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Flood Risk Assessment & Drainage Strategy

UNIT 10&14, BRIDGE END INDUSTRIAL ESTATE, EGREMONT

23-C-17325

Rev A

December 2024

CONTENTS

1. INTRODUCTION

A L Daines & Partners LLP (ALD) have been instructed to undertake a Site Specific Flood Risk Assessment, in accordance with the National Planning Policy Framework (NPPF) [1].

2. DEVELOPMENT SITE AND LOCATION

2.1 The site location is detailed below and a location plan is included within *Appendix A* for reference.

Units 10&14, Bridge End Industrial Estate, Egremont. CA22 2RD
National Grid Reference: 301306E , 510082N

2.2 The land is currently developed industrial estate land.

2.3 The definition of the Environment Agency Flood Zone is provided within PPG Table 1: Flood Zones and is included for reference below:

- Flood Zone 1 – Low probability. Is defined as land which could be at risk of flooding from fluvial or tidal events with less than 0.1% annual probability of occurrence (1:1,000 year).
- Flood Zone 2 – Medium probability. Is defined as land which could be at risk of flooding with an annual probability of occurrence between 1% (1:100 year) and 0.1% (1:1,000 year) from fluvial sources and between 0.5% (1:200 year) and 0.1% (1:1,000 year) from tidal sources.
- Flood Zone 3a – High probability. Is defined as land which could be at risk of flooding with an annual probability of occurrence greater than 1% (1:100 year) from fluvial sources and greater than 0.5% (1:200) from tidal sources.
- Flood Zone 3b – the Functional Floodplain. Is defined as land where water has too flow or be stored in times of flood. Local Planning Authorities should identify in their Strategic Flood Risk Assessment areas of functional floodplain in agreement with the Environment Agency. In the absence of definitive information, it is often defined as land that would flood with an annual probability of occurrence of 5% (1:20) or greater.

In assessing the Flood Zone, the protection offered by any flood defence structures, and other local circumstances, is not considered by the Environment Agency.

2.4 The Environment Agency Flood Map for Planning indicates the majority of the site lies within Flood Zone 1 (low probability), with a small area of land to the southwest corner of the site within Flood Zone 2 (medium probability).

It is noted that the existing buildings (no new buildings are proposed) are located within Flood Zone 1. The flood zone mapping is located within *Appendix B* with an extract shown below for reference.

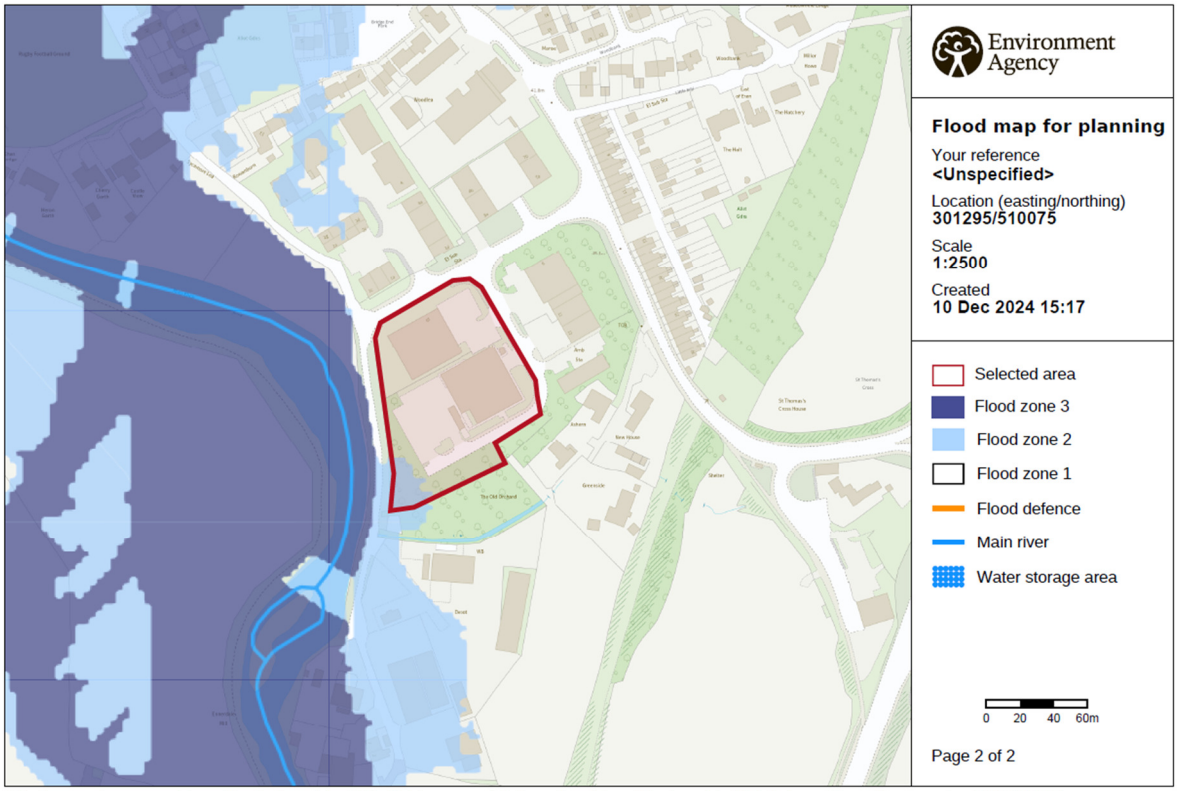


Figure 1 - Flood map for planning extract

Figure 2 - Flood map for planning extract

2.5 The Lake District National Park (LDNPA) Strategic Flood Risk Assessment (SFRA) shows a larger flood extent with a greater portion of the existing site within Flood Zone 3a. A screenshot of the SFRA is shown below

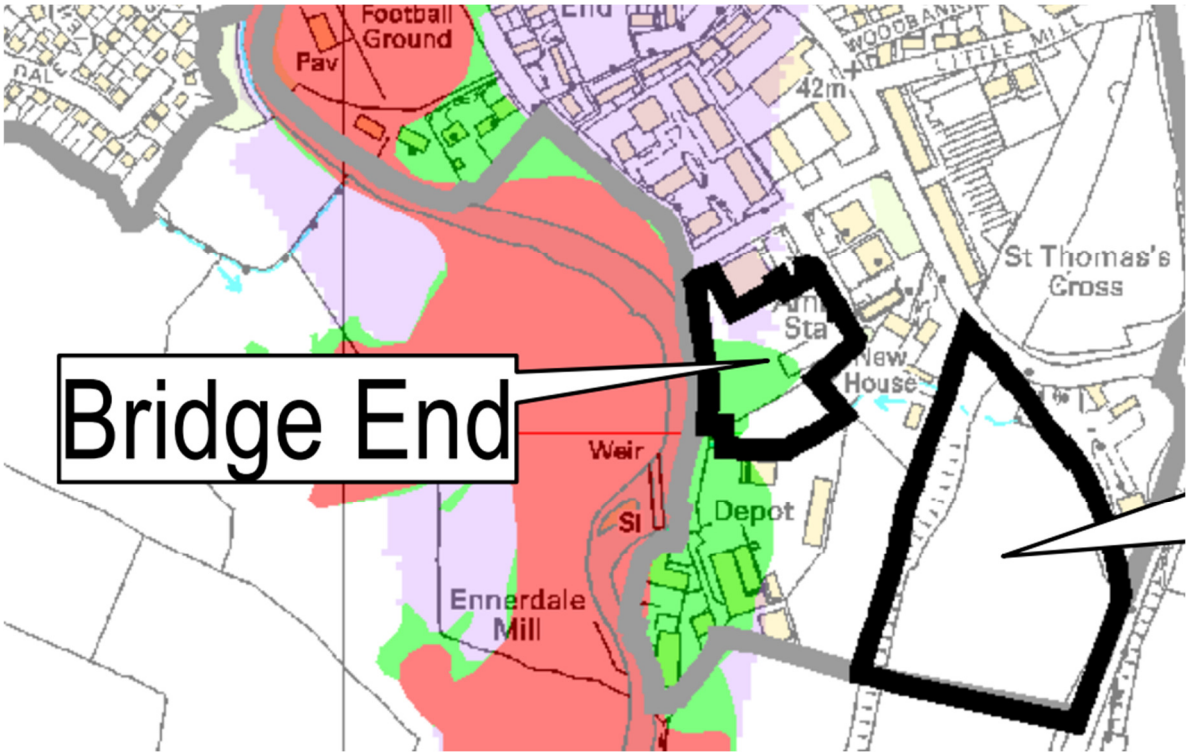


Figure 3 - Copeland SFRA Flood map

3. DEVELOPMENT PROPOSALS

3.1 The site is to be redeveloped to include an enlarged yard area to the west/southwest of the site.

The existing buildings are to remain largely unchanged with a small link structure built between the two existing buildings.

The overall building footprint does not extend into the flood zones.

The proposed site layout is shown in *Appendix C* for reference.

3.2 With reference to paragraph 66 of PPG Table 2: Flood Risk Vulnerability Classification, the proposed development relating to '*Buildings used for general industry, storage and distribution*' are considered to be 'Less Vulnerable' in terms of flood risk classification.

3.3 The lifetime of the development is expected to be 75 years as in accordance with the recommendation for commercial development in the NPPF.

4. SEQUENTIAL TEST

As the development site is not greater than 1ha in area and does not seek to gain permission for an extension to the existing development of more than 1000m2 floor area, it should not be considered a major development.

The buildings on site are located within Flood Zone 1 with only a small section of the site coming within FZ2 (Flood map for planning) and FZ3a (Copeland SFRA).

The buildings and yard areas are also classified as 'Less Vulnerable'.

Therefore PPS25 is satisfied and as such a full exception test is not deemed to be required, although full consideration will be given to flood risks and whether these will impact the chosen site.

5. CLIMATE CHANGE

River levels are likely to be impacted by climate change over the lifetime of the development. The Copeland SFRA has not accounted for the anticipated climate change effects however does state the below:

The Copeland SFRA states *"The detailed modelling of the River Keekle, River Ehen and associated tributaries was developed prior to current Environment Agency guidelines. As a result, the modelling has not considered the potential impact of climate change. Notwithstanding this however, experience has shown that (for planning purposes) a strong analogy can be drawn between Zone 2 Medium Probability and the 1% (100 year) plus climate change extent. This is simply a function of the topography of the Borough, and in the absence of 'better' information, this is considered an entirely appropriate way forward within the strategic context of the SFRA process"*.

It can therefore be assumed that FZ2 and above represent climate change affected flows.

As the majority of the site, and all the building development, is within FZ1 with a small area within FZ2 and upgraded to FZ3a in the Copeland SFRA, an exception test is not deemed necessary however the site specific flood risks should still be identified and assessed.

6. SITE SPECIFIC FLOOD RISK

6.1 Potential flood sources

This section of the report will attempt to identify the potential major sources of flood risk to the site using the Environment Agency long term flood risk mapping. The sources considered are surface water, rivers and seas, groundwater, sewers and reservoirs.

6.1.1 Flooding extent from surface water

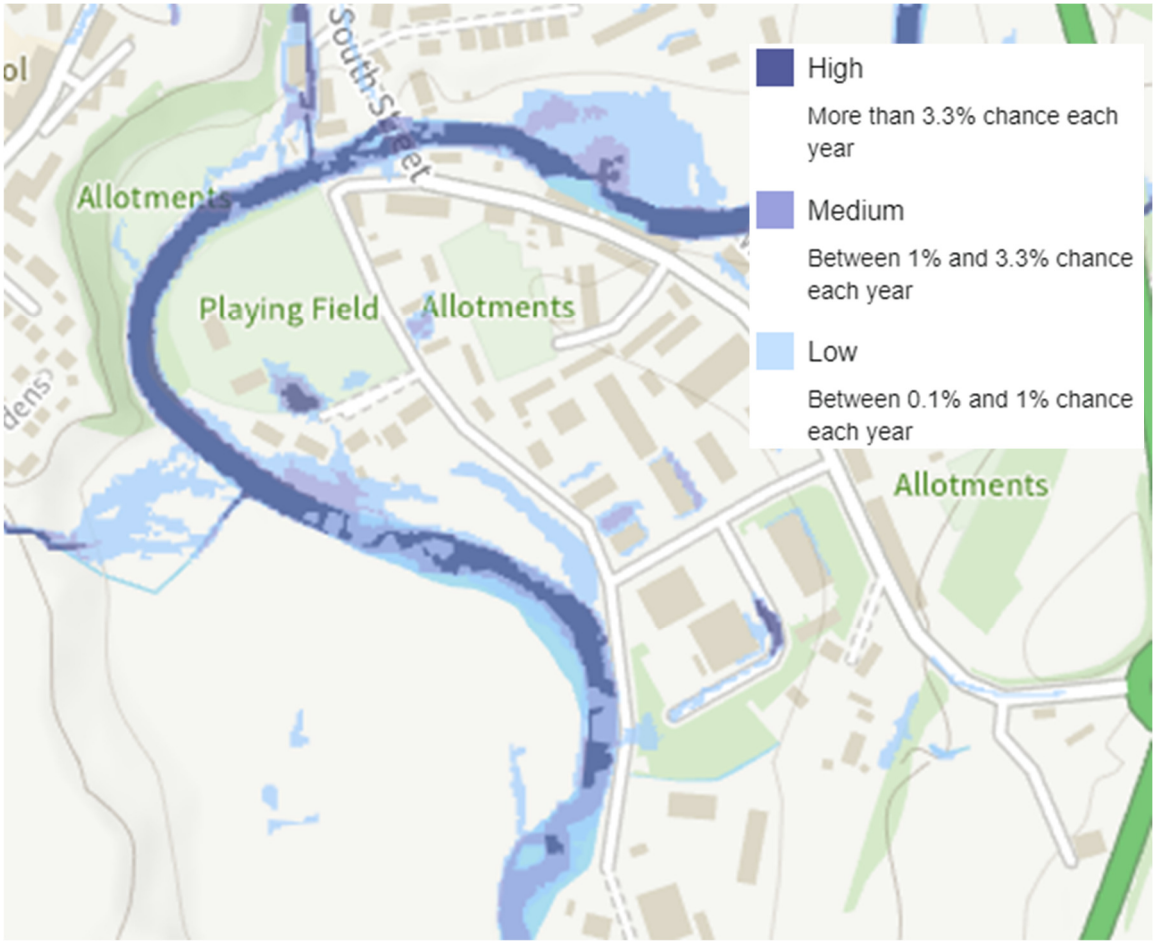


Figure 4 - Flood risk from surface water - EA

As can be seen from the flood map above, there is low risk to the site from surface water flooding as taken from the Environment Agency flood mapping. This includes three brackets of high, medium and low risk as can be seen from the inset key.

According to the data there is a low risk of some surface water flooding to the front (northeast elevation) of Unit 14 at the 0.1-1% event period, with some higher risk areas confined to the industrial access road to the front of Unit 14

6.1.2 Flooding extent from rivers and seas

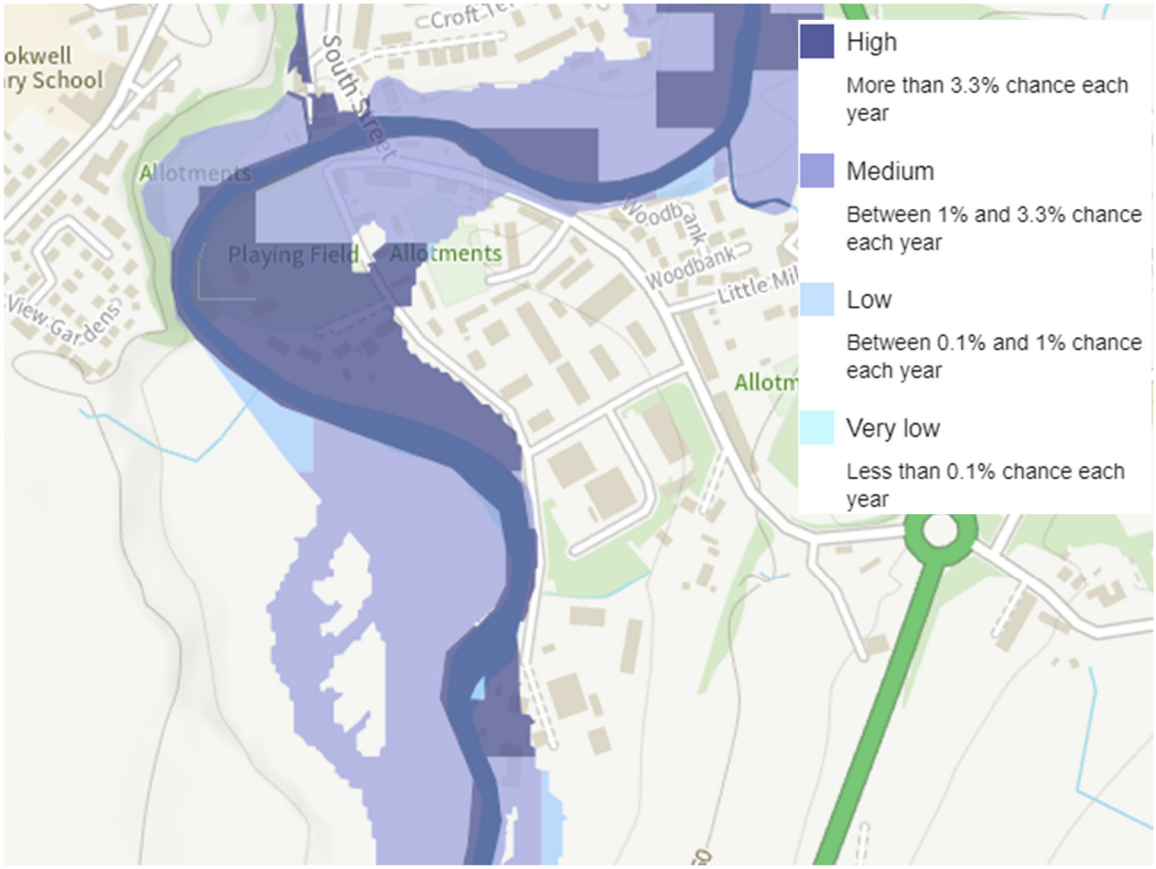


Figure 5 - Flood risk from Rivers and seas

As can be seen from the EA flood map above for flooding from rivers and seas, there is no modelled risk level to the whole of the site.

6.1.3 Flooding from reservoirs

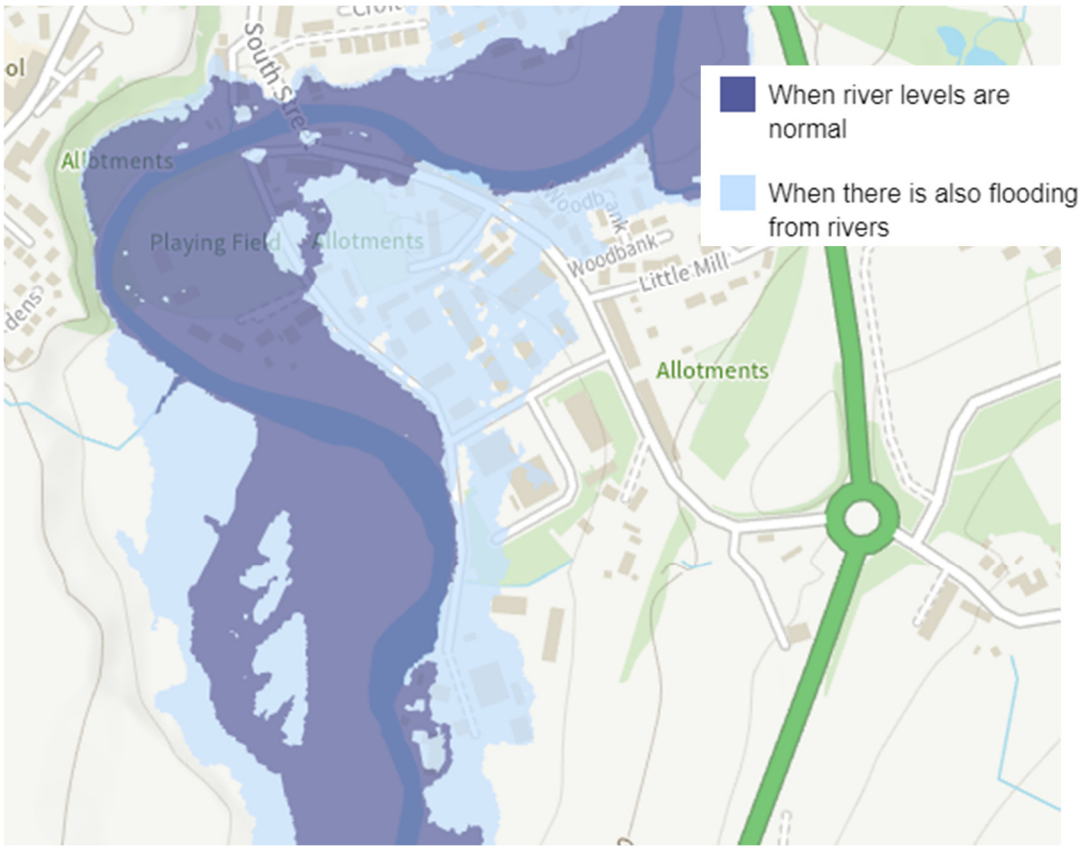


Figure 6 - Flooding from reservoirs

Figure 6 shows that the western portion of the site is at risk of flooding if the Ennerdale reservoir were to fail at the same time that rivers were also in flood.

As per the EA's own guidance, the risk of reservoir failure is extremely low and should be considered through this lens. The risk area is shown where there is potential for risk to life in the worst case scenario of a dam or reservoir failure.

Copeland Council does not mention reservoir failure risk in their SFRA although this extent of flooding is similar to that shown in their flood risk mapping.

It is likely that the EA flood mapping is more up to date than the Copeland SFRA which was compiled in 2007.

6.1.4 Flooding from groundwater

Groundwater flooding can occur where sites are located on permeable ground, particularly where there are significant variations in local topography and geology. After a prolonged period of rainfall and groundwater recharge, a considerable rise in the water table can result in this intersecting the ground surface, resulting in flooding. Due to the slow response of groundwater systems any resulting flows and inundation could persist for an extended period.

Given the proximity to the surrounding watercourses and the probability of groundwater manifesting at the surface is low and therefore the resulting risk is also assessed to be low.

Flooding from this source is therefore considered to be Low.

6.1.5 Flooding from sewers and water mains

There are separate foul and surface water public sewers located under the industrial access roads adjacent to the site. Flood risk from the surface water drain is included within the surface water mapping which shows localised flooding to the estate road, with little impact to the site itself.

Mains foul sewer surcharging is extremely unlikely to affect the site and would likely be confined to the road areas.

Flood risk due to sewers is seen to be Low

6.1.6 Flood source risk summary

Potential Flood Source	Potential Flood Risk of site
Surface water and overland flow	Low & Very low.
Rivers and seas	Very low
Reservoirs	Extremely low – albeit within EA risk map area.
Groundwater	Low
Sewers and water mains	Low

Table 1 - Flood source risk summary

6.2 Probability of site flooding

Using the EA flood map data freely available, at the time of writing there is a very low probability of the site flooding, with the greatest risk coming from surface water flooding.

The majority of the site is within FZ1 and not impacted by the surface water flooding, however there are areas of the estate road which appear to flood during high intensity rainfall events.

There are also undeveloped areas of the site which sit within FZ2 and have a medium risk of surface water flooding amounting to between 1% and 3.3% per year.

Flooding from Ennerdale reservoir is deemed a risk according to EA flood mapping. This risk is seen as extremely low, however has been considered in the followings assessments.

6.3 Interactions between flood sources

The largest in combination flood risk comes from the River Ehen in combination with a failure of Ennerdale Reservoir. This is shown on the EA flood mapping to impact the widest area within the site boundary.

With the current site layout, this is shown to potentially affect one of the existing Units and also impact the yard and car parking areas.

6.4 Expected depth of design flood

The depth of surface water flooding is likely to be less than 300 mm as per the EA mapping, and due to the site layout is unlikely to impact the buildings themselves.

The depth of flooding from the failure of Ennerdale Reservoir is unknown, however it is categorised as an extreme event and therefore it should be assumed that the flood level is significant.

6.5 Flooding to properties

The existing buildings are not expected to flood through any known flood source with the possible exception of the Ennerdale Reservoir failure.

Flooding from the Ennerdale Reservoir is likely to result in the largest *extent* of flooding and potentially reach the existing buildings.

The greatest *likelihood* of flooding stems from surface water, which is mostly confined to localised flooding on the access roads. The risk of this flood source reaching the buildings is seen to be Low at less than 1%.

The flooding from the Ennerdale Reservoir failure is likely to impact Unit 10 according to the mapping, however in reality the floor level of Unit 10 is higher than that in Unit 14. As these are existing properties there are no proposals to raise the floor levels, however as the buildings are used for general industry and storage there will be no high risk elements contained at ground level.

It should be noted that this flood event is seen as an extremely low likelihood event and would need to occur at the same time as the River Ehen also flooding to have the associated impact noted through the EA mapping.

There is no historic evidence of the existing buildings having been affected by flooding.

6.6 Making development safe in flood events

As above, the properties are existing and there is no intention to make alterations to further protect the buildings from flood events. The properties are not known to have flooded and are considered to be in the 'Less Vulnerable' category as General Industry and storage buildings.

The site proposals do not impact on any perceived flood risk. The existing buildings remain largely unchanged externally with the exception of a small link between the two buildings.

The small increase in yard area will be constructed using permeable surfacing preventing any additional run off entering the stormwater system during peak storm events.

6.7 Increased flood risk elsewhere

The development does not impact on any functional flood plain and any flooding from the Riven Ehen or localised surface water flooding to the existing estate roads will not be inhibited from entering the site to any greater extent than it is at present. All physical development above existing ground levels will occur outside of the known flood risk areas and therefore will not impact on any current flood paths and volumes.

Surface water from the development will be managed in accordance with the drainage strategy covered in Section 7 of this report and will not result in increased flooding beyond the site boundary.

6.8 Sources of uncertainty

The source of uncertainty for this development is around the level of risk attributed to the failure of Ennerdale Reservoir.

The low vulnerability of the development type and the minor changes in site layout from the existing scenario do not increase the likelihood or scale of the impact of this particular flood source and therefore does not warrant specific site contingency measures.

7. SURFACE WATER DRAINAGE STRATEGY

The aim of the strategy is to provide a design which will avoid, reduce, and delay the discharge of surface water flows into public sewers and watercourses. This will aid in the protection of watercourses but will also ensure that no knock-on effects are seen beyond the site and that the risk of localised flooding and pollution within the site are reduced as far as possible.

To satisfy these criteria, surface water flows shall be subject to assessment via the hierarchy of drainage in accordance with the LASOO Non-Statutory Technical Standards for Sustainable Drainage: Practice Guidance.

7.1 Development overview

The proposed development will see the redevelopment of 2No. existing industrial units within Bridge End Industrial Estate, Egremont.

The site is approximately 0.825ha with the land use consisting of industrial storage and associated hardstanding areas. The proposed land use will consist of:

- 2No. industrial buildings (existing)
- Existing yard and car parking areas.
- Retained soft landscaping areas.
- New yard area (0.06ha)

The site generally falls north to south towards the River Ehen running along the western site boundary.

7.2 Permeability and soil profile

British Geological Survey (BGS) and Land Information Systems (LandIS) mapping services have been used determine the following land make-up:

- Bedrock: St Bees Sandstone Member - Sandstone
- Superficial deposits: River Terrace deposits – Sand and gravel
- Soil: Soilscape 6 – Freely draining slightly acid loamy soils

The existing car parking and hardstanding areas to the south west of the existing buildings utilise infiltration trenches and permeable paving to dispose of the surface water. The ground is therefore suitable for infiltration.

7.3 Current foul and surface water drainage provision

7.3.1 Existing watercourses

The River Ehen flows north to south down the western boundary of the development site.

7.3.2 Surface and foul water sewers

There are existing separate surface water and foul water sewer systems present within the industrial estate access road.

The surface water discharges into the River Ehen to the southwest corner of the site while the foul water drains to a pumping station beyond the southwestern corner of the site.

The existing buildings drain foul and surface water separately into these UU adopted sewer systems. There is no intention to change these drainage routes.

7.4 SuDS hierarchy

In order of preference:

- Drain into the ground (infiltration).
- To a surface water body.
- To a surface water sewer, highway drain or another drainage system.
- To a combined sewer.

The drainage strategy for the site is to be developed using the first level on the above hierarchy for the following reasons:

Drain into the ground (infiltration)

As shown within Section 7.2, the information provided by the Land Information Systems (LandIS) mapping services indicate that infiltration is a viable method of surface water as the soils are freely draining. This is backed up by the presence of infiltration systems within the existing development.

All other modes of disposal are not required to be considered.

7.5 Surface water proposed design

The proposed additional yard area is to be constructed using a permeable surfacing with a permeable make up below to allow direct infiltration to ground.

No changes are to be made to the remainder of the site with all existing hardstanding areas maintaining their current drainage routes.

7.5.1 Exceedance Routes

For rainfall events with a return period more than 100 years, surface flooding of open spaces such as landscaped areas or car parks is acceptable for short periods, but the layout and landscaping of the site should aim to route water away from buildings and avoid creating hazards for access and egress routes.

The proposed site scheme does not affect current exceedance routes and existing ground levels will be maintained so as to not affect any existing flows.

7.5.2 Surface water quality

The SuDS Manual provides best industry practice for assessing the pollutant potential of developments and providing mitigation methods to increase run off water quality using SuDS components.

The simple index approach has been utilised here to assess the pollutant hazard indices and proposed treatment components. Note, this has been carried out in conjunction with the above SuDS component suitability assessment for the site and as such many features have already been discounted.

Table 26.2 from The SuDS Manual below outlines the pollution hazard indices for different land uses.

TABLE 26.2 Pollution hazard indices for different land use classifications

Land use	Pollution hazard level	Total suspended solids (TSS)	Metals	Hydro-carbons
Residential roofs	Very low	0.2	0.2	0.05
Other roofs (typically commercial/ industrial roofs)	Low	0.3	0.2 (up to 0.8 where there is potential for metals to leach from the roof)	0.05
Individual property driveways, residential car parks, low traffic roads (eg cul de sacs, homezones and general access roads) and non-residential car parking with infrequent change (eg schools, offices) ie < 300 traffic movements/day	Low	0.5	0.4	0.4
Commercial yard and delivery areas, non-residential car parking with frequent change (eg hospitals, retail), all roads except low traffic roads and trunk roads/motorways[1]	Medium	0.7	0.6	0.7
Sites with heavy pollution (eg haulage yards, lorry parks, highly frequented lorry approaches to industrial estates, waste sites), sites where chemicals and fuels (other than domestic fuel oil) are to be delivered, handled, stored, used or manufactured; industrial sites; trunk roads and motorways[1]	High	0.8[2]	0.8[2]	0.9[2]

Figure 7 SuDS Manual Table 26.2 Pollution hazard indices

This development is to be classed as a 'Medium' risk land use due to the presence of the commercial yard space.

This level of risk demands the following level of pollution control:

Land use	Suspended solids	Metal	Hydrocarbons
Commercial yard and delivery areas	0.7	0.6	0.7

As per section 26.7.1 each SuDS component should be included in the total mitigation with a reduction of 50% for every additional component after the first.

Land use	Suspended solids	Metal	Hydrocarbons
Pollution hazard	0.7	0.6	0.7
Constructed permeable pavement	0.7	0.6	0.7

The above table shows that a constructed permeable pavement would provide sufficient pollutant removal for the associated risk categories of the development. The introduction of further treatment would be deemed inappropriate for a development of this scale.

Surface water drainage proposals

Based on the above assessments, it is proposed that the extended yard areas would utilise a direct to ground drainage system resulting in sufficient water quality control while maintaining existing drainage routes and discharge rates while maintaining existing ground levels.

7.6 Maintenance

All components shall be maintained in accordance with the relative requirements shown in the SuDS Manual. These intervals should be deemed as a minimum frequency and reference should also be made to the manufacturers and landscape designers' guidance to ensure all components are maintained correctly.

7.6.1 Permeable paving

Maintenance Schedule	Required Action	Minimum Frequency
Regular maintenance	Removal of leaf and other debris from surface	After autumnal leaf fall (or as required)
Occasional maintenance	Removal of weeds using glyphosphate applied directly to the weeds.	As required – once a year on less affected areas.
Remedial actions	Rehabilitation of surface and upper substructures by removal and cleaning of gravel layers.	Every 10-15 years as required (or more frequent if infiltration performance is reduced.

Monitoring	Inspect and record areas of surface ponding / non-infiltration / compacted surfacing / weeds.	As required

Figure 8 - Maintenance for permeable surfacing

7.7 Foul water proposed design

No change to the existing foul water design routes is proposed.

7.8 Management

All separate surface and foul water drainage systems within the site are proposed to remain private and be maintained by the landowners.

8. CONCLUSION

The site is an existing industrial development within the Less Vulnerable category. The development proposals do not change the extent or type of structure and do not impact on existing ground levels.

The greatest flood risk is associated with the failure of Ennerdale Reservoir combined with the flooding of the River Ehen. The likelihood of this combination is extremely low and does not pose a risk to any High Vulnerability class structures.

The small area of additional yard area is to be provided with direct infiltration surfacing which will maintain existing ground levels and drainage routes.

There is therefore no meaningful change from the existing scenario and there is no increased flood risk to either the site itself, nor to any site beyond the site boundary. The development has been shown to meet all required guidelines and meets the required resilience requirements for a development of this type.

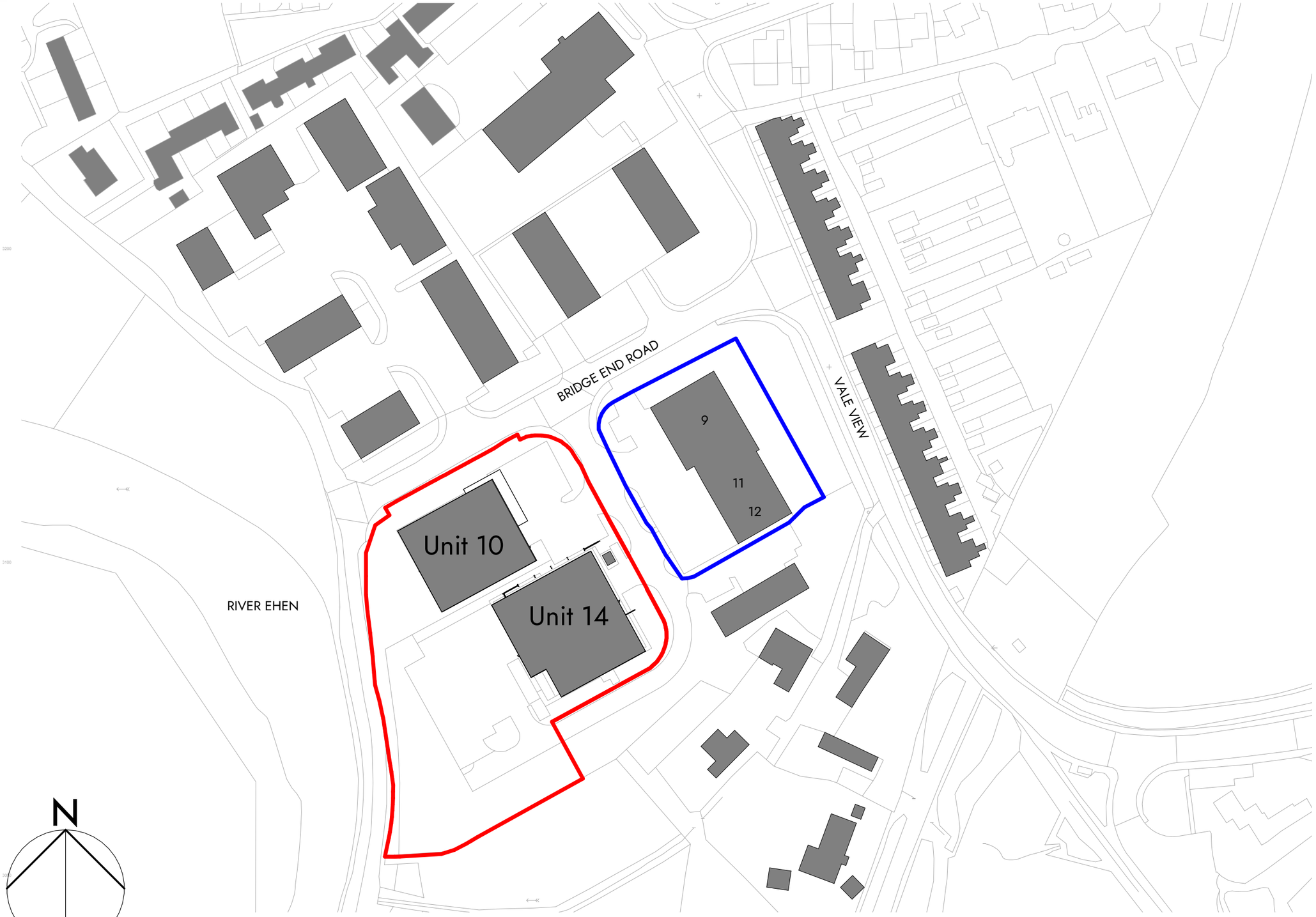
S MARSHALL C.Eng. M.I.C.E.
For and on behalf of
A L DAINES & PARTNERS LLP

Appendix A

Architects PLUS

Site - subject of the application

Adjoining land - same owner as subject site



Rev. Description Drw. App. Date

Site Location Plan

Units 10 & 14, Bridge End Industrial Estate

0m 25m 50m 75m 100m 125m

VISUAL SCALE 1:1250 @ A3

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Company Registration
Architects Plus (UK) Limited
Registered in England no. 4221140

Drawing: Site Location Plan

Status: PL - Planning

Project: Units 10 & 14, Bridge End Industrial Estate

Client: Thomas Graham & Sons Ltd

RIBA stage: 3-Spatial Coordination

Date	Drawn by	Scale @ A3	Drawing number	Revision
31/10/23	LC	1 : 1250	23034-PL01	

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Appendix B

Flood map for planning

Your reference	Location (easting/northing)	Created
<Unspecified>	**301295/510075**	**10 Dec 2024 15:17**

Your selected location is in flood zone 2, an area with a medium probability of flooding.

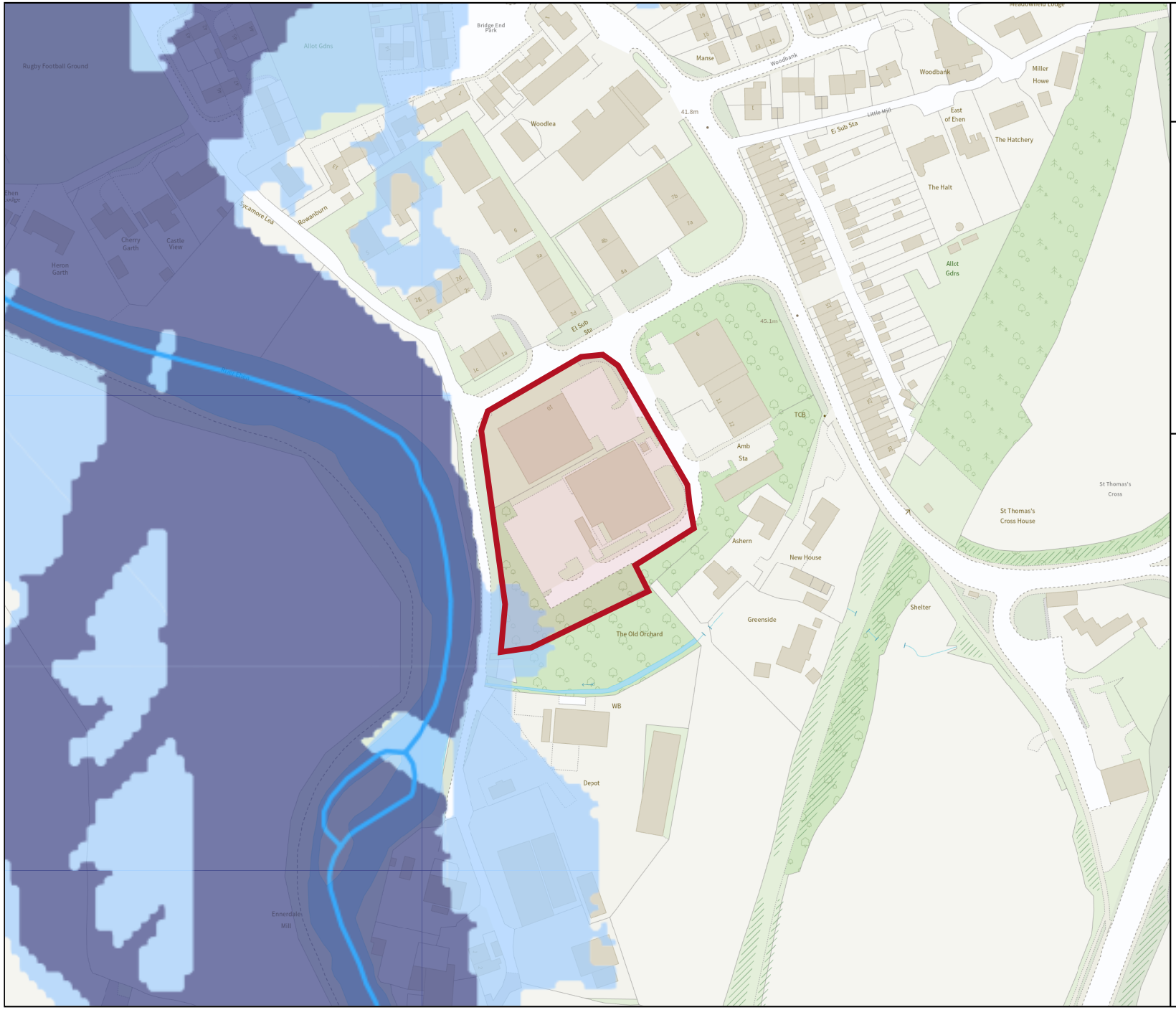
This means:

- you must complete a flood risk assessment for development in this area
- you should follow the Environment Agency's standing advice for carrying out a flood risk assessment (see www.gov.uk/guidance/flood-risk-assessment-standing-advice)

Notes

The flood map for planning shows river and sea flooding data only. It doesn't include other sources of flooding. It is for use in development planning and flood risk assessments.

This information relates to the selected location and is not specific to any property within it. The map is updated regularly and is correct at the time of printing.



Environment Agency

Flood map for planning

Your reference
<Unspecified>

Location (easting/northing)
301295/510075

Scale
1:2500

Created
10 Dec 2024 15:17

- Selected area
- Flood zone 3
- Flood zone 2
- Flood zone 1
- Flood defence
- Main river
- Water storage area

0 20 40 60m

Appendix C

Existing tarmac car parking

Existing soft landscaping

Existing gravel parking areas

Existing concrete paviours

Existing footpath

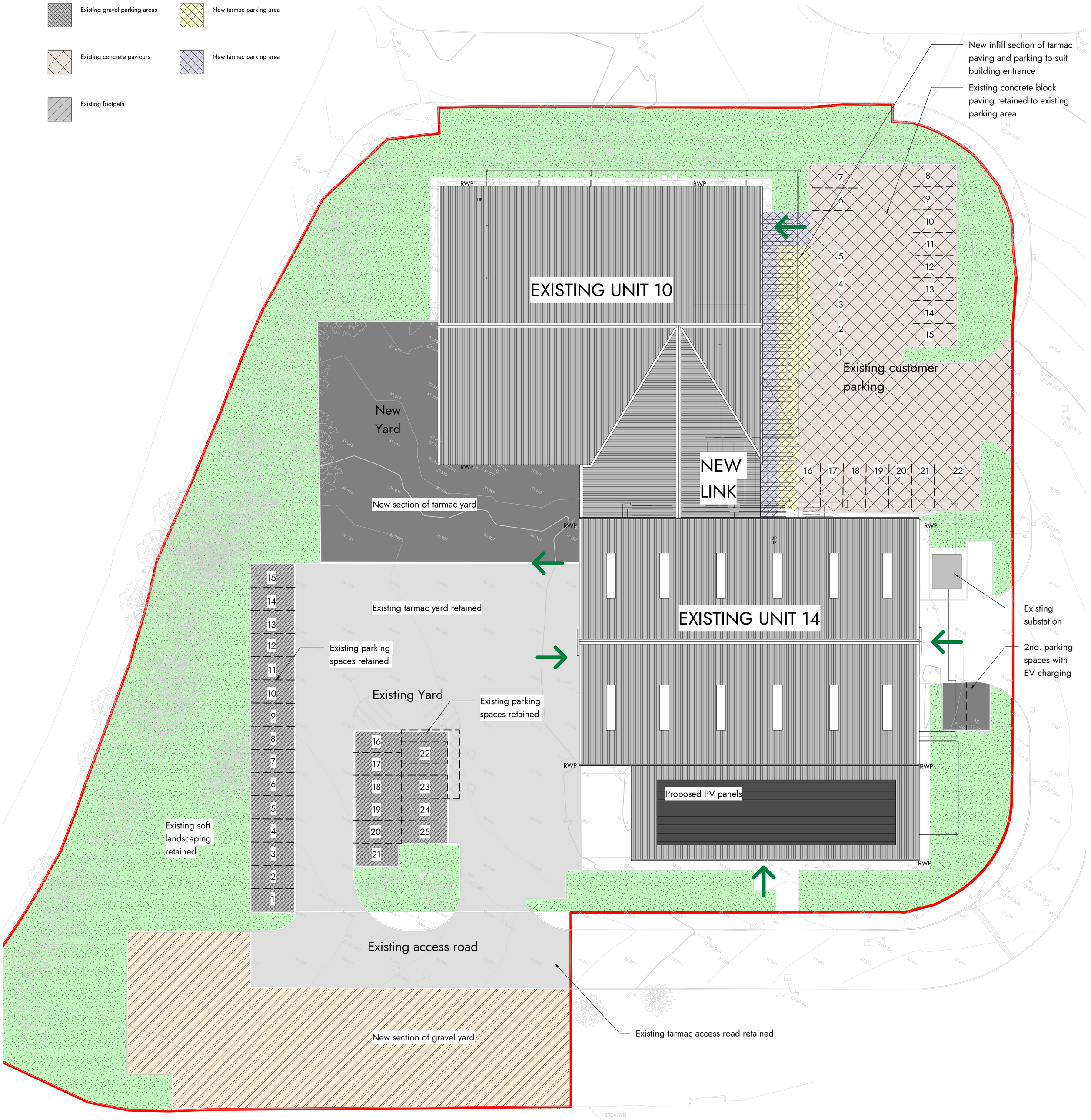
New tarmac yard

New gravel area

New tarmac parking area

New tarmac parking area

Architects PLUS



Revision	Description	Drawn	Approved	Date
A	Client updates to external works	LC		24/04/2024

Proposed Site Plan 1-200

Units 10 & 14, Bridge End Industrial Estate

0m 4m 8m 12m 16m 20m

VISUAL SCALE 1:200 @ A1

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Registered in England No. 4221140

Drawing	Proposed Site Plan 1-200	Status	PL - Planning
Project	Units 10 & 14, Bridge End Industrial Estate	Client name	Thomas Graham & Sons Ltd
RIBA stage	3-Spatial Coordination		
Date	24/04/24	Drawn by	LC
Scale @ A1	1 N200	Drawing number	23034-PL08A
Revision	A		

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