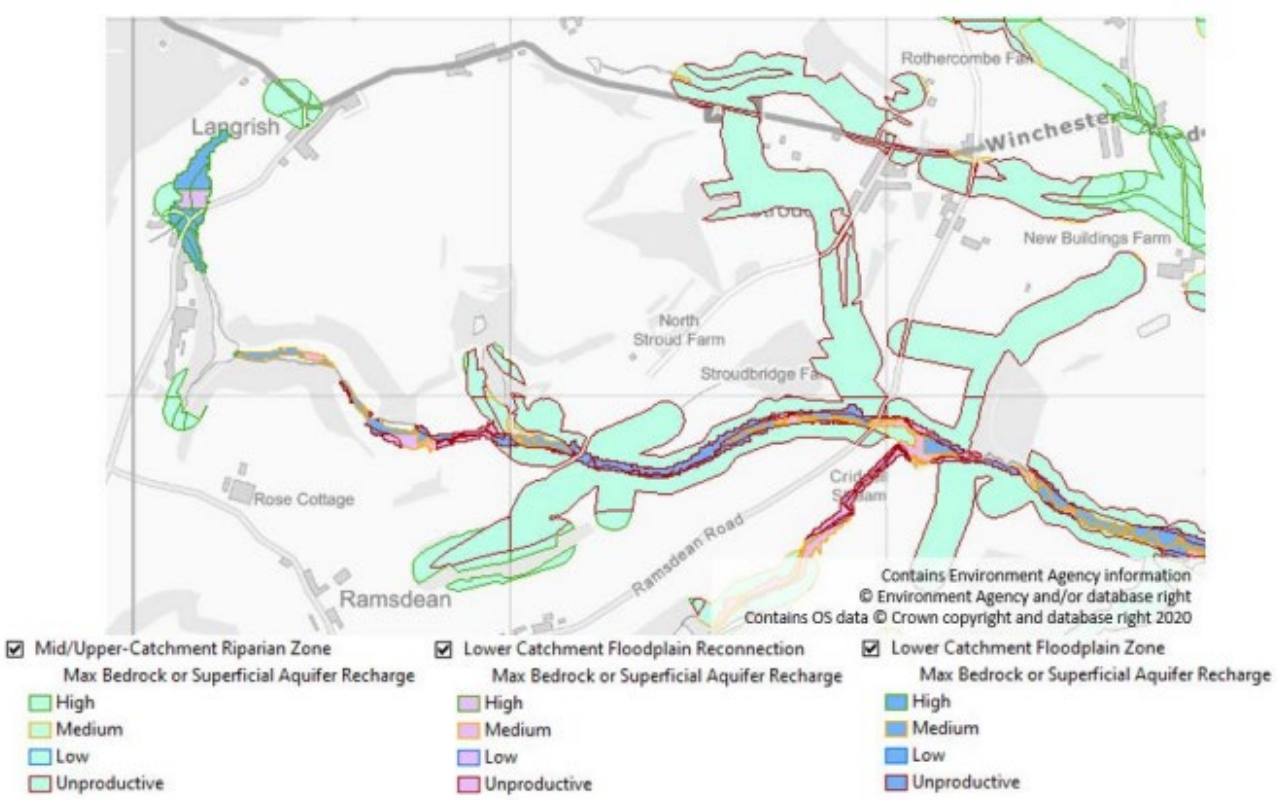


Figure 4-2: Mid/upper Catchment Riparian Zone, Lower Catchment Floodplain Reconnection and Lower Catchment Floodplain Zone features maximum aquifer recharge potential. Reproduced with the permission of the British Geological Survey © UKRI 2025. All Rights Reserved.

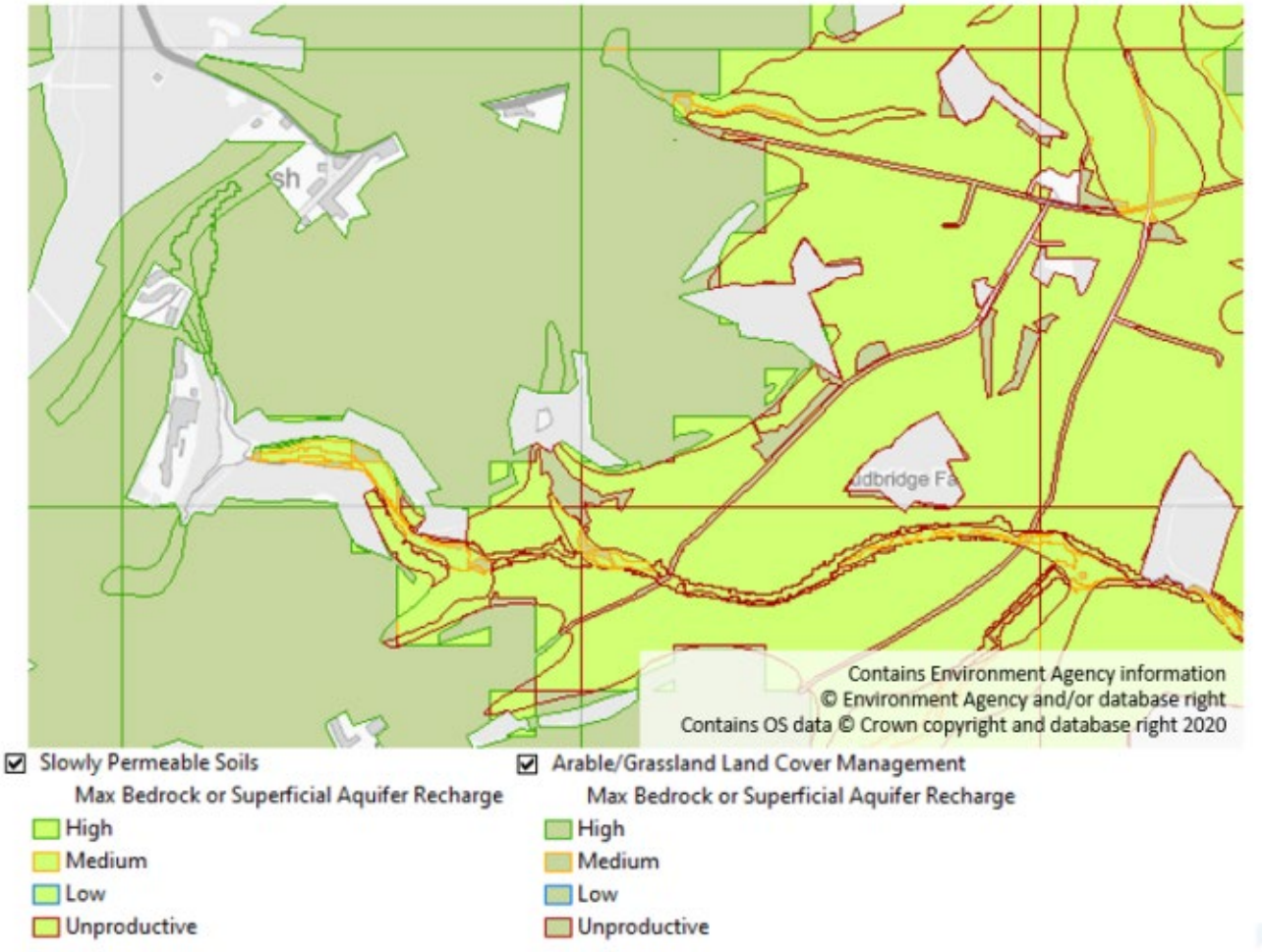


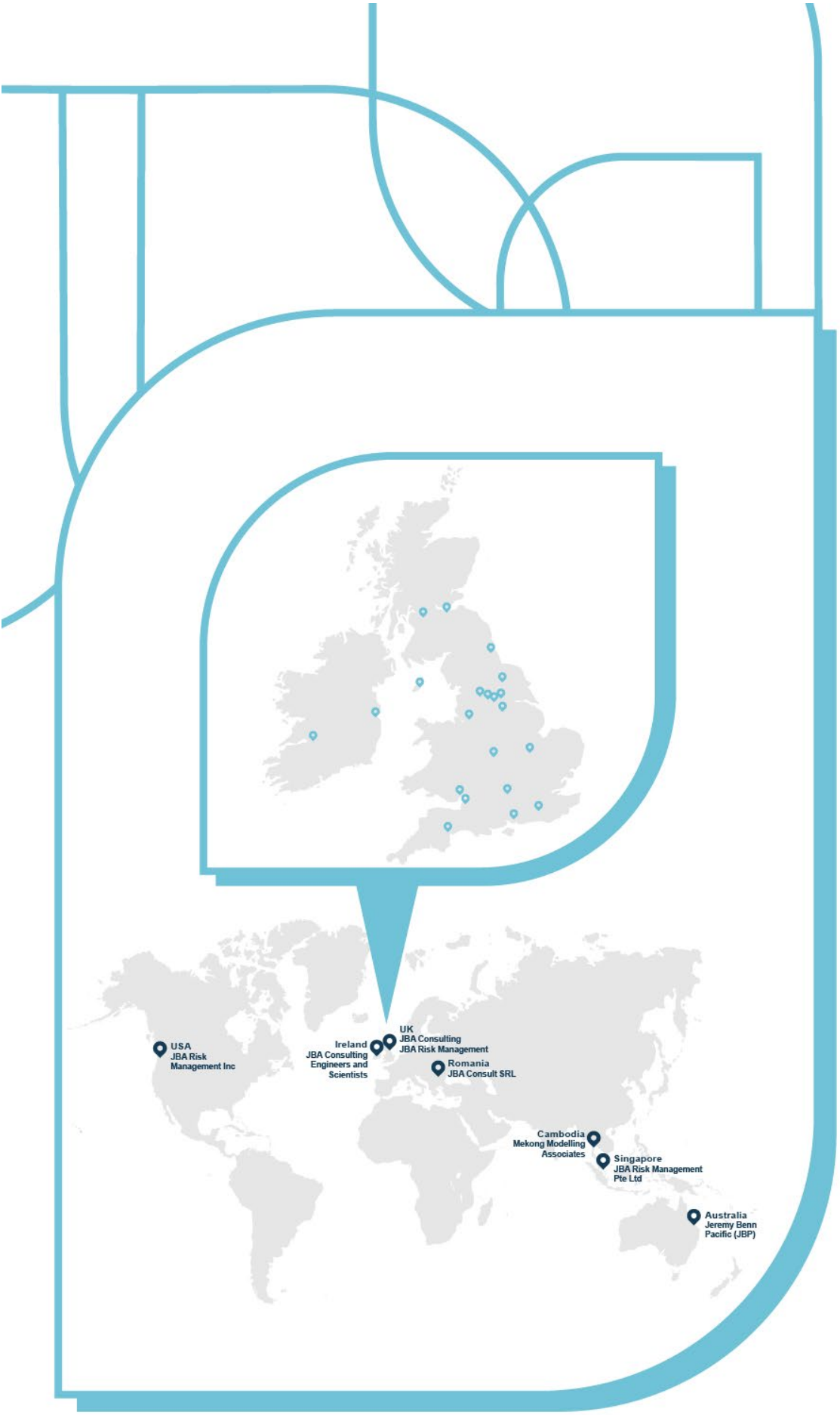
Figure 4-3: Slowly Permeable Soils and Arable/grassland Land Cover Management features maximum aquifer recharge potential. Reproduced with the permission of the British Geological Survey © UKRI 2025. All Rights Reserved.

References

[1] Water Resource Benefits of Working With Natural Processes, 2021. JBA Consulting.

[2] Working with natural processes to reduce flood risk - GOV.UK

[3] Protect groundwater and prevent groundwater pollution - GOV.UK



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