



ERI Limited

ENVIRONMENTAL IMPACT ASSESSMENT: VOLUME 3 - APPENDICES

Chapter 13: Water Environment



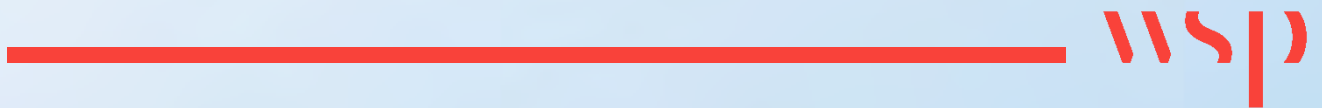
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FLOOD CONSEQUENCES ASSESSMENT





ERI Limited

BEDWAS TIPS RECLAMATION PROJECT

Flood Consequences Assessment





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Flood Consequences Assessment

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CONTENTS

INTRODUCTION	1
1.1 APPOINTMENT AND BRIEF	1
1.2 DEVELOPMENT PROPOSALS	1
1.3 REPORT OBJECTIVES	4
2 POLICY AND GUIDANCE	5
2.1 FLOOD AND WATER MANAGEMENT ACT, 2010	5
2.2 NATIONAL STRATEGY FOR FLOOD AND COASTAL EROSION RISK MANAGEMENT, WALES, 2020	5
2.3 PLANNING POLICY WALES (10TH EDITION), 2018	5
2.4 TECHNICAL ADVICE NOTE 15: DEVELOPMENT AND FLOOD RISK, 2004	6
2.5 THE SUDS MANUAL, CIRIA, 2015	9
2.6 WELSH GOVERNMENT SUDS GUIDANCE, 2018	10
2.7 SUSTAINABLE DRAINAGE APPROVAL BODY (SAB)	10
2.8 UK CLIMATE IMPACT PROGRAMME 2009 (UKCIP09)	11
2.9 CAERPHILLY COUNTY BOROUGH COUNCIL LOCAL DEVELOPMENT PLAN UP TO 2021, ADOPTED 2010.	12
2.10 CAERPHILLY COUNTY BOROUGH COUNCIL LOCAL FLOOD RISK MANAGEMENT STRATEGY, 2013	13
3 SITE DESCRIPTION	14
3.1 SITE LOCATION	14
3.2 TOPOGRAPHY	14
3.3 GEOLOGY AND SOILS	14
3.4 HYDROGEOLOGY	15
3.5 EXISTING SITE DRAINAGE	15

4	PRE DEVELOPMENT FLOOD RISK	17
4.1	TIDAL FLOOD RISK	17
4.2	FLUVIAL FLOOD RISK	17
4.3	SURFACE WATER AND SMALL WATERCOURSES	18
4.4	FLOOD RISK FROM SEWERS	20
4.5	GROUNDWATER FLOOD RISK	20
4.6	FLOOD RISK FROM ARTIFICIAL SOURCES & RESIDUAL FLOOD RISK	20
5	POST DEVELOPMENT FLOOD RISK	21
5.1	FLUVIAL FLOOD RISK	21
5.2	SURFACE WATER AND SMALL WATERCOURSES	21
5.3	GROUNDWATER FLOOD RISK	24
5.4	RISK OF FLOODING FROM ARTIFICIAL & RESIDUAL SOURCES	24
6	FLOOD RISK MANAGEMENT	25
6.1	JUSTIFICATION TEST	25
6.2	MITIGATION	25
6.3	DEVELOPMENT PLANNING CONSIDERATIONS	25
7	CONCLUSIONS	27
7.1	CONCLUSION	27

TABLES

No table of figures entries found.

FIGURES

No table of figures entries found.

APPENDICES



APPENDIX A

SITE LOCATION

APPENDIX B

TOPOGRAPHIC DATA

APPENDIX C

DRAINAGE STRATEGY

1 INTRODUCTION

1.1 APPOINTMENT AND BRIEF

- 1.1.1. ERI Limited (ERI) has commissioned WSP to undertake a Flood Consequence Assessment (FCA) in support of an Environmental Impact Assessment (EIA) for the proposed reclamation of Bedwas Coal Tips, in Bedwas, Caerphilly County Borough.
- 1.1.2. WSP has prepared this report in accordance with the instructions of their client; ERI, for their sole and specific use relating solely to the above site. Any person who uses any information contained herein does so at their own risk and shall hold WSP harmless in any event.
- 1.1.3. Whilst this report was prepared using the reasonable skill and care ordinarily exercised by engineers practicing under similar circumstances, and reasonable checks have been made on data sources and the accuracy of the data, WSP accepts no liability in relation to the report should any data, information or condition be incorrect or have been concealed, withheld, misrepresented or otherwise not fully disclosed to WSP.

1.2 DEVELOPMENT PROPOSALS

- 1.2.1. The purpose of the Proposed Scheme is for the reclamation of the existing Bedwas Navigation Colliery site, which contains large amounts of coal spoil left after historic mining at the site.
- 1.2.2. The proposed scheme seeks to restore the site to a more natural habitat, redeveloping the land at two colliery spoil tips; Lower Tips (Tip 1) and Upper Tips (Tip 2), associated with Bedwas Colliery, which closed in 1984. The existing tip extents within the site boundary are illustrated in Figure 1-1.

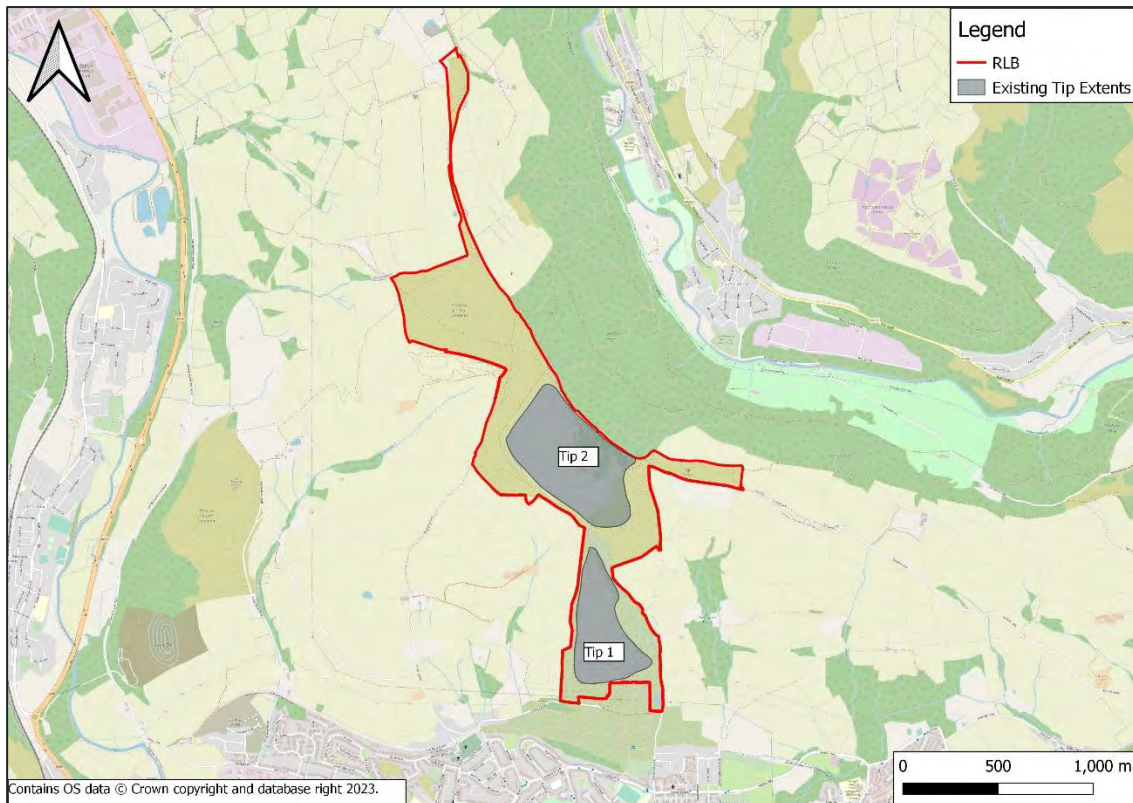


Figure 1-1: Existing Development

1.2.3. As part of this process, coal within the tips will be reclaimed. Upon the completion of coal reclamation, it is intended to return shale by product to the tip areas and to reprofile the tips as close as practicable to their original land contours prior to mining works and to restore, landscape and revegetate these areas. While the majority of process shale will be returned to Proposed Tip 1 and Proposed Tip 2, some will be deposited at a third location in the northwestern area of the site, hereafter referred to as Proposed Tip 3. A haul road is also proposed to facilitate proposed work. The extent of the proposed tips areas and haul road route are illustrated in Figure 1-2.

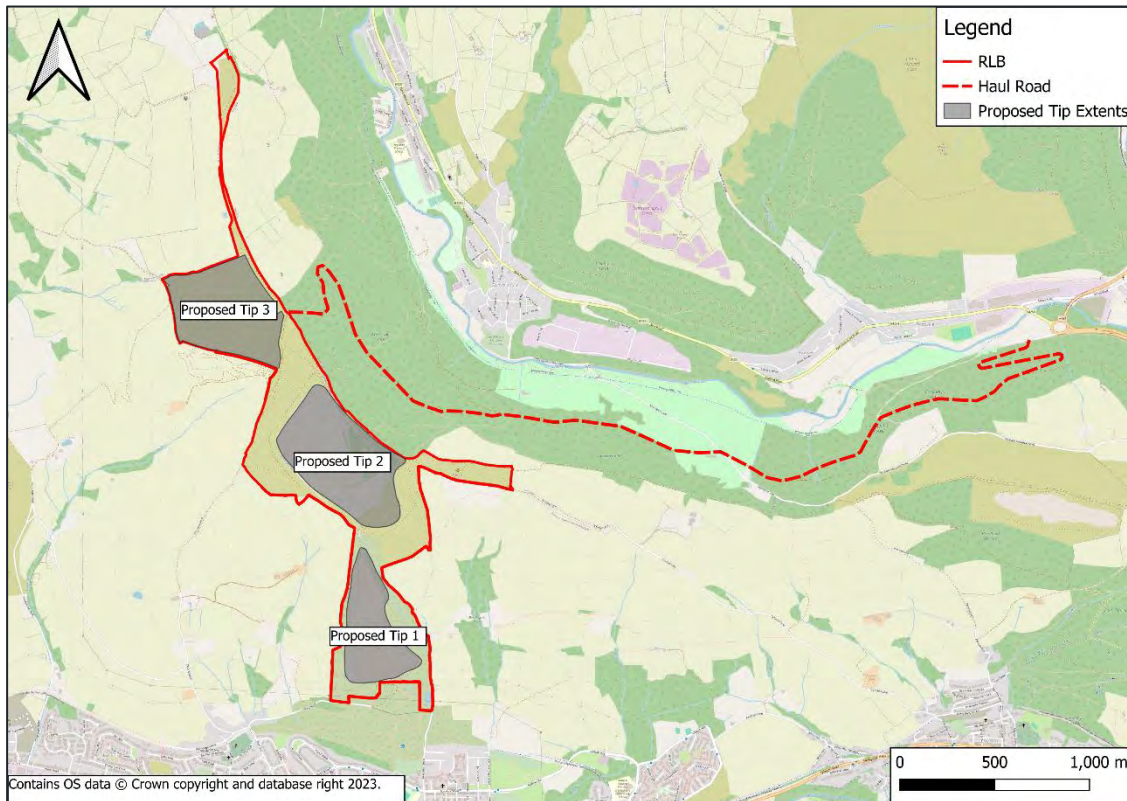


Figure 1-2: Proposed Development

1.2.4. While there will be permanent change in topography within the tip areas, proposals also include temporary works to facilitate the redevelopment of the site. This will include temporary works such as site compound and material processing plant. These areas will be returned to existing conditions at the site though, and apart from the three proposed tips areas, there will be negligible change to existing site condition following completion of all works for the remainder of the site area indicated in Figure 1-2.

1.2.5. The works will involve a construction phase, excavation, deposition, reclamation, decommissioning and aftercare, details of which are provided in the EIA Scoping report. Key points from each phase have also been summarised below.

Construction Phase

- An access road for construction and staff traffic will be constructed. This will connect to the A467 at Wattsville;
- Site bunding and drainage channels to collect water from the site and link to water collection and treatment ponds will be provided to manage surface water runoff during this phase. Water collection and treatment ponds will also be provided above Tip 1 to ensure adequate surface water quality

prior to it leaving the site. This will include automated pumping station, flocculent station and associated pipework;

- Addition of processing plant approximately 37x35m and portable buildings for workers and project administration

Excavation Phase

- The Tip 1 will be excavated first and hauled up to the Process Plant for beneficiation. Soil will be deposited in the Landform Deposition areas and overlapping the Tip 2. Tip 1 will be excavated from the top down and the areas restored close to its original topography.
- Excavation of the Tip 2 will occur in select sections, depositing spoil to create the final restored and stabilised tip landform.
- Subsoil will be excavated from beneath sections of the spoil tips and stored in piles in the new deposition area to be spread as part of the soil forming material when weather permits.

Deposition Phase

- Soils and subsoil from area where spoil will be deposited and re-landscaped will be stored for use in final restoration.
- New areas of deposition will occur to the north/north west of Tip 1 in an area described as Upper Landform Deposition area to the east/south east of Tip 1. The topsoil from these areas will be made into an outer 3m high bund above and below the land intended for deposition.

Reclamation Phase

- The scheme will operate with progressive restoration of the landscaped tips, with the new tip landform being created on an ongoing basis.
- Appropriate landscape features will be incorporated into the reformed tips, in keeping with the surrounding terrain.
- Water drainage channels from operations will be reclaimed.
- Reseeding and tree planting will be undertaken.

Decommissioning

- Once processing operations have ceased, the processing plant and buildings will be dismantled and removed.
- Final land forming will take place in areas previously occupied by plant and equipment, with final landscaping completed within six months of cessation of operations.

Aftercare

- After completion of land restoration and removal of plant and equipment, a five year aftercare period will commence in which any necessary improvement works will be completed. The aftercare programme will include any water and drainage maintenance requirements under any relevant Sustainable Drainage System planning conditions for the scheme.
- This period will include up to two years of compost or fertiliser addition to maintain the re-established upland grazing and grassland habitats.
- It is possible that there may be some remediation required on the site which would be dealt with accordingly at the time (for example if heavy rains have disturbed establishment of new vegetation).



1.3 REPORT OBJECTIVES

- 1.3.1. The contents of this FCA describes the assessment of the proposal and the implications of the proposed development on flood risk.
- 1.3.2. The aim of this assessment is to provide the level of detail necessary to demonstrate that the potential effects of flood risk have been addressed by:
 - Identifying the source and probability of flooding to the application site, including the possible effects of climate change;
 - Determining the consequences of flooding to and from the proposed development proposal and advising on the how this will be managed, if necessary; and
 - Demonstrating the flood risk issues described in this assessment are compliant with the relevant guidance.

2 POLICY AND GUIDANCE

2.1 FLOOD AND WATER MANAGEMENT ACT, 2010

2.1.1. Combined with the Flood Risk Regulations 2009 ('the Regulations'), which enact the European Union (EU) Floods Directive in the England and Wales, the Flood and Water Management Act 2010 ('the Act') places significantly greater responsibility on local authorities to manage and lead on local flooding issues. The Act and the Regulations together raise the requirements and targets Local Authorities need to meet, including:

- Playing an active role in leading Flood Risk Management;
- Development of a Local Flood Risk Management Strategy (LFRMS);
- Implementing requirements of Flood and Water Management Act legislation;
- Development and Implementation of drainage and flooding management strategies;
- Responsibility for first approval, then adopting, management and maintenance of SuDS where they service more than one property.

2.2 NATIONAL STRATEGY FOR FLOOD AND COASTAL EROSION RISK MANAGEMENT, WALES, 2020

2.2.1. This is the second National Strategy for Flood and Coastal Erosion Risk Management Strategy (FCERM), replacing the previous 2011 strategy. The strategy is prepared under the Flood and Water Management Act 2010. The strategy sets out how the Welsh Government intend to manage risks from flooding and coastal erosion across Wales and sets out objectives and measures for all partners to work towards over the life of the document, which will be ten years unless significant policy updates are required prior to that time. The strategy sets out five objectives:

- Improving understanding and communication of risk;
- Preparedness and building resilience;
- Prioritising investment to the most at risk communities;
- Preventing more people becoming exposed to risk;
- Providing an effective and sustained response to events.

2.2.2. To fulfil the requirements of the Flood and Water Management Act 2010 the Strategy specifies the Welsh Risk Management Authorities (RMAs).

- National Resources Wales (NRW);
- 22 Local Authorities as Lead Local Flood Authorities (LLFAs) and highway authorities;
- Water Companies;
- Welsh Government as highway authority for trunk roads

2.3 PLANNING POLICY WALES (10TH EDITION), 2018

2.3.1. The Planning Policy Wales (PPW) sets out the National Planning Policy Framework (NPPF) for addressing land use planning issues in preparing and developing Local Development Plans (LDPs).

2.3.2. The PPW is supplemented by a series of Technical Advice Notes (TANs), including Minerals TAN (MTAN) 2: Coal and TAN 15: Development and Flood Risk. The Minerals Technical Advice Note (MTAN) 2 sets out detailed advice on the mechanisms for delivering the policy for coal extraction through surface and underground working by mineral planning authorities (MPAs) and the coal mining

industry. PPW and MTAN 2 draws a distinction between coal used for energy or power generation and coal as a “non-energy” industrial mineral. It is stated that “whilst the use of coal for energy generation should not be permitted if, exceptionally, planning applications come forward for industrial uses for coal then each case would need to be considered individually and the policies contained in MTAN 2: Coal applied, including the test outlined in paragraph 45 of MTAN 2.” As the proposed scheme will extract coal for industrial purposes, paragraph 45 will be applied, which states:

- 1. The proposal should be environmentally acceptable or can be made so by planning Conditions or obligations, and there must be no lasting environmental damage”;
- 2. If this cannot be achieved, it should provide local or community benefits which clearly outweigh the disbenefits of likely impacts to justify the grant of planning permission.”

2.3.3. Policies related to reclamation and restoration are outlined below:

2.3.4. Reclamation can provide opportunities for creating or enhancing sites for nature conservation and contribute to the targets in the UK Biodiversity Action Plan, or equivalent, and those adopted in local Biodiversity Action Plans throughout Wales. Reclamation can also provide opportunities for the conservation of historic assets and their settings. Capturing the potential of these opportunities should be explored at a strategic level through green infrastructure assessments, which may also result in further benefits such as protection of geological exposures and public access.”

2.3.5. In view of the long life of many mineral working sites, it is essential that progressive restoration is introduced at the earliest opportunity where appropriate and practicable. The increased use of phased restoration reduces the visual impact of mineral activities at any one time and provides continuity of restoration works throughout the active operations, so reducing the potential environmental damage left by any failure to restore.”

2.4 TECHNICAL ADVICE NOTE 15: DEVELOPMENT AND FLOOD RISK, 2004

2.4.1. Planning Policy Wales, supported by TAN15, advises caution in respect of new development in areas at high risk of flooding and sets out a precautionary framework to guide planning decisions. The aim of the framework is to:

- Direct new development away from these areas which are at high risk of flooding;
- Only allow development in high risk areas (Zone C) where they can be justified on the basis of the justification test (justification of development and acceptability of flood consequences) outlined in TAN15.

2.4.2. Flood Risk should be considered at all stages throughout the planning and development process to ensure that new development proposals in flood risk areas are justified and not exposed to unacceptable flood consequences. TAN15 advises that:

- The susceptibility of land to flooding is a material planning consideration;
- NRW has the lead role in providing advice to the planning authority on flood risk issues;
- Development Plans should include site specific policies and proposals for development and flood risk. Planning authorities should apply the Precautionary Framework when allocating sites for development, seeking to direct new development away from those areas at high flood risk, unless they can be justified on sustainability grounds;
- The vulnerability of a proposed land use should be considered when assessing flood consequences;

- Developers are responsible for providing information to demonstrate that their proposal satisfies the tests contained in TAN15. Furthermore, developers should bear the costs of mitigation, construction and long-term maintenance of flood defence required for the proposed development.

2.4.3. TAN 15 provides technical guidance which advises on development and flood risk. It sets out a precautionary framework to guide planning with regard to flood risk. This is achieved by:

- A Development Advice Map (DAM) which contains the three flood risk zones and should be used to trigger the appropriate tests;
- Definitions of vulnerable development and advice on permissible uses in relation to the location and consequences of flooding.

2.4.4. DAMs have been drawn up for the whole of Wales, dividing it into three Development Advice zones which represent different levels of risk from flooding. Zone C is further subdivided into Zone C1 and C2. These Development Advice zones are described fully in Table 2-1. Table 2-1: Flood Zones as defined by TAN 15.

Table 2-1: Flood Zones as defined by TAN 15

Source: Welsh Assembly Government (2021). Tan 15: Development and Flood Risk

Zone	Description of Zone	Use within precautionary framework
A	Considered to be at little or no risk of fluvial or tidal/coastal flooding.	Used to indicate that justification test is not applicable and no need to consider flood risk further.
B	Areas known to have been flooded in the past evidence by sedimentary deposits.	Used as part of a precautionary approach to indicate where site levels should be checked against the extreme (0.1%) flood level. If site levels are greater than the flood levels used to define adjacent extreme flood outline there is no need to consider flood risk further.
C	Based on NRW (EA) extreme flood outline, equal to or greater than 0.1% (river, tidal or coastal).	Used to indicate that flood issues should be considered as an integral part of decision making by the application of the justification test including assessment of consequences
C1	Areas of the floodplain which are developed and served by significant infrastructure, including flood defences.	Used to indicate that development can take place subject to application of justification test, including the acceptability of consequences.
C2	Areas of floodplain without significant flood defence infrastructure.	Used to indicate that only less vulnerable development should be considered subject to application of justification test, including acceptability of consequences. Emergency services and highly vulnerable development should not be considered.

2.4.5. Development vulnerability categories are listed below in Table 2-2.

Table 2-2: Development Vulnerability Categories

Development category	Types
Highly vulnerable development	<p>All residential premises (including hotels, Gypsy and Traveller sites and caravan parks and camping sites).</p> <p>Schools and childcare establishments, colleges and universities.</p> <p>Hospitals and GP surgeries.</p> <p>Especially vulnerable industrial development (e.g. power generating and distribution elements of power stations, transformers, chemical plants, incinerators), and waste disposal sites.</p> <p>Emergency services, including: ambulance stations, fire stations, police stations, command centres, emergency depots.</p> <p>Buildings used to provide emergency shelter in time of flood.</p>
Less vulnerable development	<p>General industrial, employment, commercial and retail development.</p> <p>Transport and utilities infrastructure.</p> <p>Car parks.</p> <p>Mineral extraction sites and associated processing facilities (excluding waste disposal sites).</p> <p>Public buildings including libraries, community centres and leisure centres (excluding those identified as emergency shelters).</p> <p>Places of worship.</p> <p>Cemeteries. Equipped play areas. Renewable energy generation facilities (excluding hydro generation)</p>
Water compatible development	<p>Boatyards, marinas, and essential works required at mooring basins.</p> <p>Development associated with canals.</p> <p>Flood defences and management infrastructure. Open spaces (excluding equipped play areas). Hydro renewable energy generation</p>

Source: Welsh Assembly Government (2021). Tan 15: Development and Flood Risk

2.4.6. Development, including transport infrastructure will only be justified if it can be demonstrated that:

- Its location in Zone C is necessary to assist, or be part of a local authority regeneration initiative or a local authority strategy required to sustain an existing settlement; or,
- Its location in Zone C is necessary to contribute to key employment objectives supported by the local authority and other key partners to sustain an existing settlement or region; and
- It concurs with the aims of PPW and meets the definition of previously developed land; and
- The potential consequences of a flooding event for the particular type of development have been considered, and in terms of the criteria contained in Sections 5 and 7 in Appendix 1 of TAN15 are found to be acceptable.

Assessing Flood Consequences

- 2.4.7. When a development passes the justification test, the potential of flooding is known and requires appropriate consideration in the planning of the development. A development should only proceed if the consequences of flooding can be managed to an acceptable level for the development, and therefore an FCA should be completed. The assessment can be used to establish whether suitable mitigation measures can be incorporated within the design to provide a development that is as safe as possible and there is:
- Minimal risk to life;
 - Minimal disruption to people living and working in the area;
 - Minimal potential damage to property;
 - Minimal impact to the proposed development on flood risk generally; and
 - Minimal disruption to natural heritage.
- 2.4.8. TAN 15 also provides indicative guidance for different types of development, for the probability of flood risk when the development should be flood free up to the appropriate threshold frequencies (see Table 2-3). The lifetime of the development should be considered when referring to the indicative guidance and appropriate climate change allowance applied if necessary.
- 2.4.9. Beyond the threshold frequency it is expected that the development would be flooded during extreme conditions.

Table 2-3: Threshold Frequencies

Type of development	Threshold frequency (years)	
	Rivers	Sea
Residential	1%	0.5%
Commercial/retail	1%	0.5%
Industrial	1%	0.5%
Emergency Services	0.1%	0.1%
General Infrastructure	1%	0.5%

Source: Welsh Assembly Government (2021). Tan 15: Development and Flood Risk

2.5 THE SUDS MANUAL, CIRIA, 2015

- 2.5.1. This guidance provides best practice on planning, design, construction, operation and maintenance of SuDS to facilitate their effective implementation within developments.
- 2.5.2. The information presented in the publications is a compendium of good practice, based on existing guidance and research both in the UK and internationally, and the practical experience of the authors, project steering group, and industry.
- 2.5.3. The guidance provides the framework for designing SuDS with confidence and to maximise benefits. Its contents are relevant for a wide range of professions, and roles and it highlights that through engagement and collaboration SuDS can be integrated into the design of urban areas, to create high quality places for future generations.

2.6 WELSH GOVERNMENT SUDS GUIDANCE, 2018

- 2.6.1. In October 2018, the Welsh Government published a series of standards for the design of SuDS in proposed developments, which defined a series of principles to underlie the design of SuDS:
- To manage water on or close to the surface and as close to the source of runoff as possible;
 - Treat rainfall as a valuable natural resource;
 - Ensure that pollution is prevented at source, rather than relying on the drainage system to treat or intercept it;
 - Manage rainfall to help protect people from increased flood risk, and the environment from morphological and associated ecological damage resulting from changes in flow rates, patterns and sediment movement caused by development;
 - Take account of likely future pressures on flood risk, the environment and water resources such as climate change and urban creep;
 - Use the “SUDS Management Train”, using damage components in a series across a site to achieve a robust surface water management system (rather than using a single “end of pipe” feature, such as a pond, to serve the whole development);
 - Maximise the delivery of benefits for amenity and biodiversity;
 - Seek to make the best use of available land through multifunctional usage of public spaces and the public realm;
 - Perform safely, reliably and effectively over the design life of the development taking into account the need for reasonable levels of maintenance;
 - Avoid the need for pumping where possible; and
 - Be affordable, taking into account both construction and long term maintenance costs and the additional environmental and social benefits afforded the system.
- 2.6.2. The legislation states that all new developments where the construction area is 100m² or more, will require sustainable drainage systems for managing surface water.

2.7 SUSTAINABLE DRAINAGE APPROVAL BODY (SAB)

- 2.7.1. On 7th January 2019 Schedule 3 of the Flood and Water Management Act (2010) was implemented. The legislation applies to new development of more than one house or where the construction area is greater than 100m².
- 2.7.2. Each Local Authority in Wales has a statutory duty as a Sustainable Drainage Approval Body (SAB) to manage surface water from developments. This means that all compliant developments will need technical approval from the SAB for the design and construction of surface water drainage systems. It is the role of the SAB to assess the design of SuDS against the national standards for sustainable drainage and local policy requirements.
- 2.7.3. The duty of the SAB is to:
- Evaluate and approve drainage applications where construction work has drainage implications, and,
 - Adopt and maintain surface water drainage systems according to Section 17 of Schedule 3 (FWMA);
 - Inspect and enforce approved systems;
 - Offer non-statutory pre-application advice.

2.8 UK CLIMATE IMPACT PROGRAMME 2009 (UKCIP09)

- 2.8.1. In June 2009 the UK Climate Impact Programme released new guidance with respect to climate change predictions (superseding UKCIP02). The predictions have moved from a deterministic approach (i.e. one range of outcomes) to a probabilistic approach (i.e. a range of possible outcomes based on a range of climate change scenarios). In 2018 the latest climate change predictions were published (UKCP18). Work is still ongoing by the various lead organisations to incorporate this into the guidance for climate change allowances for fluvial flood risk. Therefore, the current NRW guidance based on the UKCP09 predictions is used in this FCA.
- 2.8.2. The UKCIP09 predicts that, by the 2050s, temperatures across Wales could rise by between 2.0 and 2.5°C. Annual average rainfall is expected to remain the same, but there is some difference expected in the seasonal variations of the storm events with winter rainfall expected to be more intense, but short-lived, rainfall events and summer rainfall may decrease with more frequent short term droughts.
- 2.8.3. The sea level along the Welsh coast is expected to rise and result in more severe coastal erosion and inundation in low lying coastal areas.
- 2.8.4. The Welsh Government development a guidance on Climate Change Allowances (Adapting to Climate Change: Guidance for Flood and Coastal Erosion Risk Management Authorities in Wales, December 2017). No changes to the climate change allowances for wave height, storm surge or peak rainfall intensity. There have however been small changes to peak river flow allowances in the three River Basin Districts that cover Wales. Bedwas is located in the Severn River Basin District.
- 2.8.5. The information provided in Table 4 below is derived for change to river flow likelihood of a 1 in 50 (2%) chance of occurring in any year. The climate change allowances provided correspond to the central estimate of change from the research. The projections are percentage changes to a 1961 – 90 baseline.
- 2.8.6. Only maximum daily total rainfall data have been considered from the climate model projections. It is recommended that changes to rainfall intensity presented in Table 5 are used as the best available estimate.
- 2.8.7. As with river flood flows, it is recommended that the 2080s changes are used when considering any time beyond 2115.

Table 2-4: Peak river allowances for Severn RBD (using 1961-1990 baseline)

Severn RBD	Total potential change anticipated by 2020s	Total potential change anticipated by 2050s	Total potential change anticipated by 2080s
Upper Estimate	25%	40%	70%
Central Estimate	10%	20%	25%
Lower Estimate	0%	5%	5%

Table 2-5: Change to extreme rainfall intensity (compared to 1961 to 1990 baseline)

Applies across all of Wales	Total potential change anticipated by 2020s	Total potential change anticipated by 2050s	Total potential change anticipated by 2080s
Upper Estimate	10%	20%	40%
Central Estimate	5%	10%	20%

2.9 CAERPHILLY COUNTY BOROUGH COUNCIL LOCAL DEVELOPMENT PLAN UP TO 2021, ADOPTED 2010.

- 2.9.1. The Local Development Plan is the statutory framework for the development and use of land within Caerphilly County Borough.
- 2.9.2. The LDP provides the development strategy and policy framework for the development and conservation needs of the County Borough for the fifteen-year period, from 2006 to 2021. The LDP is be used by the Council to guide and control development, providing the basis by which planning applications will be determined consistently and appropriately. The LDP has regard European legislation, national legislation and planning policies, background reports and other data, referred to as the “evidence base”.
- 2.9.3. Aims of the LDP include:
- To protect the environment as a whole, while balancing need for development with need to conserve resources;
 - Ensure new development minimises emissions of greenhouse gases;
 - Underpin all development with principle of good design;
 - Make Caerphilly County Borough Council (CCBC) a clean, green, safe space to live and work with decent public services;
 - Increase economic prosperity
- 2.9.4. Objective 4 of the LDP requires development to ensure that environmental impacts of all new development is minimised.
- 2.9.5. Policy SP8 is designed to safeguard known resources of coal and other resources, balancing the need for safeguarding of nationally important mineral resources against the potential impact of such development on the landscape and on sites of ecological interest.
- 2.9.6. Mineral resources shown on the Proposals Map should be safeguarded from permanent development that would prevent their future working. The proposed scheme is covered by sandstone safeguarding policy, with areas to the north of Bedwas and Trethomas covered by coal safeguarding.
- 2.9.7. Policy CW5 states that development proposals will only be permitted where:
- A. They do not have an unacceptable adverse impact upon the water environment, and
 - B. Where they would not pose an unacceptable risk to the quality of controlled waters (including groundwater and surface water).

2.10 CAERPHILLY COUNTY BOROUGH COUNCIL LOCAL FLOOD RISK MANAGEMENT STRATEGY, 2013

- 2.10.1. The Flood Risk Regulations 2009 and Flood and Water Management Act 2010 designate CCBC as Lead Local Flood Authority (LLFA), responsible for developing and implementing a strategy for local flood risk management with the County Borough.
- 2.10.2. The strategy states that the terrain within CCBC is typical of the valleys of South East Wales. Catchments consist of steep hillsides which are generally formed of impermeable clay overlying other strata and with steep rivers in valley floors. A combination of characteristics which leads to catchments being very “flashy”, giving rise to high flows which generally subside very quickly of particular relevance to surface water runoff and ordinary watercourses.
- 2.10.3. The strategy requires new development to implement controls to restrict runoff to a rate no greater than the existing rate, although volume of total runoff may increase.
- 2.10.4. The strategy also states that flooding from highways often occurs as a result of short duration, high intensity storms when gullies are unable to manage the volume of water as a result of blockages.
- 2.10.5. Groundwater flooding is not considered to be a high risk in CCBC but is difficult to predict as water must to percolate through clay before entering former mine workings. Since the closure of the mines, pumping has ceased and many workings have filled with water, which sometimes escapes through mine entrances and shafts, occasionally discharging in unexpected locations.

3 SITE DESCRIPTION

3.1 SITE LOCATION

- 3.1.1. The proposed scheme is located northeast of Bedwas and north of Trethomas, in CCBC. Bedwas and Trethomas are located approximately two kilometres northeast of Caerphilly.
- 3.1.2. Tip 1 is located at grid reference ST 17767 89969, approximately 1km northeast of Bedwas and 0.8km north of Trethomas.
- 3.1.3. Tip 2 is located further north on top of Mynydd y Grug, at grid reference ST 17667 90675, approximately 1.6km northeast of Bedwas and north of Trethomas. Tip 2 is bounded to the north by Sirhowy Valley Country Park. Cwmfelinfach and Wattsville are located approximately 1km to the north and 2.5km to the northeast respectively. Afon Sirhowy flows west to east between these two locations, towards Newport.
- 3.1.4. The site location plan can be seen in Appendix 1.

3.2 TOPOGRAPHY

- 3.2.1. The tips are located on a steep hillside; the base of the Tip 1 is at approximately 140 m above Ordnance Datum (mAOD), rising to approximately 290 mAOD at its peak. The base Tip 2 is approximately 330 mAOD, rising to approximately 355 mAOD at its peak.
- 3.2.2. Existing OS 5m contours for the two tip areas and their adjoining land are provided in Appendix 2.

3.3 GEOLOGY AND SOILS

- 3.3.1. White Young Green Environmental completed a ground investigation of the site in July 2002. This report concluded the colliery spoil making up the two existing tip areas comprises clayey sand gravel of shale and coal fragments with, to a lesser extent, sandy and gravelly clay and clayey sandy cobbles and boulders.
- 3.3.2. Glacial deposits at the site location consisted of clayey sandy gravel with cobbles and boulders with sandy gravelly clay and clayey gravelly sand. Bedrock at the site ranges between depths of 4m to 39m and was uniform composition, consisting of sandstone with some mudstone bands and occasional coal bands.
- 3.3.3. While the ground investigation was carried out in winter during an exceptionally wet period, no groundwater problems were identified during site investigation works, with low groundwater levels being indicated. No groundwater was encountered in within the tip colliery layer and between 0.8 m and 11.3m below ground level beneath the former surface level.
- 3.3.4. The above soil classifications is reaffirmed by the British Geological Survey (BGS) Geology Viewer indicates bedrock geology beneath the site comprises Hughes Member, of the Pennant Sandstone Formation. This is overlain by superficial deposits of glacial till, consisting of clayey sandy gravel with cobbles, sandy gravelly clay and clayey gravelly sand.
- 3.3.5. Information provided by the Cranfield Soil and Agriculture Institute database “Soilscapes” describes the soils for the entire site as being classified as freely draining acid loamy soils over rock, with a loamy texture. The land cover is described as grassland and rough grazing which drains to local groundwater and river network.

3.4 HYDROGEOLOGY

- 3.4.1. The BGS Groundwater vulnerability dataset for Wales indicates that the bedrock beneath the site is classified as a Secondary A aquifer with a high vulnerability and is an area that can potentially transmit pollution to groundwater. The dataset shows the superficial deposits to have an unproductive aquifer and are deposits with negligible significance for water supply or baseflow to rivers, lakes and wetlands.
- 3.4.2. The NRW Source Protection Zone (SPZ) data set available from DataMapWales indicates the site and adjoining area are not located in a SPZ. Any groundwater body beneath the site is not used for drinking water supply. The site location and closest SPZ are illustrated in Figure 3-1 below.

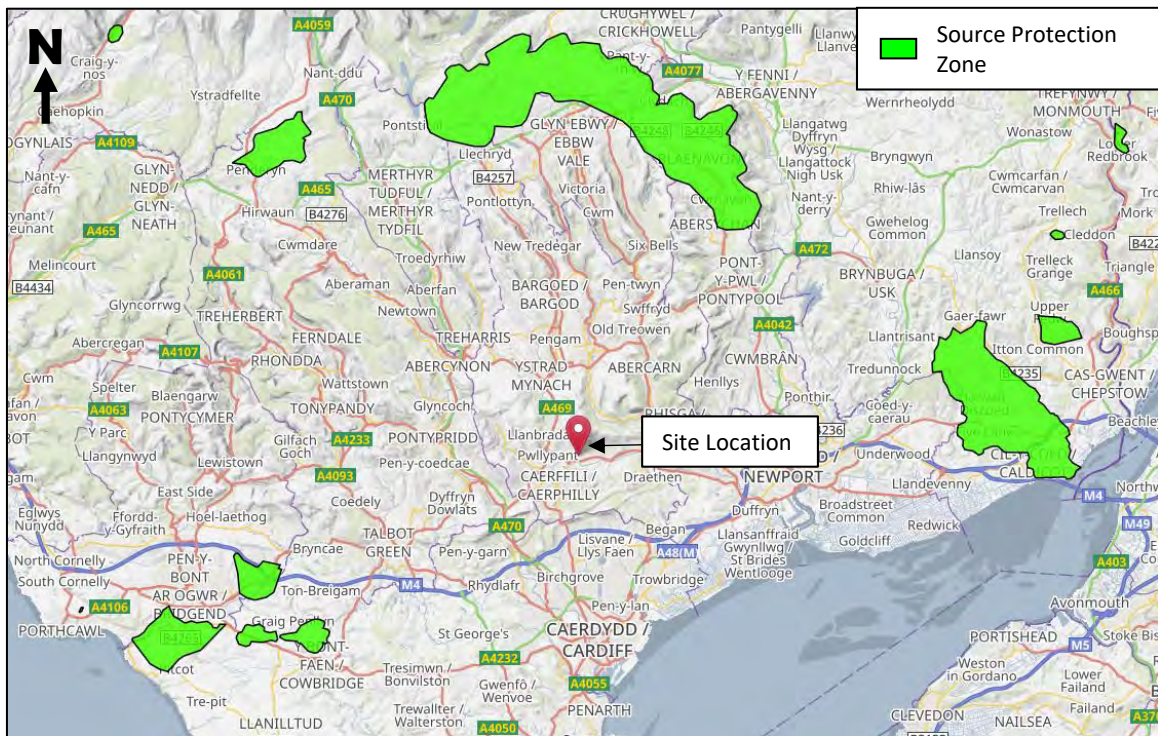


Figure 3-1: DataMapWales Source Protection Zones

3.5 EXISTING SITE DRAINAGE

- 3.5.1. The two existing tip areas are served by existing drainage infrastructure in the form of drainage channels. These concrete drainage channels have been constructed across Tip 1 and Tip 2, draining surface water runoff to a pond situated within a disused quarry at the sites southernmost corner. Water from this pond then discharges via a culvert that runs south beneath Trethomas before outfalling into Afon Rhymney.
- 3.5.2. While the site is served by existing drainage infrastructure, historical efforts to manage drainage of the site have proven to be ineffective. The existing concrete channels have been prone to collapse over time due to instability in the tip substrate and subsequent erosion of soil and scouring of structures. This is believed to be a result of the tips being poorly profiled by the National Coal Board (subsequently the British Coal Corporation) when the mine was abandoned in the 1980s.
- 3.5.3. In recent years, conveyor belting has been trialled to re-instate the collapsed concrete channels. Unfortunately, this also suffers from erosion and eventual collapse and the current system of drainage channels is likely to continue to deteriorate over time.

- 3.5.4. Given the varying condition of the existing drainage infrastructure, and lack of survey data confirming its extent and size in detail, the capacity of these channels is unclear and it is not possible to determine the effectiveness of this system with respect to managing existing surface water flows originating at the site.
- 3.5.5. The approximate location of existing drainage features at the site serving Tip 1 and Tip 2 are illustrated in Figure 3-2 below.

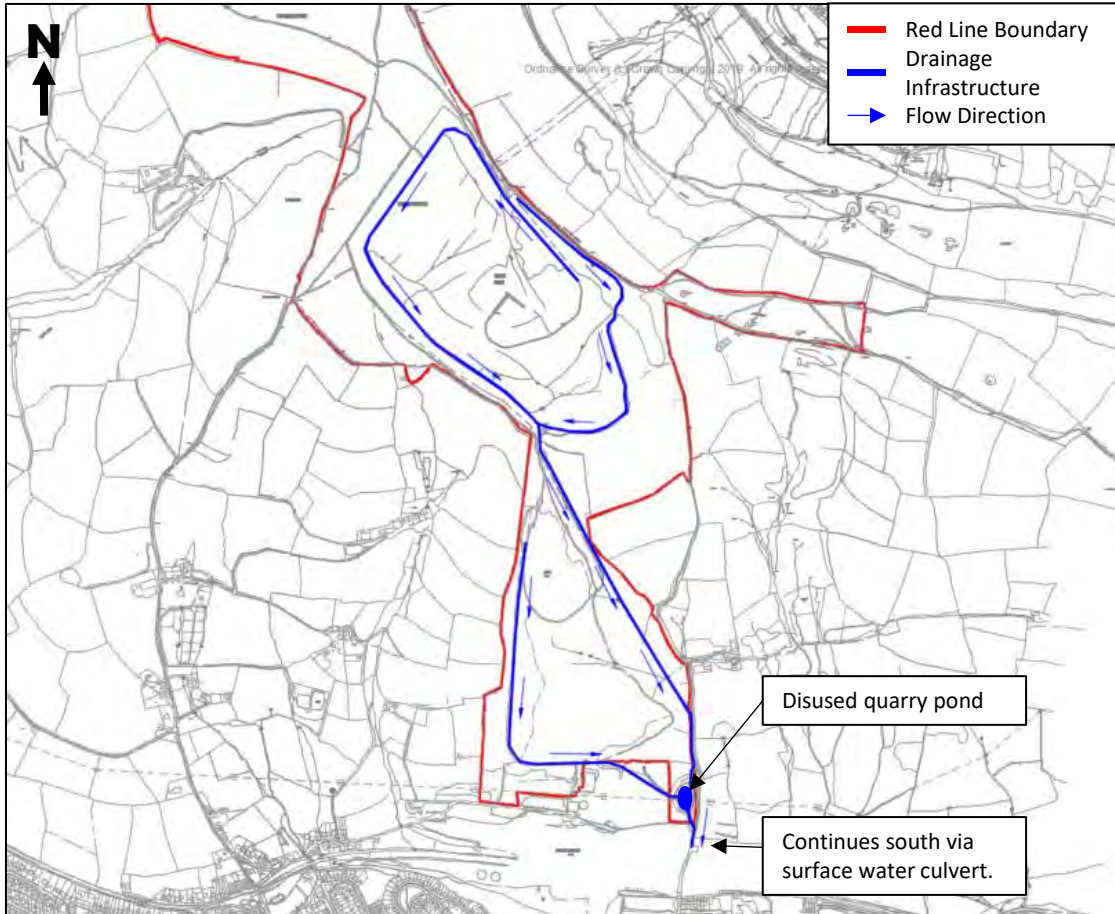


Figure 3-2: Existing Drainage Infrastructure

4 PRE DEVELOPMENT FLOOD RISK

4.1 TIDAL FLOOD RISK

4.1.1. The site is located in land and is not at risk of flooding from tidal sources.

4.2 FLUVIAL FLOOD RISK

4.2.1. The NRW Development Advice Map and Flood Map for Planning (FMfP) shows the site is located in DAM Zone A and Flood Zone 1, and is assessed to be at risk of fluvial flooding. The DAM Zone and Flood Zone at the site location are illustrated in Figures 4-1 and 4-2.

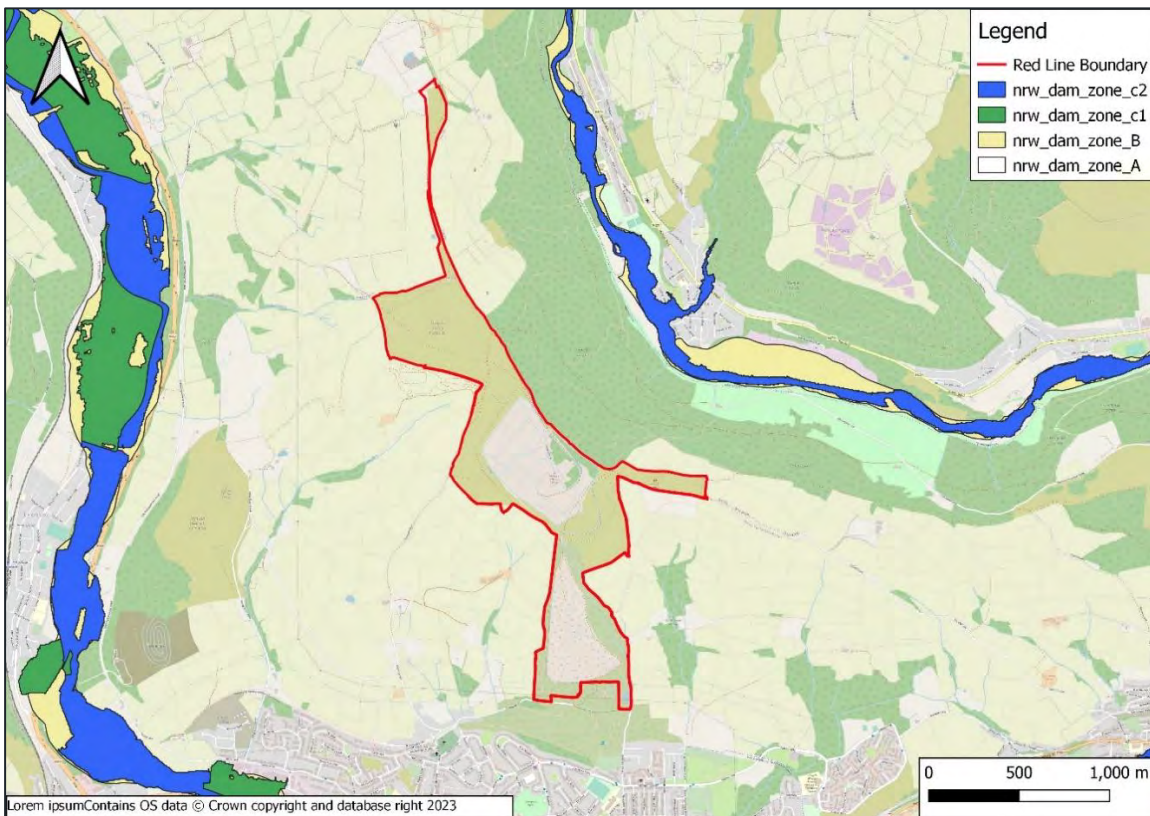


Figure 4-1: NRW DAM Zones

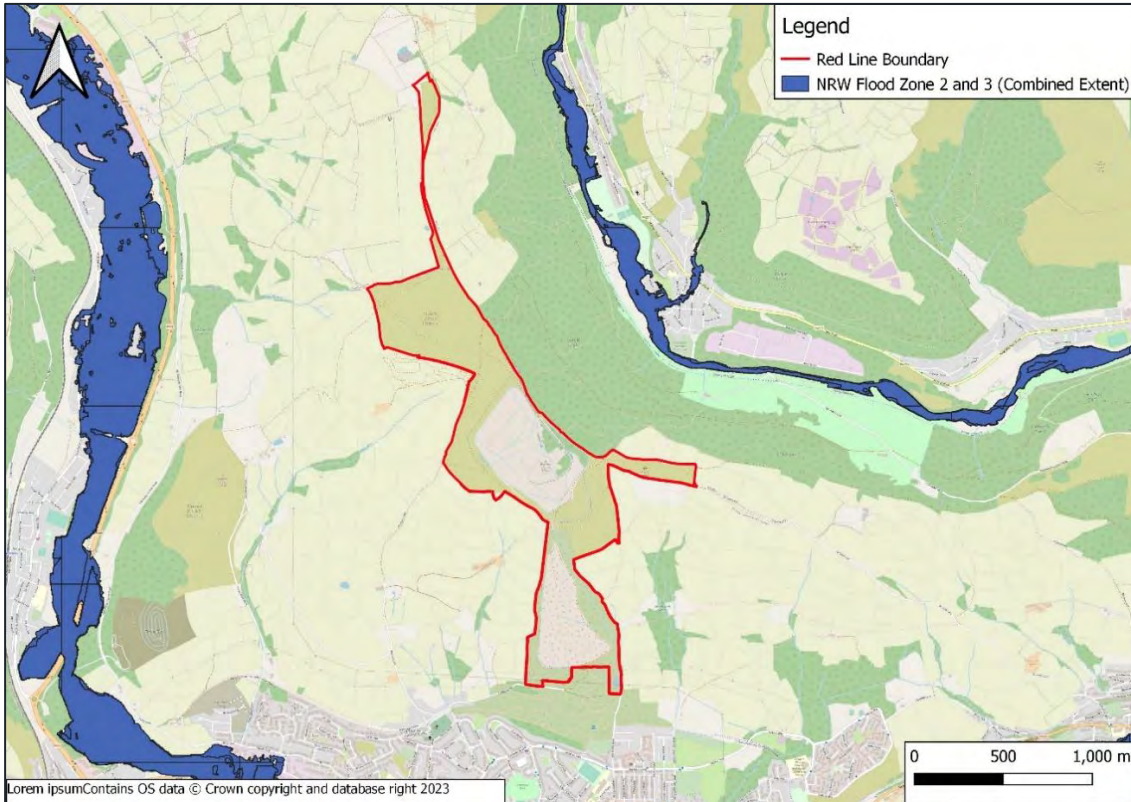


Figure 4-2: NRW Flood Zones

4.3 SURFACE WATER AND SMALL WATERCOURSES

- 4.3.1. NRW's Surface Water and Small Watercourse flood risk map indicates the majority of the site area is at very low risk of flooding from these sources.
- 4.3.2. Sections of existing drainage channels within the existing Tip 1 and Tip 2 extents are shown to be at risk of surface water flooding and are located in Flood Zone 2 and 3.
- 4.3.3. The southern area of the site is bounded by a small watercourse, which run southwards towards Trethomas. This portion of the site is shown to be in Flood Zone 2 and 3. Three other small watercourses originate along the southwestern boundary of the site, and small areas at the head of these watercourses are shown to be located in Flood Zone 2 and 3.
- 4.3.4. Isolated areas of surface water flooding are also identified within the northern area of the site, which shows small areas of Flood Zone 2 and 3 to be present. These areas are likely a result of surface water accumulating in localised depressions.
- 4.3.5. Flood risk from this source is assessed to be very low to high and risk of flooding from surface water and small watercourses is illustrated in Figure 4-3 and Figure 4-4.

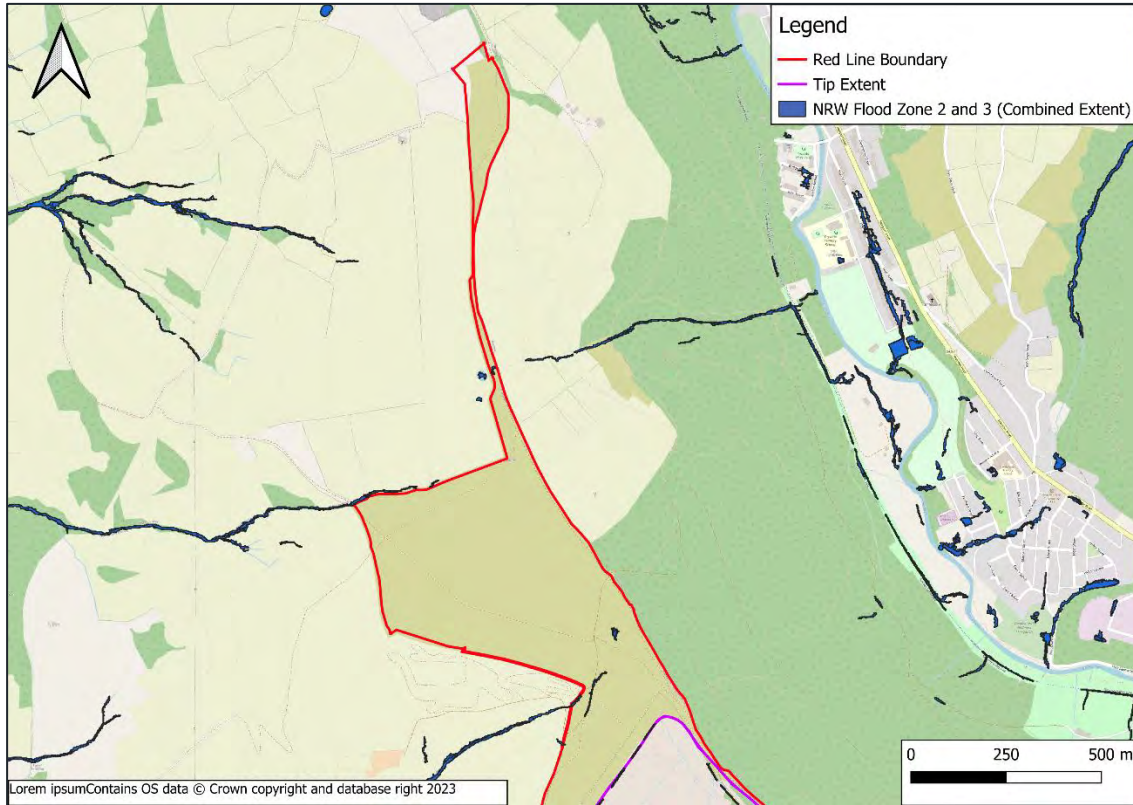


Figure 4-3: Risk of Flooding from Surface Water and Small Watercourses Northern Area

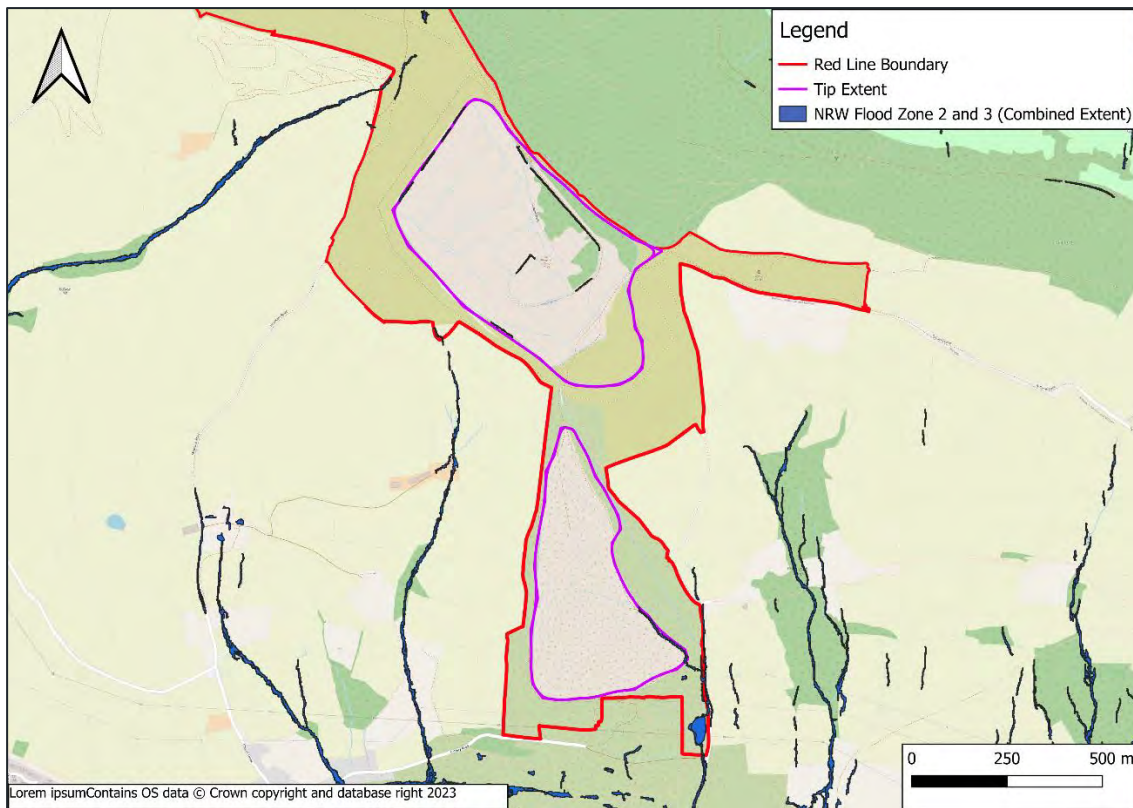


Figure 4-4: Risk of Flooding from Surface Water and Small Watercourses Central and Southern Area

4.4 FLOOD RISK FROM SEWERS

- 4.4.1. As the site is located on an undeveloped hillside and was used for tip material, it is assumed that no sewer infrastructure will be present. Furthermore, no instances of sewer flooding have been recorded in Wattsville at the location where the haul road will connect to the existing road network. Flood Risk from this source is assessed to be very low.

4.5 GROUNDWATER FLOOD RISK

- 4.5.1. Ground investigations carried out by White Young Green Environmental during winter months after an exceptionally wet period found no groundwater problems at the site, with low groundwater levels being indicated. No groundwater was encountered within the tip colliery layer and between 0.8m and 11.3m below ground level beneath the former surface level depending on the site location.
- 4.5.2. A number of springs are located on the valley side; however, these are located downstream of the site, or along the southwestern boundary at the head of the small ordinary watercourses. Any flows originating at these locations would be directed away from the site to the south, given a fall in levels towards Bedwas and Trethomas, before building to a significant depth.
- 4.5.3. Risk of flooding from groundwater is assessed to be very low.

4.6 FLOOD RISK FROM ARTIFICIAL SOURCES & RESIDUAL FLOOD RISK

- 4.6.1. NRW mapping indicates that the scheme is not at risk of flooding from reservoir overtopping or breach.
- 4.6.2. A small pond is present to the south of Tip 1 at Ty-Ganol, located within a decommissioned quarry site. As surface water accumulating here is located below ground level, there is negligible risk of structure failure and release of impounded water. Furthermore, as this pond is located in the southernmost corner of the site, any flooding from this source would be directed to the south away from the site.
- 4.6.3. Flood risk from artificial sources is assessed to be very low and the site is considered to have minimal residual flood risks.

5 POST DEVELOPMENT FLOOD RISK

5.1 FLUVIAL FLOOD RISK

- 5.1.1. Proposals are located in DAM Zone A, as illustrated in Figure 5-1, and are outside fluvial Flood Zone 2 and 3. No aspects of the scheme will be at risk of fluvial flooding or increase fluvial flood risk elsewhere due to displaced flood water within existing flood plains.
- 5.1.2. Potential impacts to and from fluvial flood risk is assessed to be very low following redevelopment.

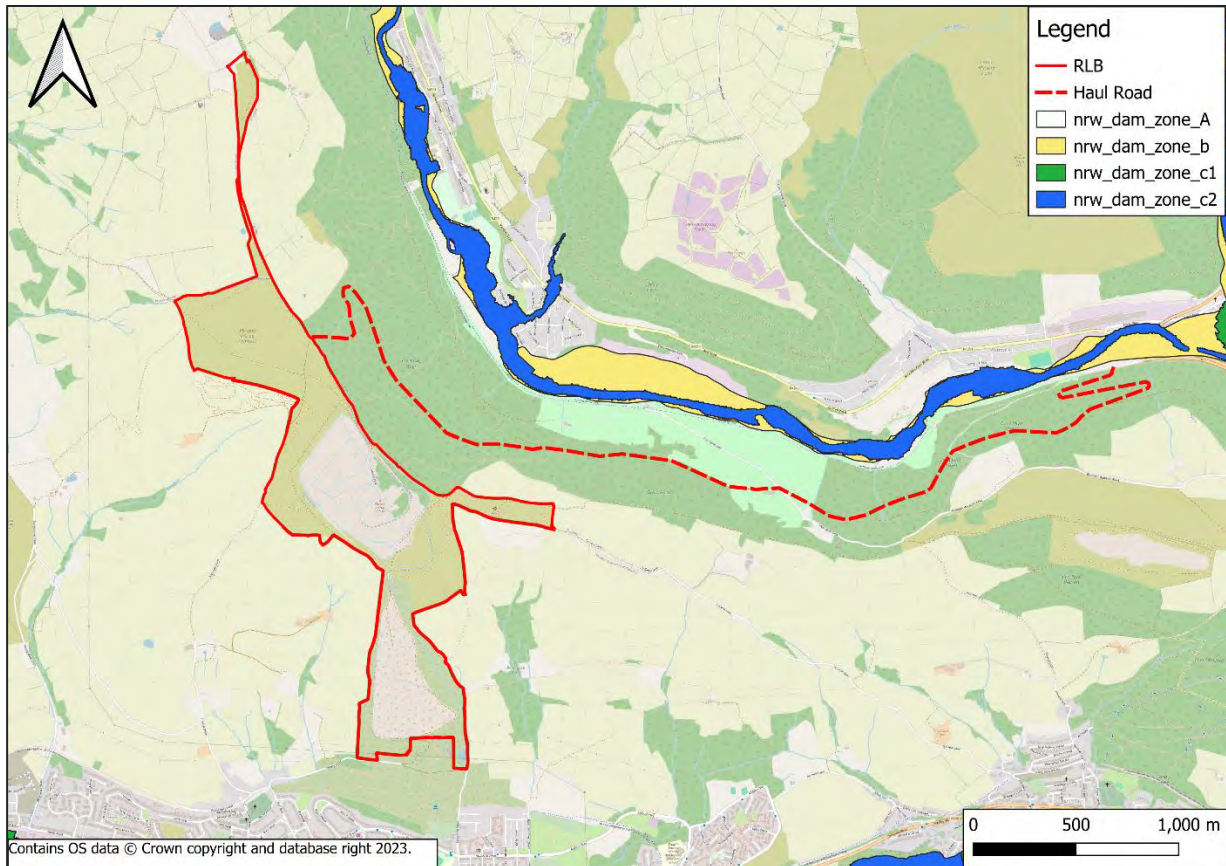


Figure 5-1: NRW DAM Zones Proposed Development

5.2 SURFACE WATER AND SMALL WATERCOURSES

- 5.2.1. As illustrated in Figures 5-2 to 5-4, the proposed tip extents and alterations to existing ground levels fall outside flood zone 2 and 3 associated with the small ordinary watercourses surrounding and adjoining the site area. As no changes to existing ground levels are proposed outside these extents, the development will not obstruct or divert any existing in-channel flow routes.

Figure 5-5 shows the potential risk to the haul road route from this source. As indicated, the majority of the route is at very low risk. Isolated areas at low to high risk are associated with isolated depressions or the route of a small watercourse. The majority of this route utilises an existing access track, and flood risk to and from this part of the development will remain unchanged.

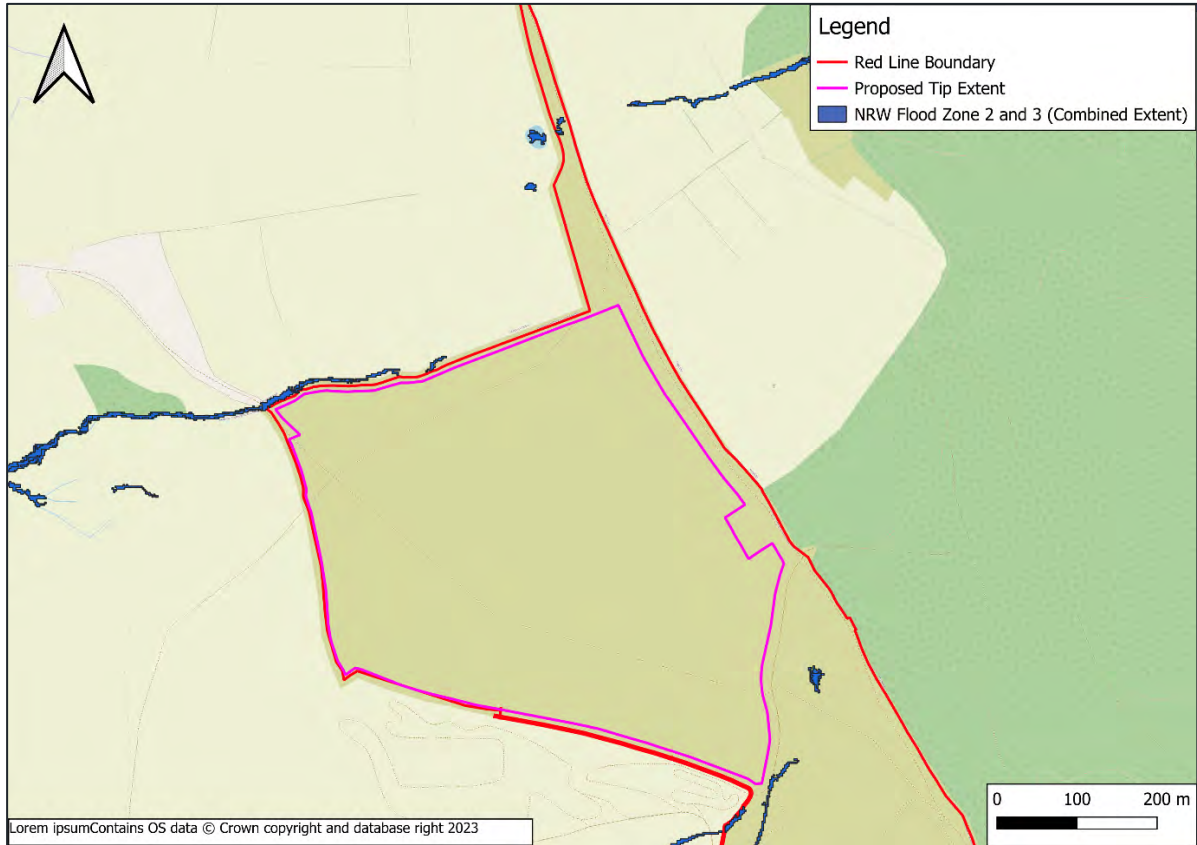


Figure 5-2: Risk of Flooding from Surface Water and Small Watercourses Tip 3 Extent

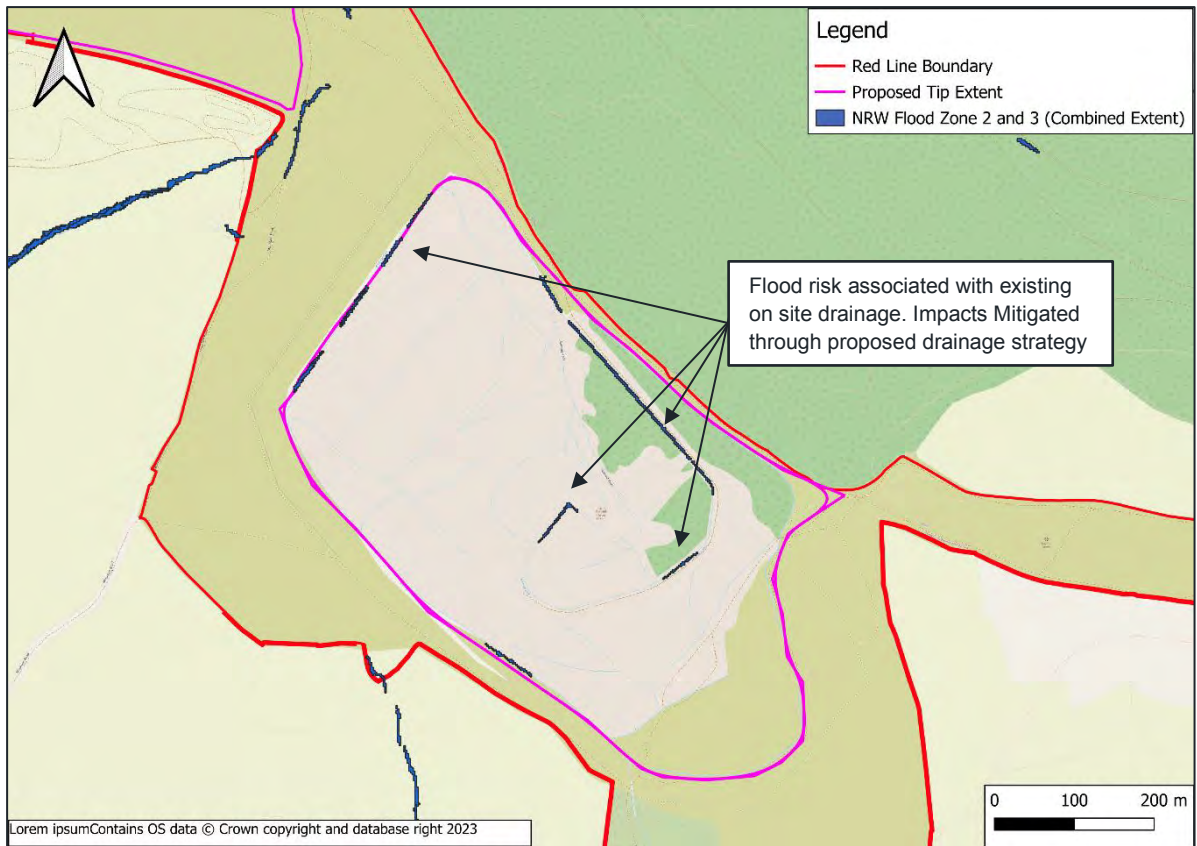


Figure 5-3: Risk of Flooding from Surface Water and Small Watercourses Tip 2 Extent

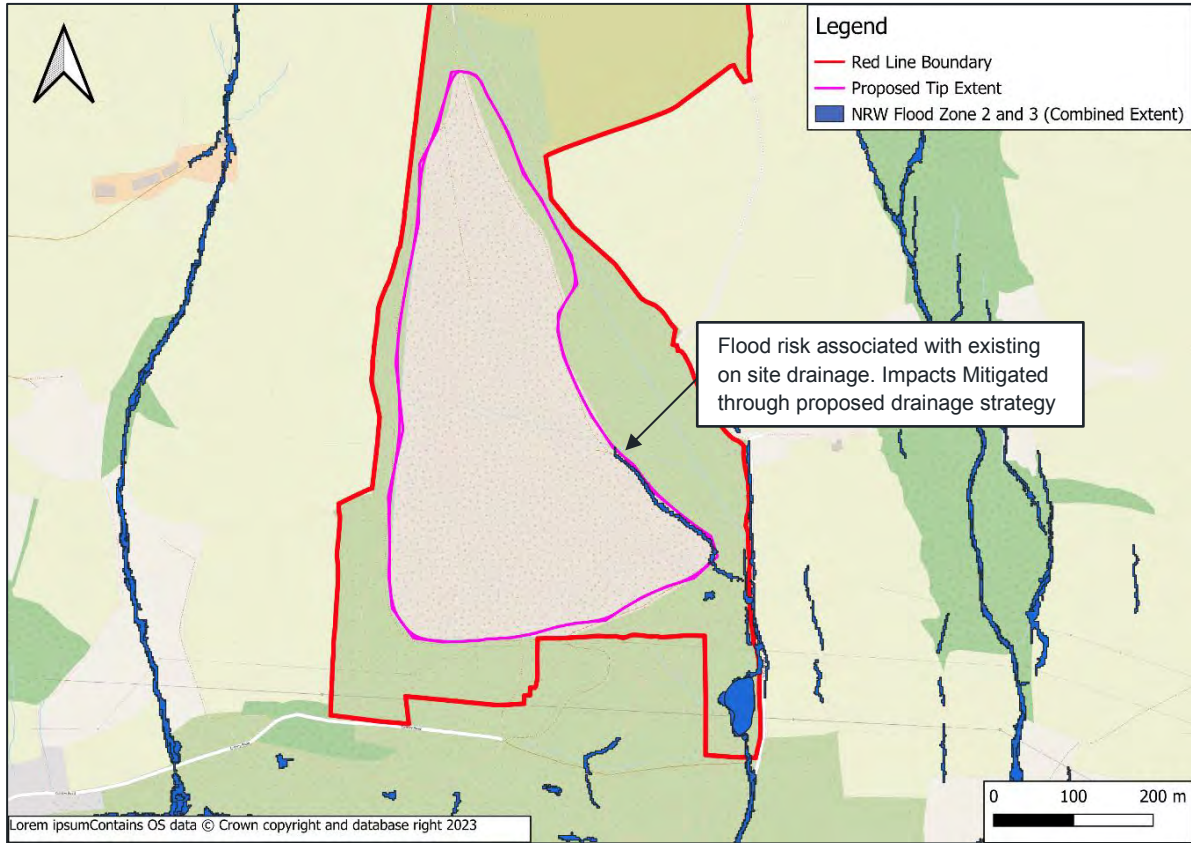


Figure 5-4: Risk of Flooding from Surface Water and Small Watercourses Tip 1 Extent

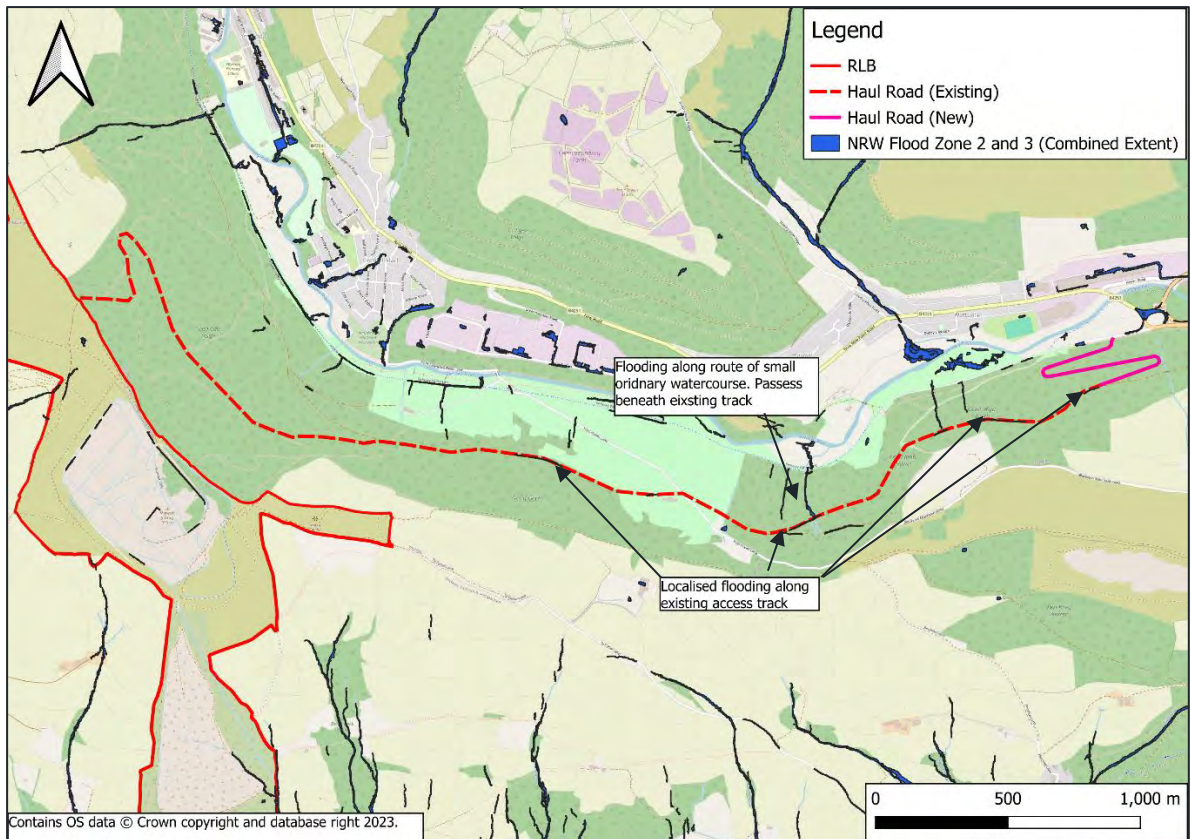


Figure 5-5: Risk of Flooding from Surface Water and Small Watercourses Haul Road

- 5.2.2. As proposals will alter existing drainage infrastructure serving the two of the tip areas, there's potential for an increase in existing surface water flood within the tip areas and at the site, as well as increasing flood risk elsewhere from this source. A small section of new haul road is also proposed, which might impact flood risk along its route. To mitigate this, SuDS features are proposed which are discussed further in Section 6.2 and a separate drainage strategy report.

5.3 GROUNDWATER FLOOD RISK

- 5.3.1. The existing round investigation found no presence of groundwater within the existing tip layers, with any recorded groundwater being below the historic surface level.
- 5.3.2. While some material will be taken off site as a result of the proposals, this will only comprise coal deposits within the colliery layer. The remaining material will be redeposited to form the reprofiled tip areas, maintaining largely similar pressure exerted on the existing groundwater body by the existing tip areas. The propensity for groundwater emergence due to unloading of tip material above the existing ground water body should remain largely unchanged. However, if groundwater were to emerge at the redeveloped site, given the nature of the proposals, any impact to development would be negligible.
- 5.3.3. The potential impacts to and from groundwater flood risk are assessed to be very low following redevelopment.

5.4 RISK OF FLOODING FROM ARTIFICIAL & RESIDUAL SOURCES

- 5.4.1. During the construction phase, temporary lagoons will be used to provide treatment to water. The volume of these ponds will never exceed 10,000m³ and will not be considered reservoirs as per NRW's Reservoir Safety Guidance.
- 5.4.2. Where practicable, it is recommended these structures are cut into the earth to remove the risk of embankment failure should they be built up and located above ground level. Given the limited volume of water, should any of these lagoons fail, any notable increase in flood risk would be greatest within the site boundary. The impacts from any overland flows from these sources would be greatly diminished by the time it reached more vulnerable development to the south of the site in Trethomas.
- 5.4.3. Subject to the implementation of suitable maintenance and management measures for proposed temporary and permanent surface water drainage features, residual flood risk from the failure of drainage features is assessed to be very low.

6 FLOOD RISK MANAGEMENT

6.1 JUSTIFICATION TEST

- 6.1.1. As a mineral extraction site, the scheme is classified as a Less Vulnerable development, as defined by TAN 15.
- 6.1.2. As the scheme is located in DAM Zone A, land considered to be at little or no risk of fluvial flooding, and given the Less Vulnerable development classification, TAN 15 states that a justification test is not applicable and there is no need to consider flood risk from this source further. Application of the justification test is not required.

6.2 MITIGATION

- 6.2.1. As the site is not assessed to be at risk of fluvial flooding, no mitigation is required to address potential flood risk from this source. Additionally, the site is assessed to be at very low risk from sewers, groundwater, and artificial sources, no mitigation measures are required to address potential flood risk from these sources.
- 6.2.2. Potential risk of flooding from surface water and small watercourses is very low for the majority of the site area. While some isolated areas are at risk of flooding from this source, given the type of development, any impact will be negligible, with the site returning to operable condition with minimal maintenance requirements. Furthermore, given the isolated nature of flooding from this source, areas of flooding can be circumnavigated, and safe access and egress is available for all areas of the site.
- 6.2.3. In order to maintain existing surface water drainage conditions and flood risk from this source at the site and ensure no increase in flood risk elsewhere, drainage features are proposed to manage surface water runoff during the construction phase and at the final developed site.
- 6.2.4. As the intention of the proposals is to return the site to its greenfield conditions, including the removal of some existing drainage infrastructure, there is the potential for increased runoff to surrounding small ordinary watercourses from the reprofiled tip areas. While this will mimic historic natural runoff and flood risk conditions, to ensure no increase in more recent baseline flood risk conditions during the construction phase and at the final development, a drainage strategy is being developed for the reprofiled tip areas. This drainage strategy will be provided in Appendix 3 when completed.
- 6.2.5. The Drainage Strategy Report aims to demonstrate that through the provision of SuDS features and by retaining and maintaining sections of existing drainage infrastructure, there will be no increase in surface water runoff to the adjoining small ordinary watercourses or third party land.
- 6.2.6. Subject to the implementation of a suitable drainage strategy, proposals should have a negligible impact to surface water and small watercourse flood risk following redevelopment.
- 6.2.7. Any residual risk associated with the failure of drainage infrastructure will be managed through the implementation of maintenance and management measures, which will be outlined in the Drainage Strategy Report.

6.3 DEVELOPMENT PLANNING CONSIDERATIONS

- 6.3.1. PPW and TAN15 require a precautionary approach to be undertaken when making land use planning decisions regarding flood risk. This is partly due to the considerable uncertainty surrounding flooding



mechanisms and how flooding may respond to climate change. The aim should be to direct new development away from areas at risk of flooding, if possible.

- 6.3.2. By implementing mitigation measures outlined in Section 6.2 with regard to risk of flooding from surface water and small watercourses and artificial sources, any increased risk of flooding on site and off site potentially as a result of the scheme will be mitigated.
- 6.3.3. There will be minimal risk to life, minimal disruption to people living and working in the area, minimal potential damage to the development, minimal impact to existing flood risk in general, and minimal disruption to natural heritage as a result of the proposals when considering the developments end use, vulnerability classification, and potential flood risk.

7 CONCLUSIONS

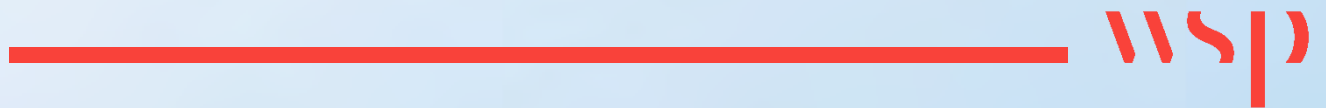
7.1 CONCLUSION

- 7.1.1. ERI has commissioned WSP to undertake a FCA in support of an EIA for the proposed reclamation of Bedwas Coal Tips, in Bedwas, Caerphilly County Borough.
- 7.1.2. The site is located in NRW DAM Zone A and Flood Zone 1, and is at very low risk of fluvial flooding. Additionally, the site is assessed to be at very low risk from sewers, groundwater, and artificial sources.
- 7.1.3. The majority of the scheme is assessed to be at very low risk of flooding from surface water and small watercourses, however there are some isolated areas of the scheme located in Flood Zone 2 and 3 at medium and high risk of flooding from this source.
- 7.1.4. As proposals have the potential to increase surface water runoff leaving the site, mitigation has been proposed, including the development of a drainage strategy to manage and control surface water during the construction phase and at the final redeveloped site. These drainage mitigation measures will be outlined in the accompanying Drainage Strategy Report and will ensure no increase in flood risk at the site and elsewhere from this source.
- 7.1.5. Residual risk associated with the failure of drainage infrastructure will be managed through the implementation of maintenance and management measures that will be outlined in the Drainage Strategy Report.

As the scheme is Less Vulnerable development type and located in DAM Zone A, land considered to be at little or no risk of fluvial flooding, TAN 15 states that a justification test is not applicable and there is no need to consider flood risk from this source further. Application of the justification test is not required.

Appendix A

SITE LOCATION





Appendix B

TOPOGRAPHIC DATA





Appendix C

DRAINAGE STRATEGY







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wsp.com

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