Flood Risk Assessment

Wallingford Mineral Workings

Revision B
21 January 2022

Greenfield enviro

EdenvaleYoung

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Glossary of Terms

- +CC - Return period inclusive for the predicted effects of Climate Change
- 1D - One-Dimensional
- 2D - Two-Dimensional
- AMAX - A series containing the peak flows recorded at a gauge from each year
- AOD - Above Ordnance Datum (0m sea level, Newlyn, UK)
- Channel Cross Section - profile view of a river channel, normally obtained by surveying a line across the watercourse
- Critical Storm - A storm that produces peak run off in the watershed
- Culvert - A device used to channel water, similar to a pipe though may be larger
- Defended - A scenario in which river defences are used
- FEH - Flood Estimation Handbook
- Fluvial - Referring to the processes associated with rivers and streams
- FRA - Flood Risk Assessment
- GIS - Geographic Information System
- Hydraulic Model - The mathematical process of analysing the interaction of water and the connected environment
- Hydrology - The calculation of catchment based flow rates
- Inflow - Source of water within a modelled domain
- ISIS Software - One-Dimensional hydraulic model – Representation of watercourses
- ISIS-TUFLOW - Hydraulic program that dynamically links ISIS and TUFLOW (1D-2D)
- LiDAR - Light Detection And Ranging, remote sensing technology to measure distance typically used to obtain topographic data over a large area
- Outflow - The method by which water may leave a modelled area
- Overtopping - Where water has passed over a feature that might ordinarily prevent flow
- f100 - 1% annual probability fluvial event
- f1000 - 0.1% annual probability fluvial event
- f100CC - 1% annual probability fluvial event with an allowance for the predicted effects of climate change
- fMED - The median of the set of annual maximum flow data (AMAX)
- TUFLOW Software - Two-Dimensional hydraulic model – Representation of floodplain
- Undefended - A scenario in which river defences are ignored

1 Introduction

Edenvale Young Associates was commissioned by Greenfield Environmental to undertake a Flood Risk Assessment (FRA) for a proposed mineral extraction scheme at White Cross Farm on the River Thames to the south of Wallingford in Oxfordshire (see Figures 1.1 and 1.2). The objective of the FRA is to support a planning application for the removal of sand and gravel.

The site is situated on greenfield agricultural land on the right bank of the River Thames to the south of Nosworthy Way (A4130) and to the east of the Reading Road (A329). Minerals will be extracted over a period of approximately five years and the resulting excavation will be backfilled with inert material in four phases with the land restored to the original levels.

The scope of the Flood Risk Assessment includes:

- A description of the development proposals
- A review of historical flood risk to the site
- A review of the Strategic Flood Risk Assessment for the area
- An assessment of flood risk from the River Thames, surface water, reservoirs, groundwater and sewers
- A discussion on the application of the National Planning Policy Framework (NPPF)
- Hydraulic modelling to evaluate impact of the works on flood risk

Hydraulic modelling has been undertaken using the existing 1D-2D FMP-TUFLOW hydraulic model for the River Thames which was developed by JBA and supplied by the Environment Agency to Edenvale Young following a Product 7 request. The short duration of the sad and gravel extraction phase means that the model has been run for existing baseline and four excavation phasing scenarios for the, 1% AEP (1 in 100 year) with an allowance for climate change.

Figure 1.1: Location (Grid Reference 460420,187940

Figure 1.2: Development Outline (red)

1.1 Appendices

The FRA should be read in conjunction with the following Appendices:

- Appendix A – Development Proposals
- Appendix B – Hydraulic Modelling Results

2 Scheme Proposal

The development proposals are included in Appendix A. Extracts from the drawings contained in the appendices are shown in Figures 2.1 to 2.3. As noted in the introduction, the scheme comprises:

- Establishment of the site
- Excavation of minerals (sand and gravel) in four phases.
- Placing of inert fill within the excavation formed during Phases 1 to 4.
- Restoration and landscaping.

Plant and supporting infrastructure will be established on site before excavation commences. The processing area will include: a lagoon, stockpile, loading facilities, a weighbridge and offices on the north western corner of the site. In addition three earth bunds will be constructed on the north and western edge of the site to shield the works from the highway. The stockpiles, bunds, loading facilities, a weighbridge and offices will be located Flood Zone 1 and are at low risk of flooding. Earth moving equipment and diesel generators will be moved to higher ground on receipt of a flood warning.

Figure 2.1 shows the phasing of the work activities which will be programmed over a period of five years. The works will proceed systematically with areas excavated and then backfilled in sequence. Phase 1 will be excavated and backfilled to within 0.5m of the finished level by the end of the Phase 2 excavation stage. The final restored level for Phase 1 would be completed by the end of Phase 3. Subsequent Phases would follow the same pattern as illustrated in Figure 2.2 for Phase 3. Stockpiling area will remain in situ for the duration of the mineral working with sand and gravel moved into the areas before being exported from the site. Figure 2.3 shows the final restoration plan. At no stage will there be a hydraulic connection to the River Thames.

Figure 2.1: Sand and Gravel Extraction Phasing

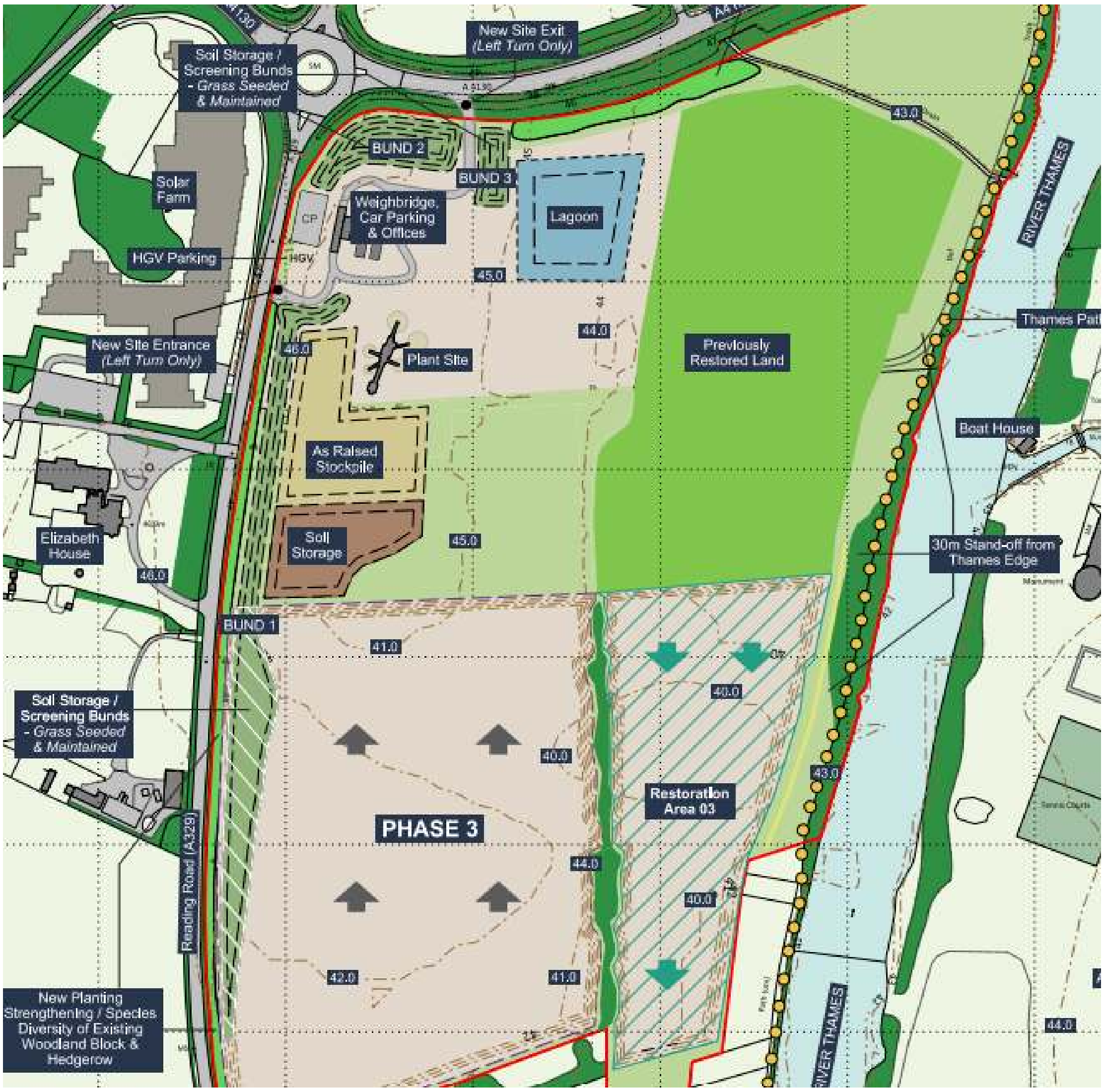


Figure 2.2: Phase 3 Excavation and Status

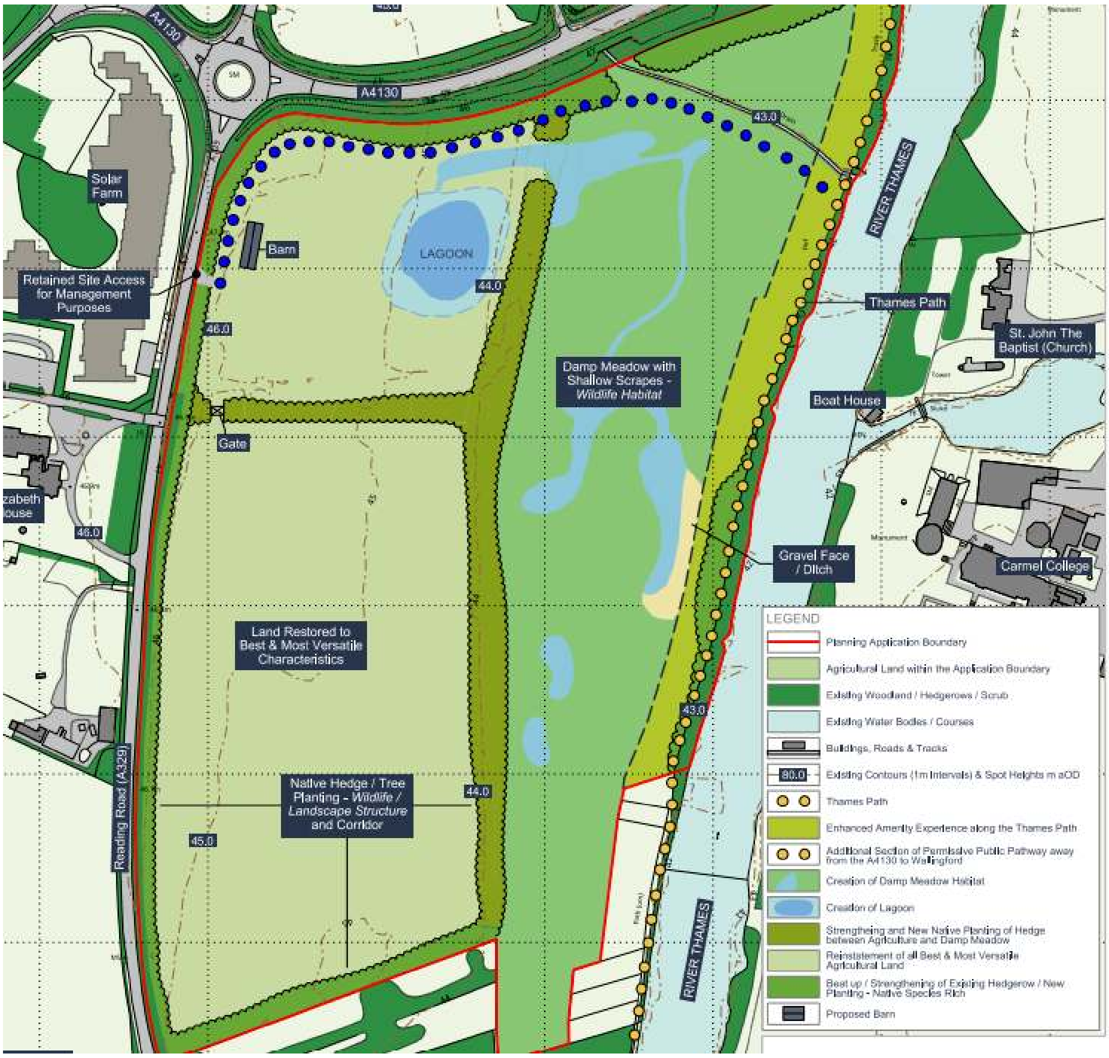


Figure 2.3: Site Restoration

3 Flood Risk Mapping

3.1 Historical Flood Risk

Figure 3.1 shows the historical flood mapping which is based on recorded flood information held by the Environment Agency. The mapping indicates that the site was inundated during the winter of 2013 and 2014 but it is highly likely that flooding to the site will have occurred frequently in the past fifty years.

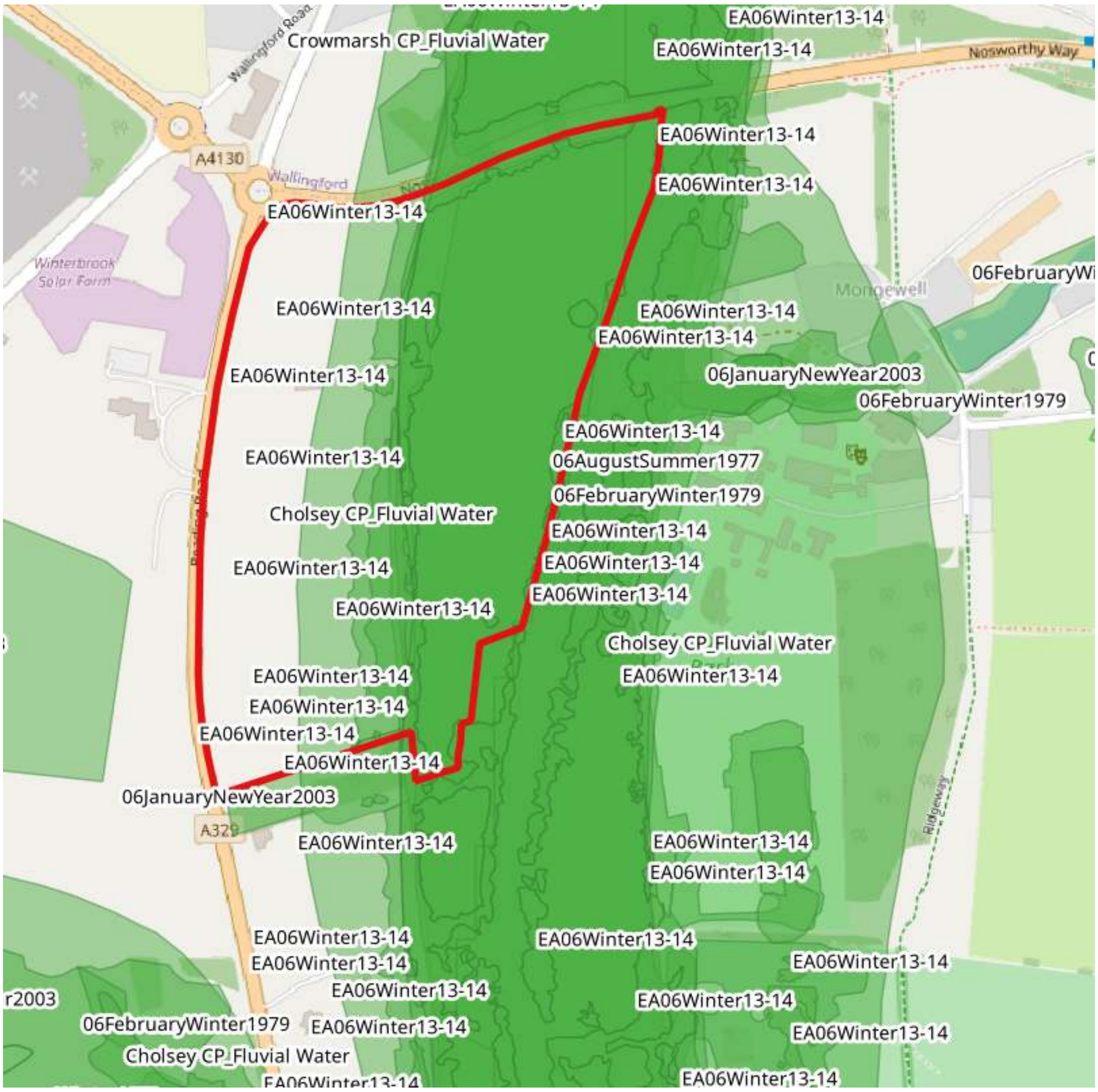


Figure 3.1: Recorded Flood Outline - Environment Agency

3.2 Flood Zone Classification

Figures 3.2 to 3.4 show the flood zone classification for the sand and gravel working. Figure 3.2 has been extracted from the UK Government's flood map for planning[1] which confirms that the site is within Flood Zone 2 and 3.

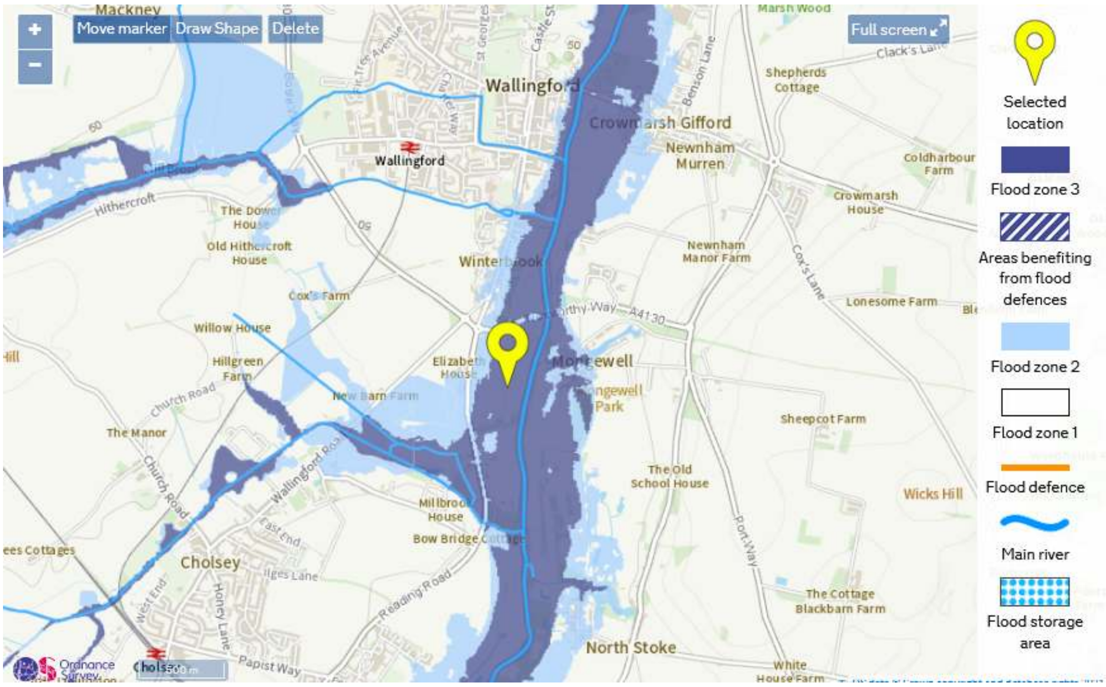


Figure 3.2: Flood Risk for Planning

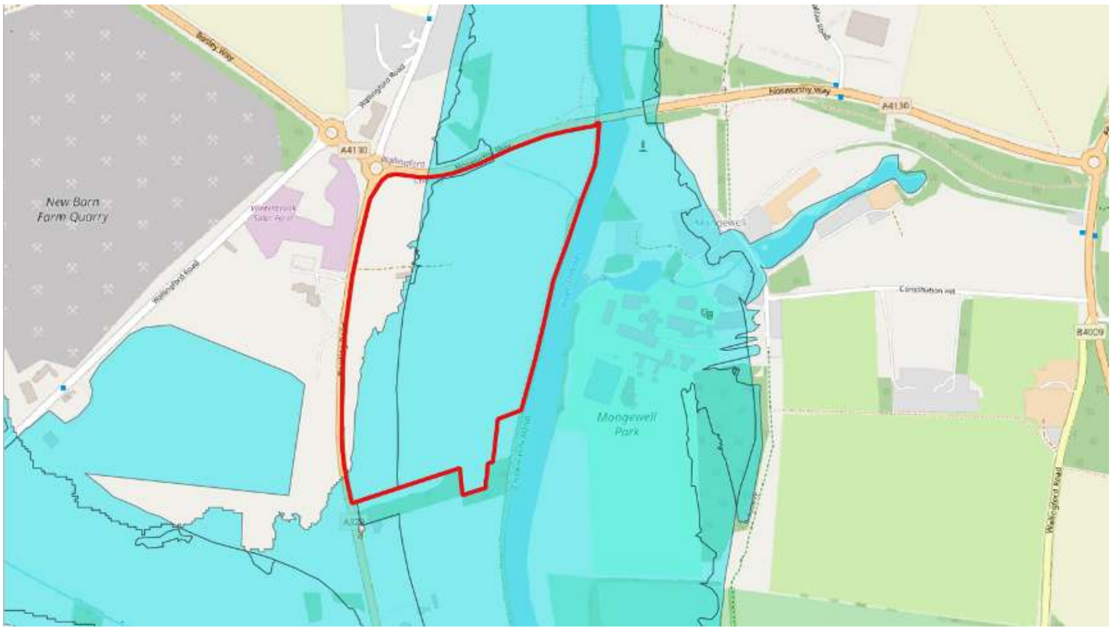


Figure 3.3: Flood Zone 2

[1] https://flood-map-for-planning.service.gov.uk/

Figure 3.4: Flood Zone 3

3.3 Rivers and Seas

A copy of the “long term flood risk mapping” downloaded from the UK government website[2] is illustrated on Figure 3.5. The figure indicates the extent of the long term flood risk from the Thames to the sand and gravel working site. The development is deemed to be at a Medium to High risk of fluvial flooding (i.e. greater 1% AEP). Fluvial flooding is discussed in more detail in Section 6.

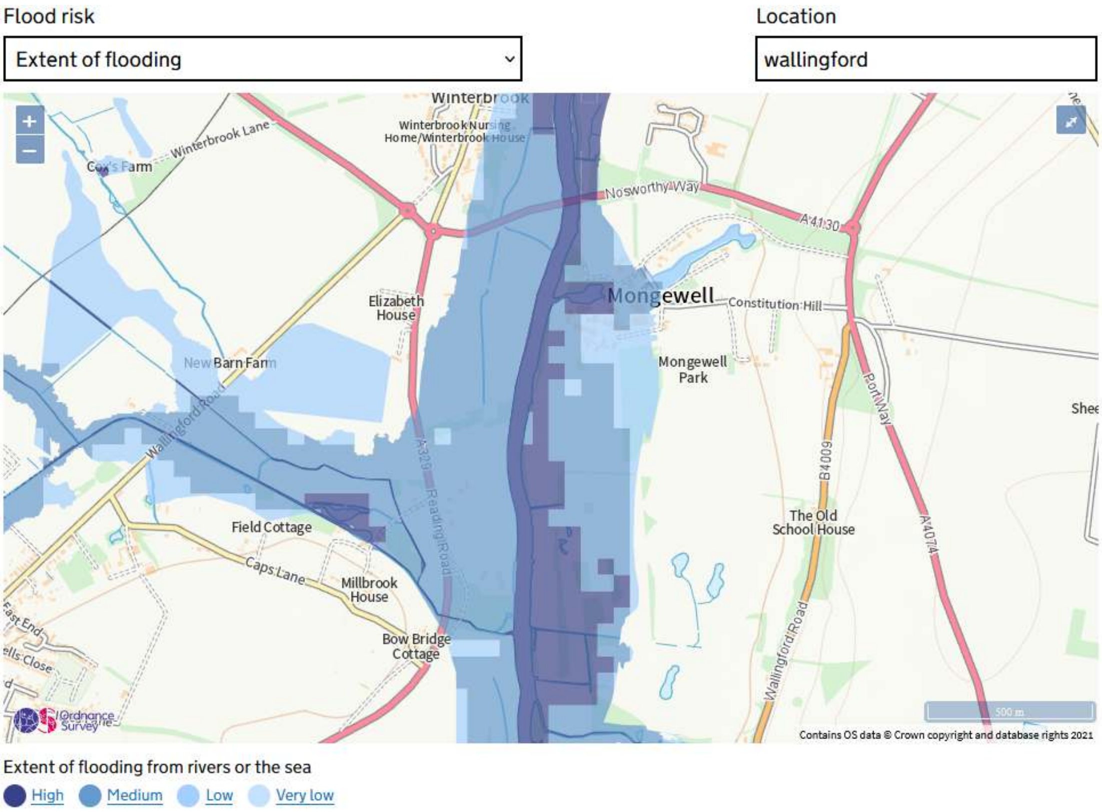


Figure 3.5: Long Term Flood Risk

3.4 Surface Water Flood Risk

Surface water flooding occurs following intense rainfall events, when water is unable to infiltrate the ground or cannot discharge to a watercourse. Figures 3.6 to 3.8 show the surface water flood risk[3]. The mapping gives flood depths on the site for high, medium and low risks which are quantified in Table 3.1. Importantly it should be recognised that the depths shown on the figures reflect the existing risk and not the risk to the proposed sand and gravel working.

The predicted depth of surface water is not considered to present a flood risk to the sand and gravel working.

[2] https://flood-warning-information.service.gov.uk/long-term-flood-risk/map
[3] https://flood-warning-information.service.gov.uk/long-term-flood-risk

Risk	Depth
Low Risk	none
Medium Risk	none
High Risk	none

Table 3.1: Surface Water Flood Depths

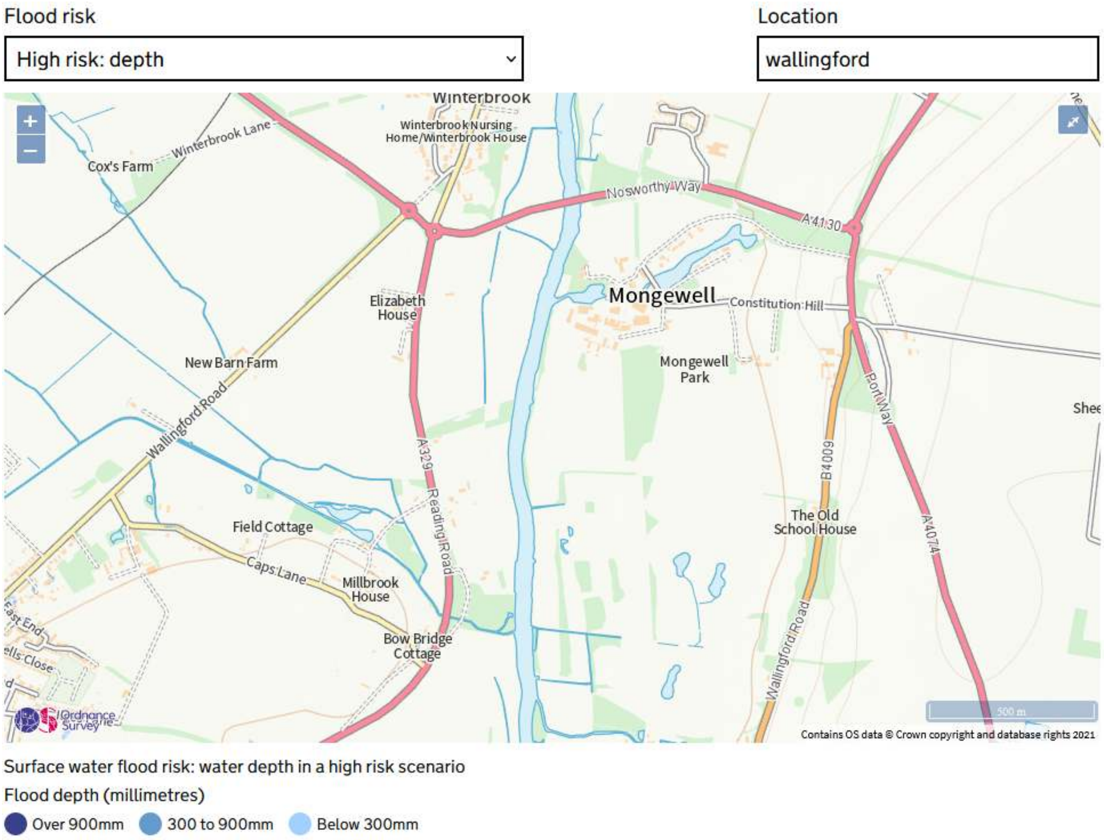


Figure 3.6: Surface Water Flood Risk (High <3.3%)

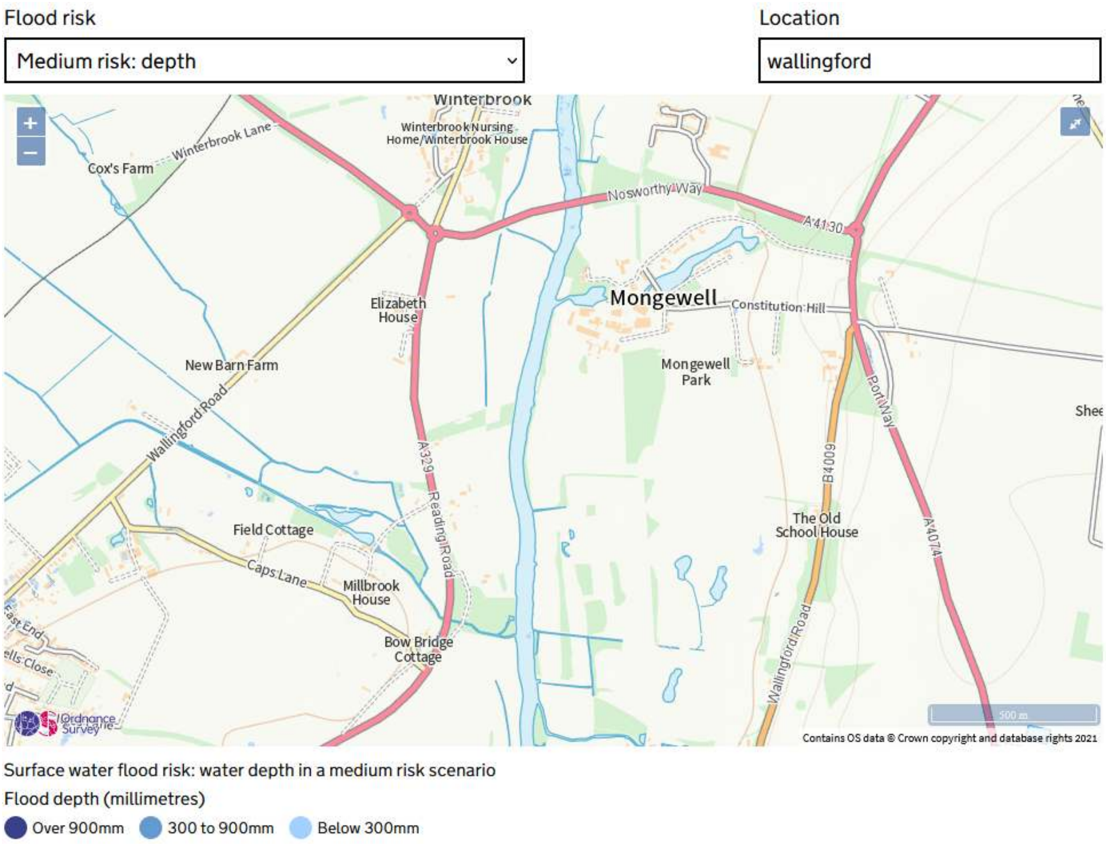


Figure 3.7: Surface Water Flood Risk (Medium 3.3% to 1%)

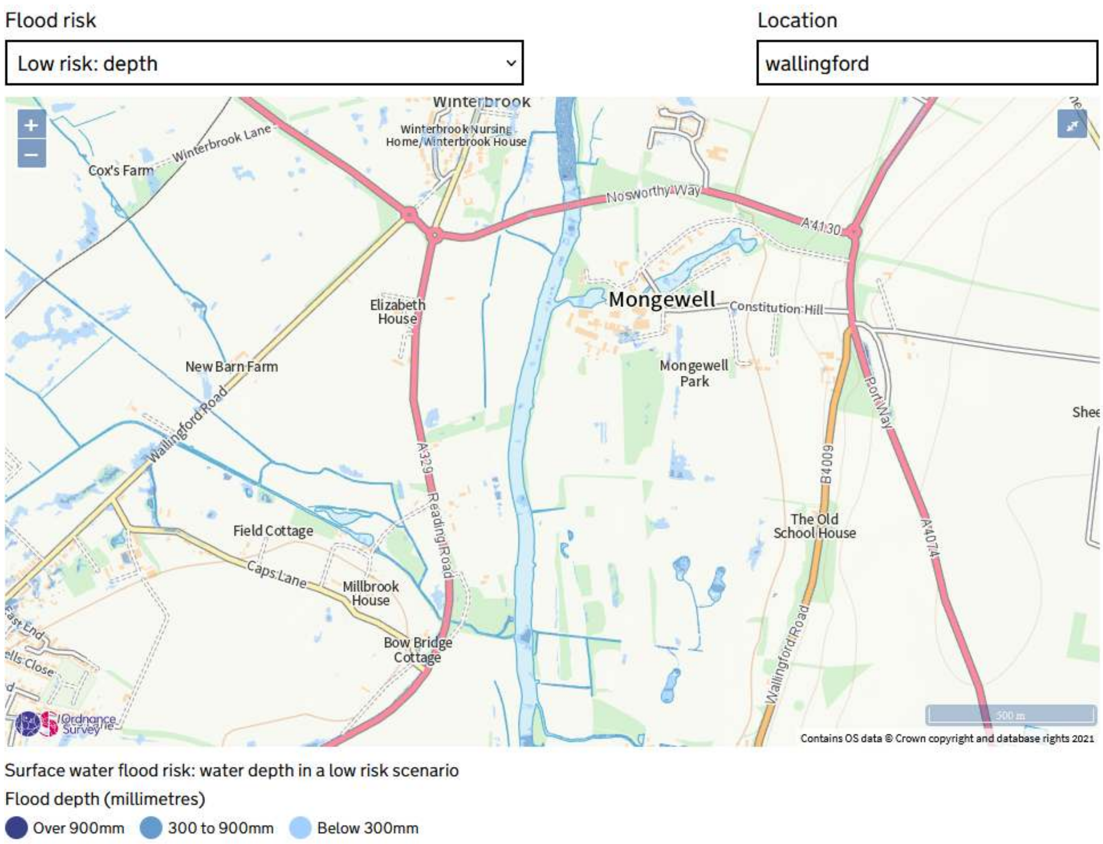


Figure 3.8: Surface Water Flood Risk (Low 0.1% to 1%)

3.5 Reservoirs

A copy of the Reservoir Inundation mapping is shown in Figure 3.9. There are no issues associated with reservoir inundation.

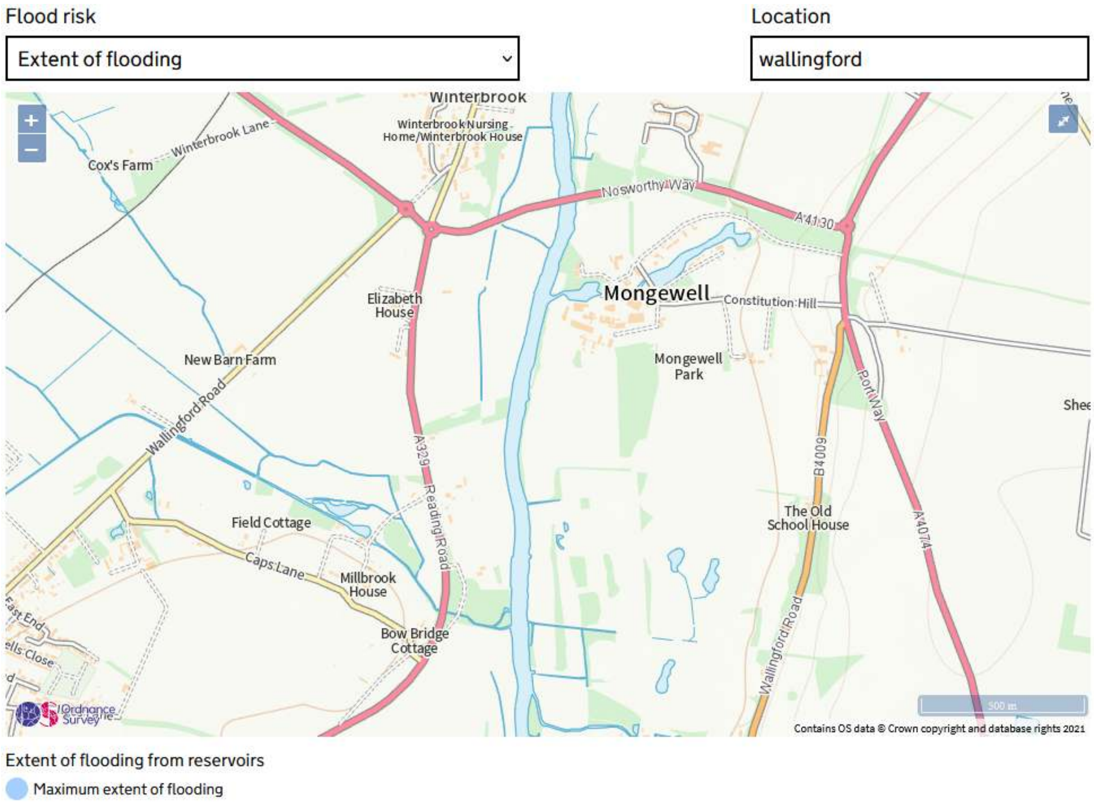


Figure 3.9: Reservoir Inundation

4 Strategic Flood Risk Assessment

4.1 Flood Risk Mapping

Oxfordshire County Council has undertaken a Strategic Flood Risk Assessment (SFRA) to inform local planning policy in relation to flood risk. This includes a specific policy document on minerals and waste which is available on Oxfordshire County Council's website:

- Oxfordshire County Council, Minerals and Waste Strategic Flood Risk Assessment: Addendum Report AECOM March 2019

The SFRA document has been reviewed in the context of this study and used where applicable to inform the findings and recommendations of the FRA. It is confirmed that:

- The flood zone mapping given in the SFRA is in broad agreement with the flood risk mapping shown in Figures 3.2 to 3.5.
- The SFRA mapping places the site within the functional flood plain (Flood Zone 3b) which is defined as the flood extent for a 5% AEP event (1 in 20 year return period).
- There are no records within the SFRA report of sewer flooding to the site.
- Groundwater susceptibility mapping is not included in the SFRA.

5 National Planning Policy

5.1 Vulnerability

Flood Risk Vulnerability is determined by the use of the development and falls into one of five classifications which ranges from from Highly Vulnerable to Water Compatible. Annex 3 of the NPPF and Table 2 of the Flood Risk and Coastal Change Guidance gives the Flood Risk Vulnerability for a range of different types of development. More common examples are given below:

- Essential Infrastructure - Essential transport infrastructure (including mass evacuation routes).
- Highly Vulnerable - Basement dwellings; operational police and ambulance stations.
- More Vulnerable - Housing, halls of residence and hospitals.
- Less Vulnerable - Shops, restaurants, cafes and offices.
- Water Compatible - Sand/gravel extraction, water-based recreation, nature conservation and biodiversity.

The vulnerability classifications are used to determine whether a proposed development is compatible with the flood zone in which the scheme is located. In the context of White Cross Farm, Table 2 of the Flood Risk and Coastal Change Guidance indicates that sand and gravel working is classified as Water Compatible. Table 3 of the same guidance confirms that Water Compatible development is appropriate development in Flood Zone 2 and 3.

Based on the above assessment, there is no requirement for Sequential and Exception tests but in relation to sand and gravel working the guidance also states that:

In Flood Zone 3b (functional floodplain) essential infrastructure that has to be there and has passed the Exception Test, and water-compatible uses, should be designed and constructed to:

- *remain operational and safe for users in times of flood*
- *result in no net loss of floodplain storage*
- *not impede water flows and not increase flood risk elsewhere*

In this case there is no requirement for the sand and gravel working to remain operational during flooding and ground levels in the post development condition will be set at, or below, existing ground levels. Accordingly there will be no loss of flood storage and there will be no change in flood risk or third party impacts between the baseline and restored condition.

5.1.1 Climate Change

Technical Guidance for climate change gives the allowances appropriate to the development is given on the peak river flow map which is shown in Figure 5.1. The relevant percentage to applied is dependent on the development type, life span of the development and the flood zone in which the scheme is located. The relevant information is summarised below:

- Development Type sand and gravel working.
- Development Lifespan - 5 years.
- Flood Zone - Flood Zone 2 and 3.

Table 5.1 shows the Central climate change allowances for fluvial flow are applicable to the scheme. It should be noted that the development lifespan in in the order of 5 years and the application of an allowance of 12% for the 2020s is therefore considered to be appropriate in relation to testing the development for flood risk.

Climate Change Epoch	Percentage
2020s	12%

Table 5.1: Central Climate Change Allowances for Flow

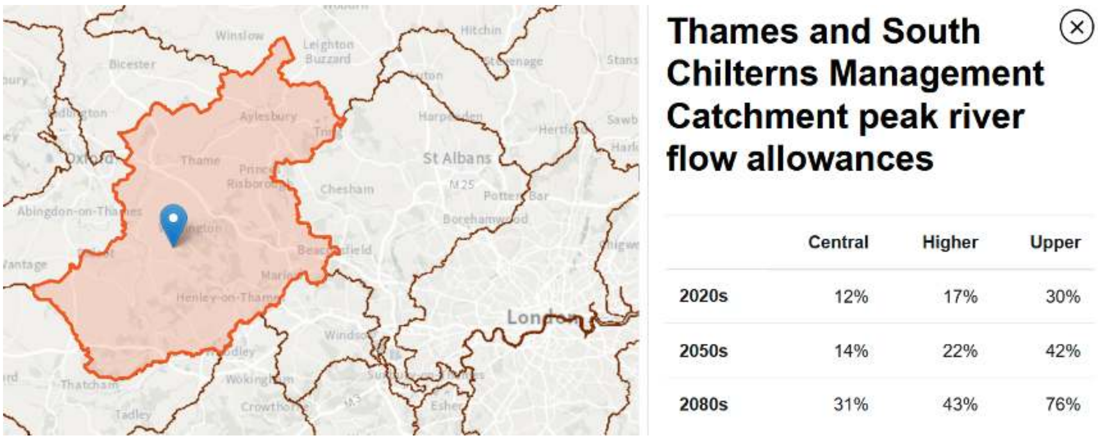


Figure 5.1: Fluvial Climate Change Allowances

6 Hydrology and Hydraulic Modelling

6.1 Hydrology

Hydrological estimates have been adopted from the incoming hydraulic model of the River Thames. No changes have been made to the model inflow boundaries.

6.2 Hydraulic Modelling

The 1D-2D FMP-TUFLOW model of the Thames at Wallingford was supplied by the Environment Agency for the purposes of the project in order to establish the flood risks to the site and assess whether there are any third-party impacts during the mineral working phases of the scheme. The incoming model is known as the "Abingdon Flood Schemes – River Thames Model".

The model extends from upstream of Sandford Lock to Reading Bridge, as shown in Figure 6.1 and adequately encompasses the site of interest. The model and has been accepted by the Environment Agency as being suitable for the use of assessing flood risk along this portion of the Thames and forms the basis of the modelling presented in this report. The model is reported by the Environment Agency as having been calibrated to an acceptable standard.

Cross sections are sparse, but commensurate for a model of this scale, with a typical spacing in excess of 500m. There is an FMP node just upstream and second near the downstream end of the site. As such, there is limited scope for the water surface to capture subtle variations by the site. The report accompanying the model states:

"Comparisons of the model results have been made against the peak water levels from telemetry data. Over the 4 events there is good agreement, under the interim model observed levels are within +/- 0.15m (83 out of 88 records) and peak flows are within 8% when compared to the high flow rating at Mapledurham (preferred to the Reading Rating). The updated model has observed levels which are within +/- 0.15m (78 out of 88 records) and peak flows are within 10% when compared to the high flow rating at Mapledurham." Note this also gives an indication of model accuracy.

The design hydrology for the supplied model has been re-evaluated using up to date data and techniques from when the modelling was undertaken. This has been reported in June 2017 . The Thames is a large and complex catchment; this analysis was undertaken in cooperation with the EA and may be considered to be the best current understanding of flow probabilities for the area.

The supplied modelling was undertaken with latest versions of the modelling software available at the time: Flood Modeller 4.2 and TUFLOW 2016-03-AC-iDP-w64. It is noted that these have since been superseded by the software authors who advise in their release notes that later versions should be used as corrections and enhancements have been made.

Following the initial review of the incoming model, it was established that it would be desirable to maintain as much of the model unchanged as possible. The model has been approved and calibrated model to the satisfaction of the Environment Agency and is understood to represent the existing condition with an acceptable accurately.

It is also noted that the process of undertaking new hydrological analysis to determine inflows for the Thames is both complex and time-consuming; this is precisely why the EA undertook the hydrological study and recommend/require its application to any other studies in the area. Accordingly, the Abingdon Flood Schemes – River Thames Model has been used as the basis for this FRA. Limited modifications have been made to the model including:

- Modifying the grid size to 20m to improve model stability in the vicinity of the site.
- Moving SX boundaries associated with the Wallingford Bridge flood relief arches to avoid a conflict with the cells raised by the z-line of the road embankment (those cells now being larger due to the above change); no boundary was moved by more than 1 cell.
- Adjusting model outputs filenames to suit EVY preferences; e.g. results names and locations as well as some additional outputs such as ZUK2.

No changes were made to the model timesteps and the model was run on the latest version of the FMP TUFLOW Software (FMP version FMP 5.0 and TUFLOW version 2020-10-AA-iDP-w64). In all other regards the model used to represent the baseline condition is as supplied by the EA.

The geometry of the excavation and phasing of the works has been added to the model using z-shapes. New surface materials were also applied, according to the land uses shown in the appropriate phase (e.g Figure 2.2). No changes were made to the model outside the red line to ensure that the baseline modelling was as close as possible to the phasing modelling with a view to making them directly comparable.

The model has been run for the existing baseline and four mineral extraction phases for the events shown in Table 6.1. The site will be restored to existing levels following completion of the mineral workings with the post development scenario being the same as the existing baseline.

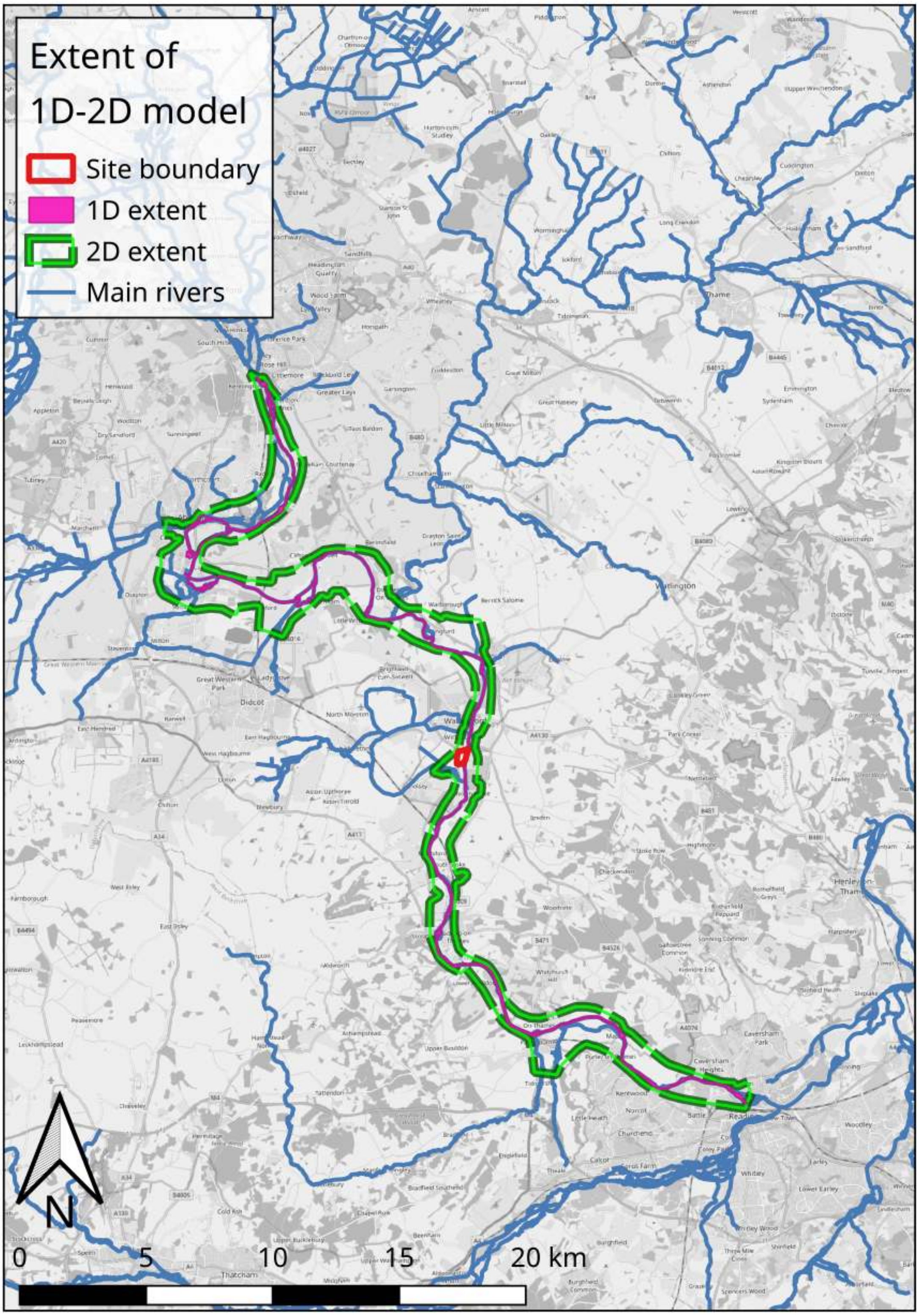


Figure 6.1: Hydraulic Model Extent

Scenario	AEP	Year
Baseline	1% cc 12%	2025
Phase 1	1% cc 12%	2025
Phase 2	1% cc 12%	2025
Phase 3	1% cc 12%	2025
Phase 4	1% cc 12%	2025

Table 6.1: Model Runs

6.3 Hydraulic Modelling Results

6.3.1 Flood Depth and Level

Figures 6.2 and 6.3 shows the depth results of the hydraulic modelling for the baseline and the Phase 3 excavation scenario (see Figure 2.2). In summary, the results indicates that the site would be partially inundated for the 1% AEP event with an allowance of 12% for climate change in all scenarios with depths varying across the site. The modelling confirms that the processing plant, offices and welfare facilities would be flood free. The size of the stockpiling area would need to be reduced slightly to ensure that there was no loss of flood plain storage

Appendix B gives the full suite of hydraulic modelling results for flood depth and level for the existing (baseline) scenario and Phases 1 to 4 for a 1% AEP event with an allowance of 12% for climate change should this occur during the life of the scheme (five years).

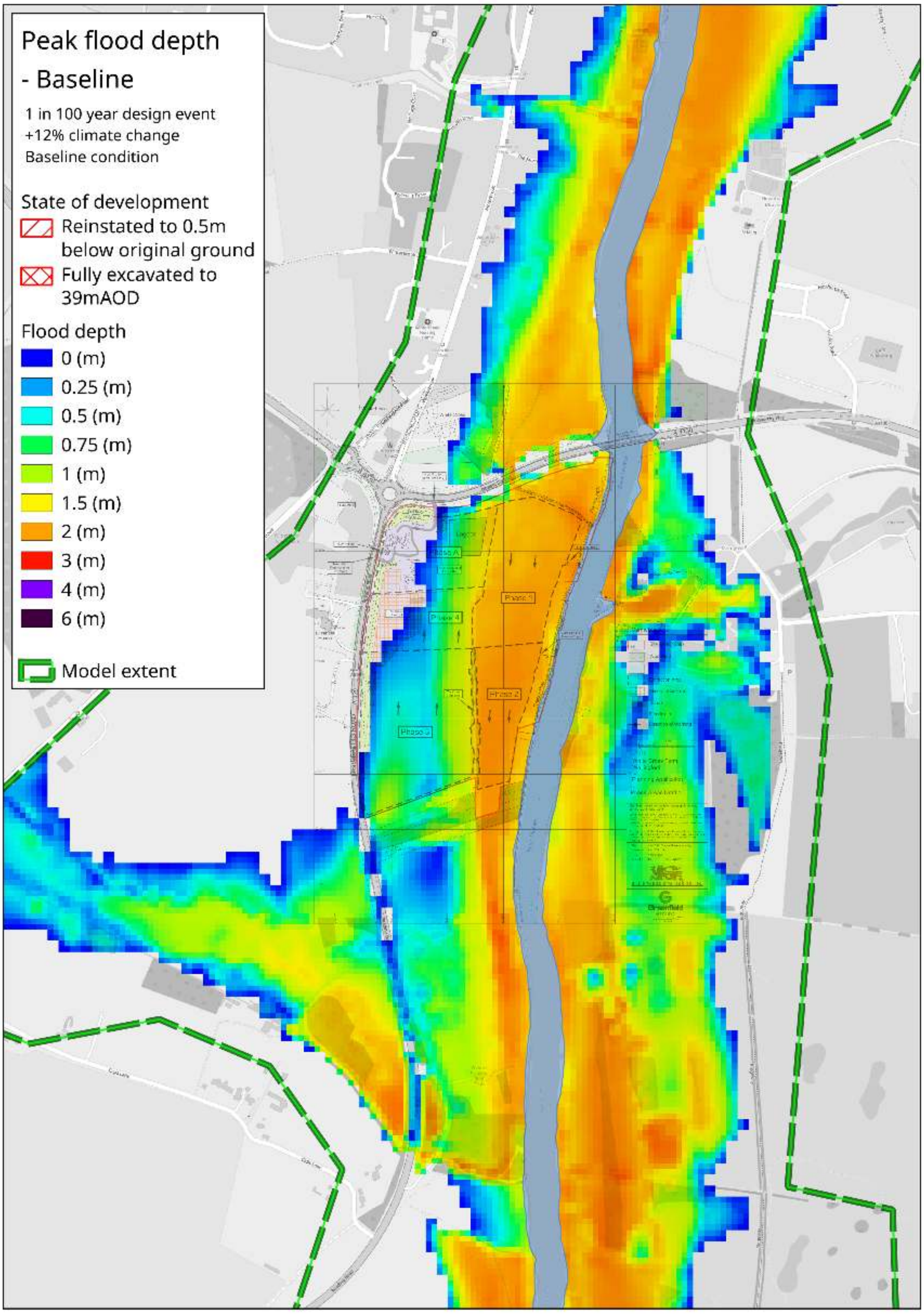


Figure 6.2: Baseline Model Results - Peak Water Depth for a 1% AEP event with an allowance of 12% for climate change

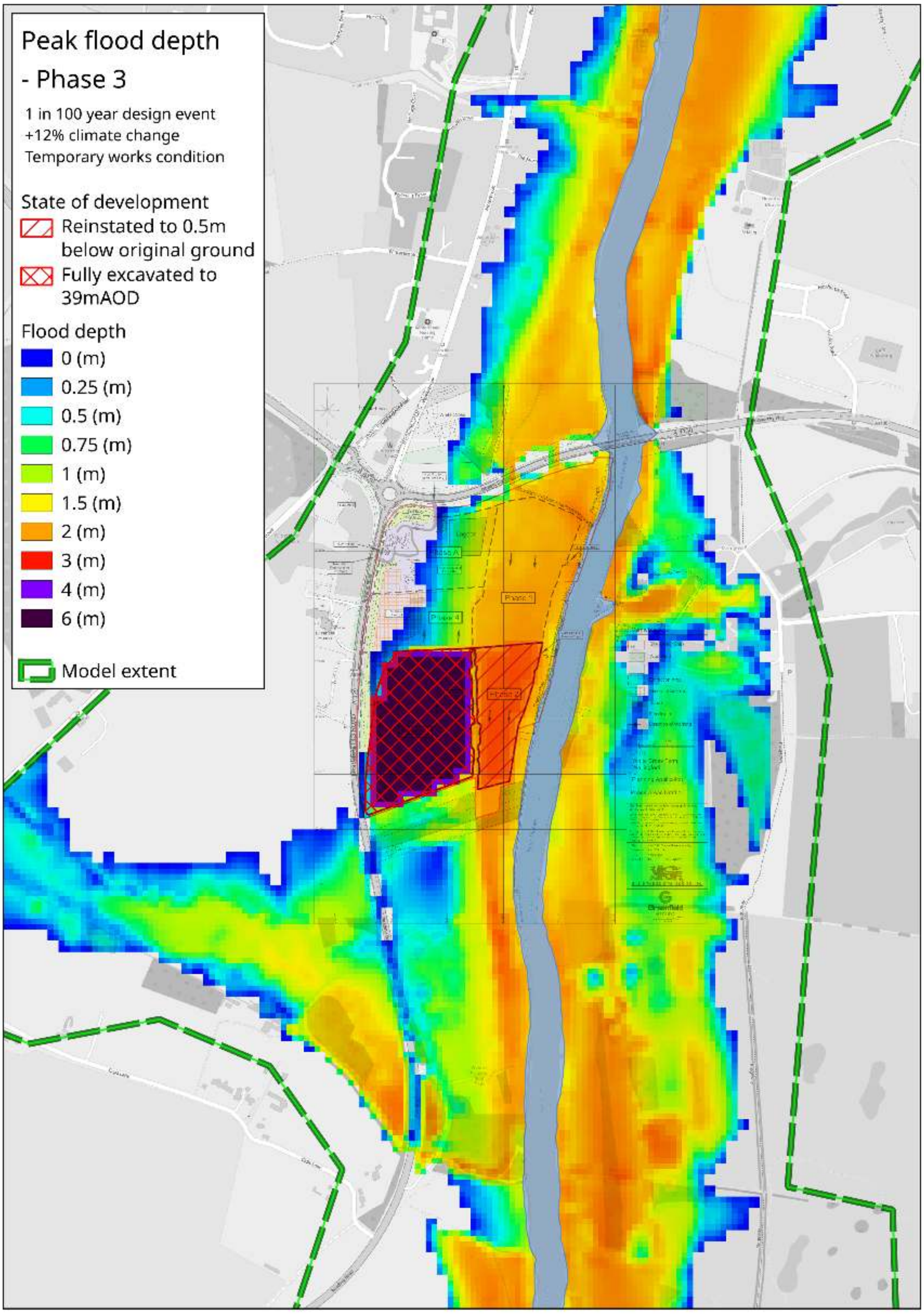


Figure 6.3: Phase 3 Model Results - Peak Water Depth for a 1% AEP event with an allowance of 12% for climate change

6.3.2 Third Party Dis-benefit

Third party dis-benefits have been assessed using difference maps. Figure 6.4 to Figure 6.7 shows the change in flood levels between the baseline and each of the four phases. The figures shows the numeric difference in level of the pre and post development schemes. Areas shade blue indicate negligible change in flood level (±0.025m) as a result of implementing the various phases of the scheme.

It should be noted that the generally accepted accuracy for models of this nature is in the order of ±0.150m (for various data related reasons), but in this case this was how accurate the calibration was considered to be and whilst it is convenient to make comparisons between baseline and the phasing scenarios it should be recognised that small differences in depth or water levels given by the hydraulic modelling results are not necessarily real or physically measurable.

Moreover, the scale applied to the difference maps is tight, since the range of differences generated by the development is fairly limited; as such, even a small change shows quite clearly on the map. Anything in blue indicates a change in flood level of less than ±0.025m compared to the baseline. Orange to red relates to an increase in water level greater than 0.025m and green colours are a reduction in water level greater than 0.025m.

Figure 6.4 to Figure 6.7 show the water level difference maps between the proposed scenario and the baseline for the 1% AEP events plus an allowance of 12% for climate change for all four phases of the mineral workings. Negative values indicate a reduction in water level due to the mineral workings, whereas positive values indicate an increase in level due to the restoration of the site. Where off-site water level differences are greater than 0.025m they are enumerated in Table 6.2.

The maximum off-site impact on water levels is 0.027m during Phase 2 stage directly to the south of the site. Similarly in the 1% AEP event with an allowance of 12% for climate change the off-site impact is limited to a small area on the existing floodplain for Phases 2, 3 and 4 with a maximum increase in water level in the order of 0.027m. All areas where there is increased flooding are within the existing floodplain and does not affect housing. The mapping shows that there is no material or measurable change in flood extent, flood level and hence depth as a result of the construction of the sand and gravel working.

Phase	Event	Location	Difference
Phase 1	1% AEP cc 12%	-	< 0.025m
Phase 2	1% AEP cc 12%	South of site	0.027 m
Phase 3	1% AEP cc 12%	South of site	0.026 m
Phase 4	1% AEP cc 12%	South of site	0.018 m

Table 6.2: Maximum off-site increase in water level

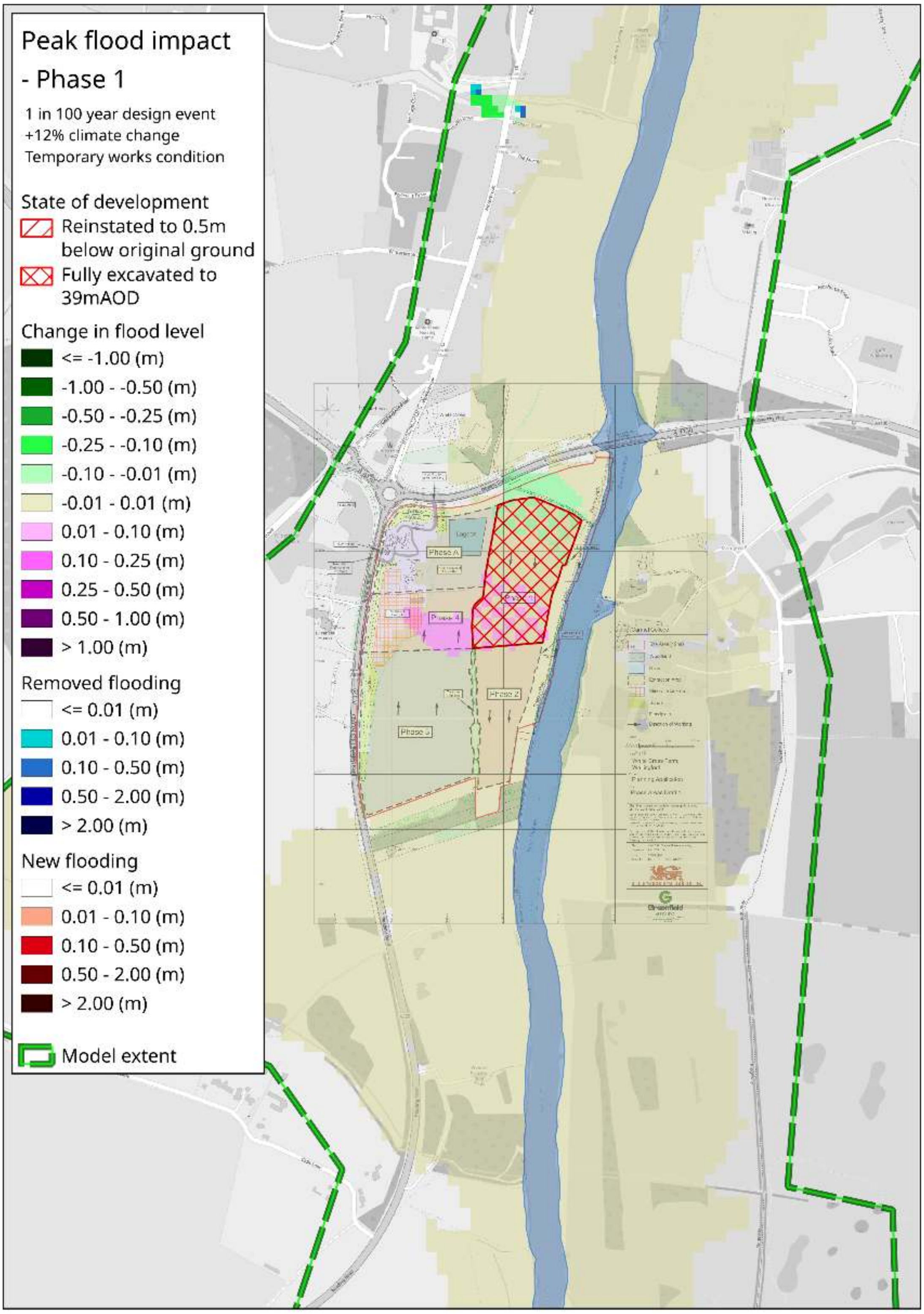


Figure 6.4: Flood Difference Mapping : Phase 1 Flood Levels minus Baseline Flood Levels for a 1%AEP event with an allowance of 12% for climate change

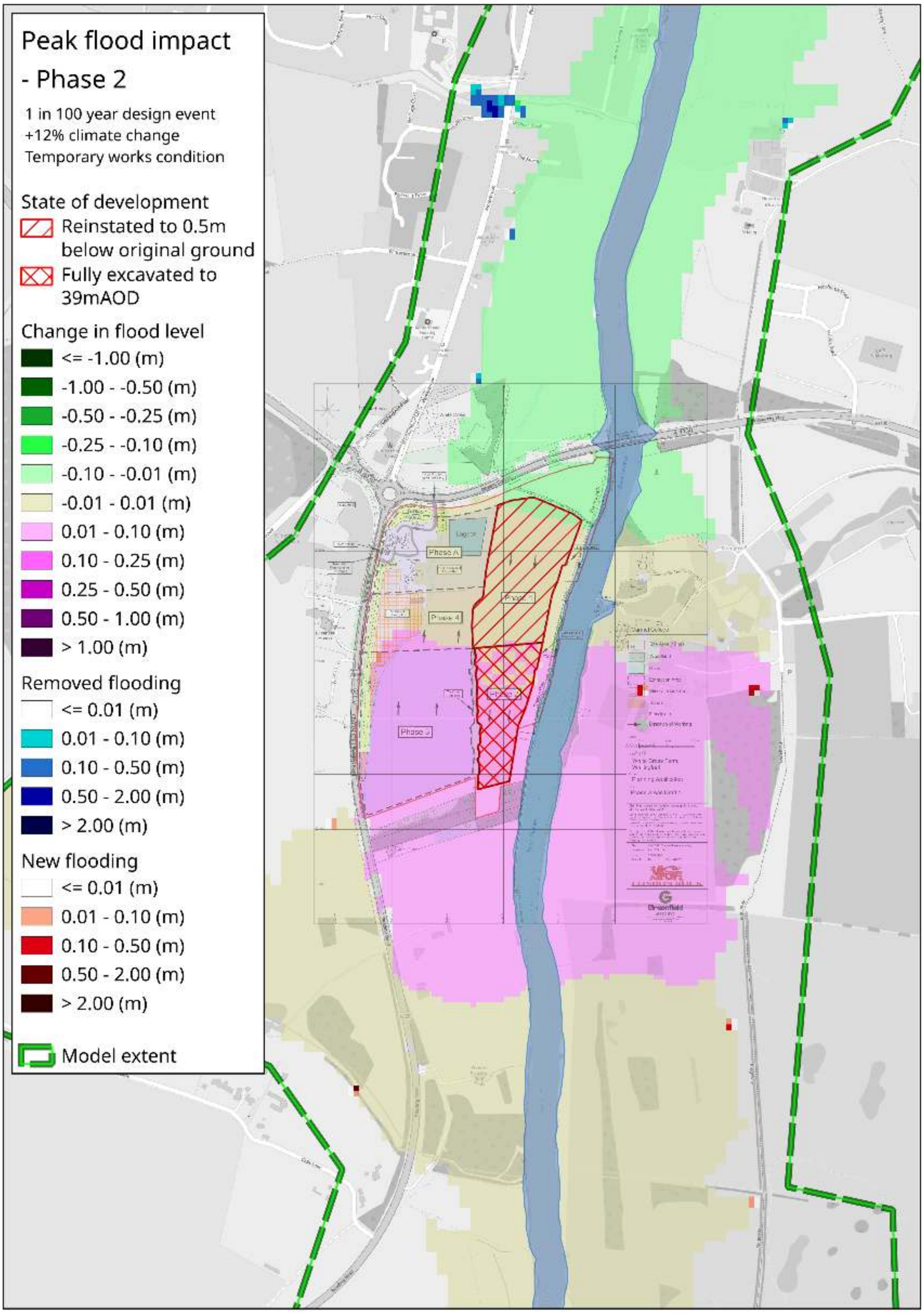


Figure 6.5: Flood Difference Mapping : Phase 2 Flood Levels minus Baseline Flood Levels for a 1%AEP event with an allowance of 12% for climate change

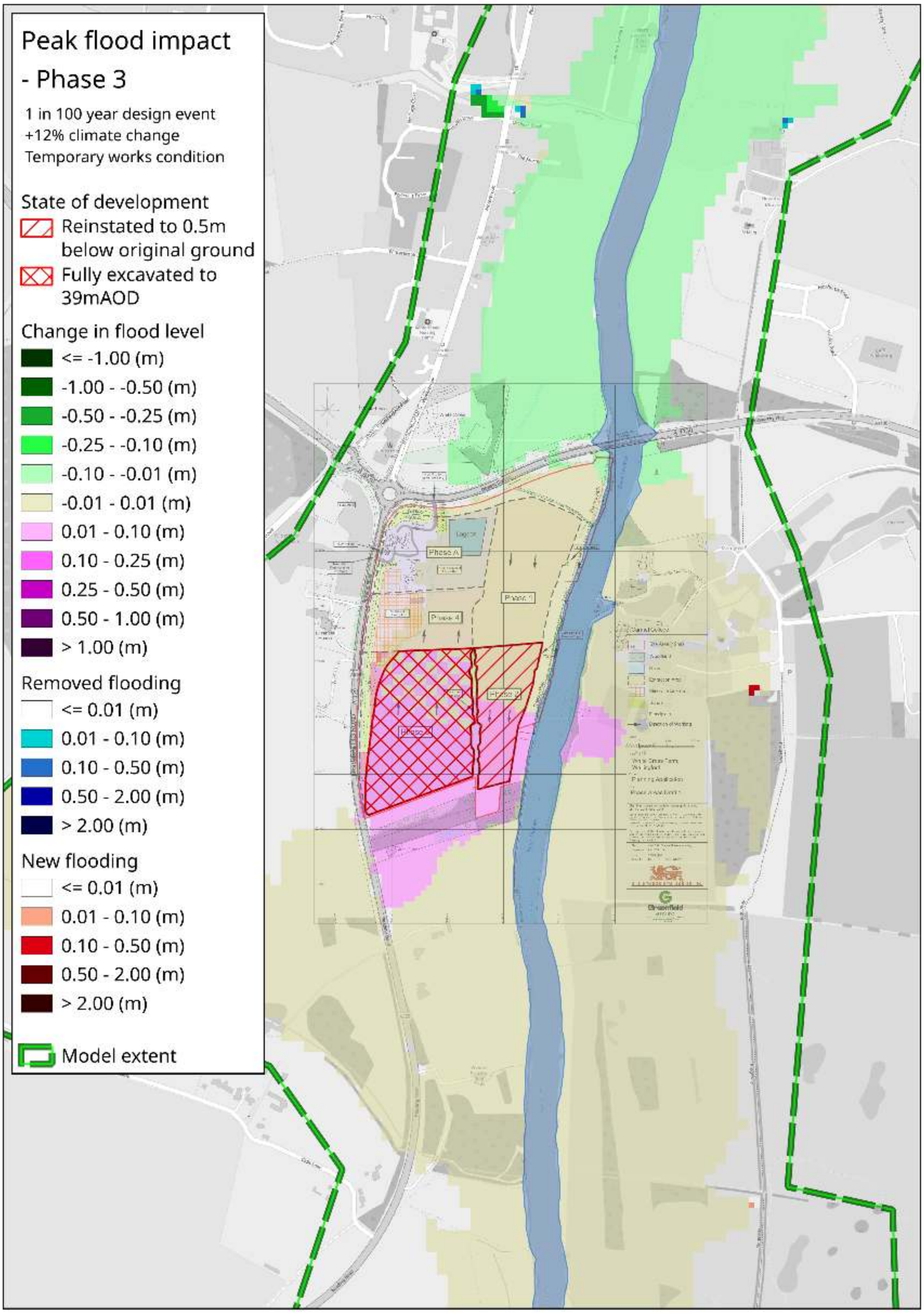


Figure 6.6: Flood Difference Mapping : Phase 3 Flood Levels minus Baseline Flood Levels for a 1%AEP event with an allowance of 12% for climate change

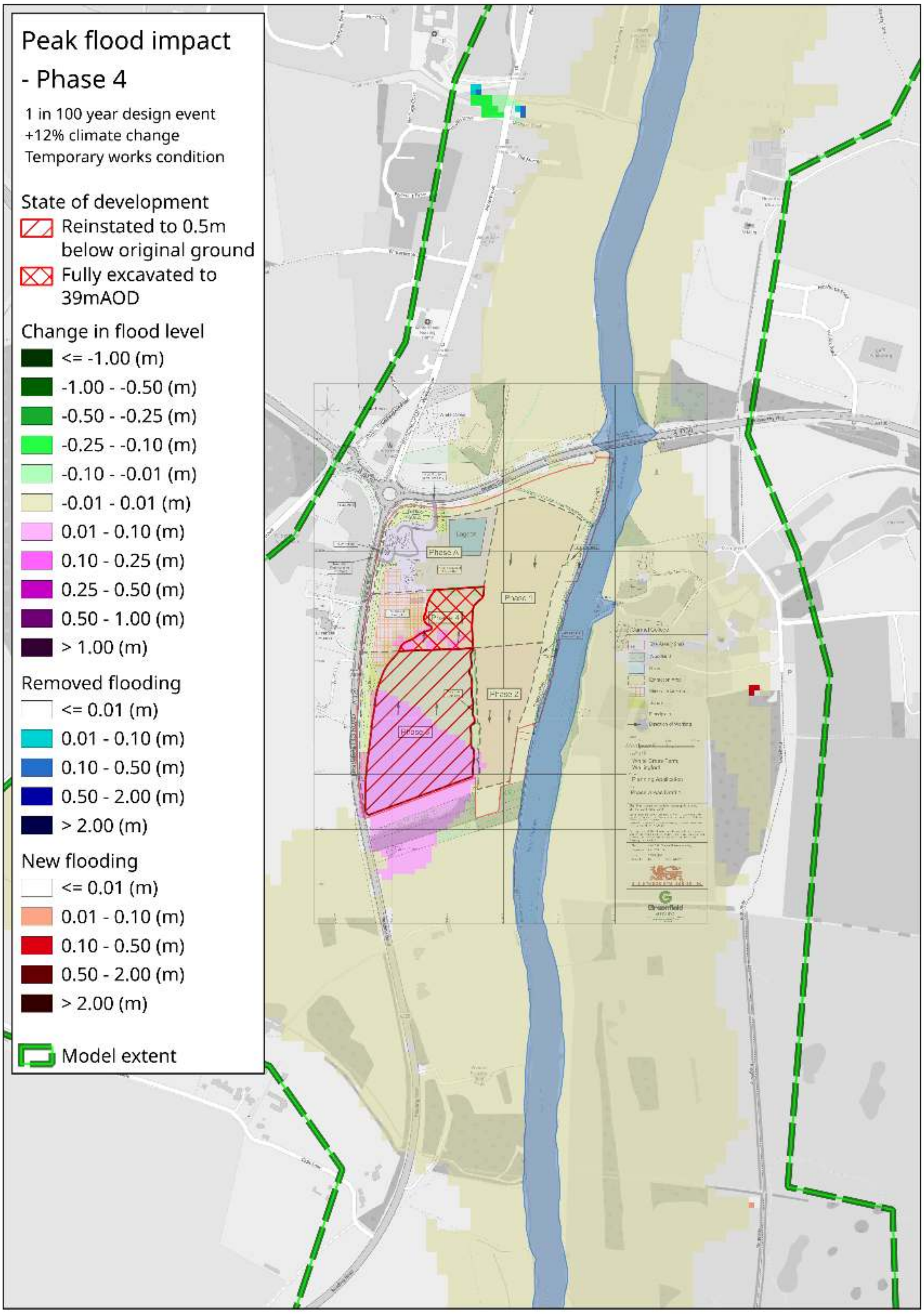


Figure 6.7: Flood Difference Mapping : Phase 4 Flood Levels minus Baseline Flood Levels for a 1%AEP event with an allowance of 12% for climate change

7 Flood Response Planning

During the operational phase of the works, labour and plant will be working on the flood plain. Water depths in areas where mineral workings are being undertaken will be deep and hazardous during flooding. Accordingly, a Flood Response Plan will be required to ensure that all operatives and plant are removed from the flood plain to a place of safety before the onset of flooding. It is recommended that operators of the site:

- Sign up to the EA Flood Warnings Direct service and make sure you know what each flood warning code means.
- Develop a plan for the movement of plant and labour out of the flood plain upon receipt of a flood warning.

8 Conclusions and Recommendations

8.1 Conclusions

Edenvale Young Associates were commissioned by Greenfield Environmental to complete a Flood Risk Assessment for the sand and gravel working scheme at the White Cross Farm to the south of Wallingford. The scope of works has included desktop analysis of published data and hydraulic modelling using the Environment Agency's 1D-2D FMP-TUFLOW hydraulic model of the River Thames to assess flood risk to the site. Based on the analysis, the following conclusions have been drawn:

- Excavation for sand and gravel will be in on the floodplain of the River Thames in Flood Zones 2 and 3.
- Stockpiles, earth bunds, offices, welfare facilities and a weighbridge will be located Flood Zone 1.
- Phases 1 and 2 are wholly within the functional flood plain (Flood Zone 3b).
- Phases 3 and 3 are partially within the functional flood plain (Flood Zone 3b).
- sand and gravel working is classified as Water Compatible development which is compatible with Flood Zones 2 and 3.
- Sequential and Exception Tests are not required for the scheme.
- There are no records within the SFRA report of sewer flooding to the site.
- Surface water flooding and reservoir inundation are not considered to present a flood risk to the scheme.
- Groundwater will be encountered during excavation for the mineral workings which must be managed by the operator.
- Hydraulic modelling indicates that there is no measurable or material change in flood extent as a result of the phasing of the works.
- Hydraulic modelling has demonstrated that there is negligible increase in off-site water levels for the 1%AEP event with an allowance of 12% for climate change with an increase in depth of approximately 0.03m to a small parkland area on the left bank.

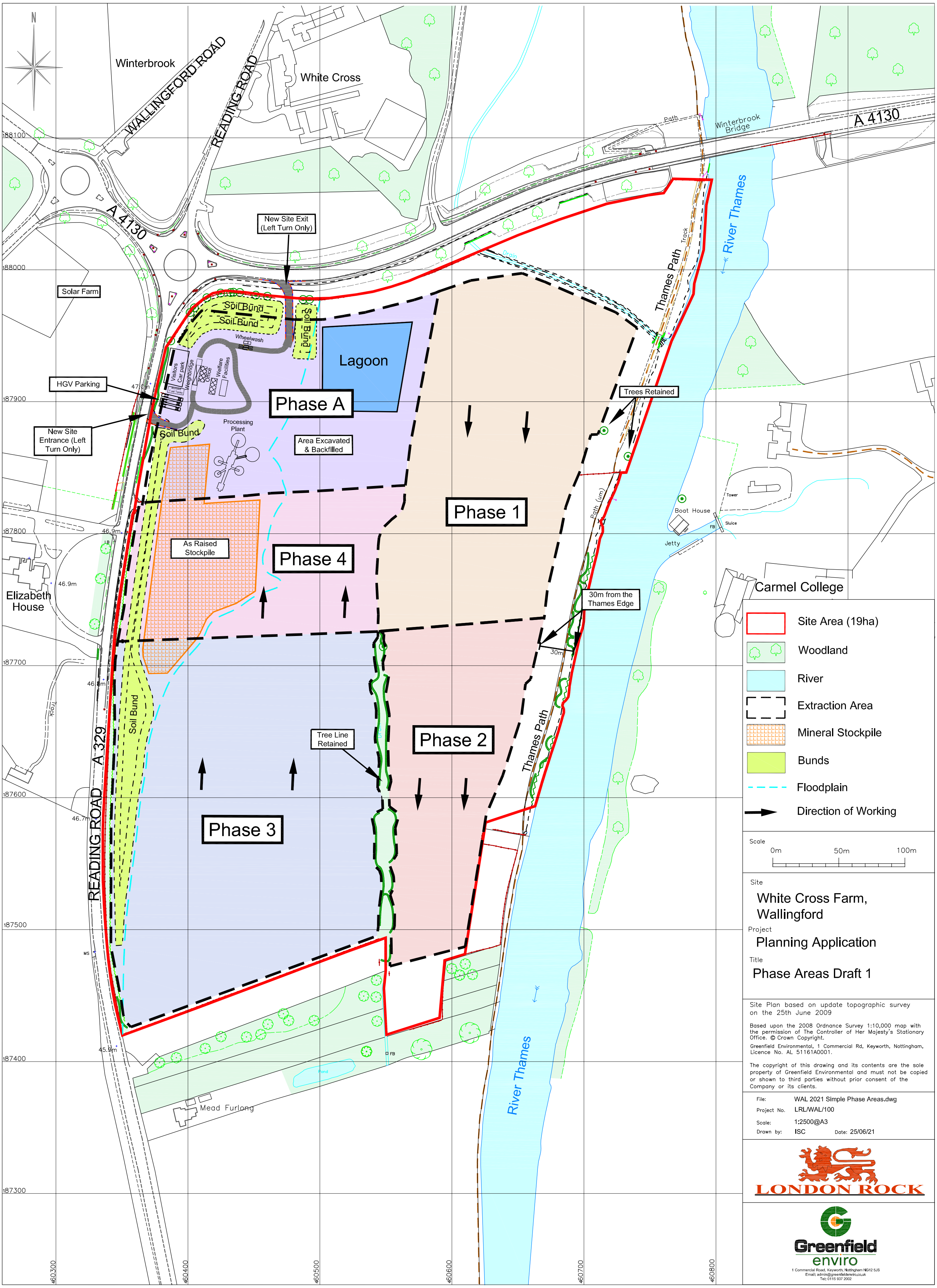
- There is no requirement for flood storage compensation as land levels will be restored to existing, or just below existing ground levels.

8.2 Recommendations

It is recommended that:

- Ground levels for the final reclamation phase are no higher than existing.
- Stockpiling areas are sited outside the 1%AEP event with an allowance of 12% climate change.
- A Flood Response Plan is developed to ensure that all operatives, staff, visitors and plant are moved or evacuated from areas which are vulnerable to flooding before the onset of flooding.
- An excavation method statement is developed to ensure that all operatives, staff, visitors are safe from drowning during the operation of the site.
- A drainage plan is prepared to deal with run of from roads, hard standing and processing areas to minimise the impact of the scheme on water quality.

A Development Proposals



N
Winterbrook
WALLINGFORD ROAD
READING ROAD
White Cross
A 4130
Winterbrook Bridge
Path
Solar Farm
New Site Exit (Left Turn Only)
Soil Bund
Soil Bund
Soil Bund
Wheelwash
Lagoon
Visitors Car park
Weighbridge
Office
Welfare Facilities
HGV Parking
New Site Entrance (Left Turn Only)
Phase A
Processing Plant
Area Excavated & Backfilled
Soil Bund
Trees Retained
Thames Path
Track
River Thames
Phase 1
Phase 4
As Raised Stockpile
Elizabeth House
Boat House
Tower
Sluice
Jetty
Carmel College
30m from the Thames Edge
30m
Tree Line Retained
Phase 2
Phase 3
Soil Bund
READING ROAD A 329
Thames Path
Mead Furlong
River Thames
Site Area (19ha)
Woodland
River
Extraction Area
Mineral Stockpile
Bunds
Floodplain
Direction of Working
Scale
0m
50m
100m
Site
White Cross Farm, Wallingford
Project
Planning Application
Title
Phase Areas Draft 1
Site Plan based on update topographic survey on the 25th June 2009
Based upon the 2008 Ordnance Survey 1:10,000 map with the permission of The Controller of Her Majesty's Stationary Office. © Crown Copyright.
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File: WAL 2021 Simple Phase Areas.dwg
Project No. LRL/WAL/100
Scale: 1:2500@A3
Drawn by: ISC
Date: 25/06/21
LONDON ROCK
Greenfield enviro

LEGEND

- Planning Application Boundary
- Agricultural Land within the Application Boundary
- Existing Woodland / Hedgerows
- Existing Water Bodies / Courses
- Buildings, Roads & Tracks
- 80.0 Existing Contours (1m intervals) & Spot Heights m AOD
- Proposed Limit of Extraction & Direction of Working - Phase 3
- Operational Area
- Proposed Soil Storage / Screening Bunds
- Proposed As Raised Stockpile
- Proposed Operational Lagoon
- Proposed Advanced Planting Works / Strengthening
- Restoration Area
- Previously Restored Land
- Agricultural Straw Bales - Screening

Operations

1. Soils will be progressively stripped in a northerly direction and temporarily stored (outside of the floodplain) within an area of the "as raised" stockpile.
2. Imported inert materials will continue to be placed to complete the restoration of Restoration Area 03.
3. Mineral will be extracted and transported to the "as raised" stockpile from which it will be removed, processed, temporarily stocked and transported by HGV to point of sale.
4. Silt generated as part of processing is to be placed within the silt lagoon.
5. Once sufficient void has been created through mineral extraction within the southern part of Phase 3, soils from both the northern part of Phase 3 together with soils held in Bund 1 (within Phase 3) will be progressively placed along with imported inert restoration materials, to restore land within the southern and central areas of this phase.
6. By removing soils temporarily held within Bund1, it will allow the full extraction of mineral from this phase.
7. All restored land will be managed and maintained under a 5 Year Aftercare Period, before being handed back to the landowner.

Greenfield enviro

KEDD Limited

PROJECT:
White Cross Farm, Wallingford

TITLE:
Phase 3

REF NO:
KD.WLF.D.007

DATE: July 2021

SCALE: 1:2,500 @ A3

STATUS:
1st DRAFT

N

Fox Studio, Much Wenlock, Shropshire TF13 6BL

KEDD Limited

PROJECT:
White Cross Farm, Wallingford

TITLE:
Concept Restoration

REF NO:
KD.WLF.D.010

DATE: July 2021

SCALE: 1:2,500 @ A3

STATUS:
1st DRAFT

N

Greenfield enviro

Fox Studio, Much Wenlock, Shropshire TF13 6BL

B Hydraulic Model Results

B.1 Water Level

B.1.1 Baseline

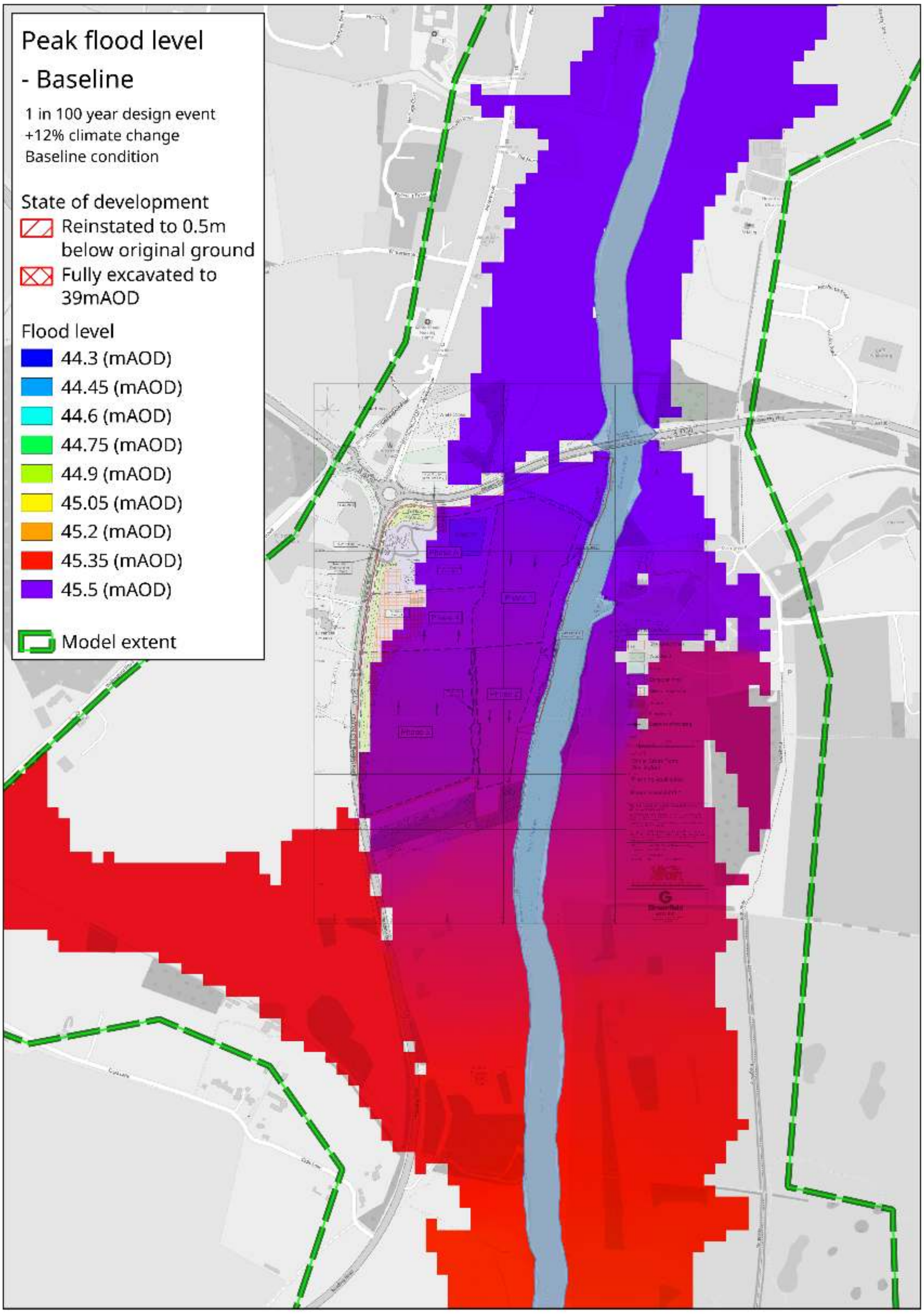

Figure B.1: Baseline Model Results - Peak Water Level for a 1% AEP event with an allowance of 12% for climate change

B.1.2 Phase 1

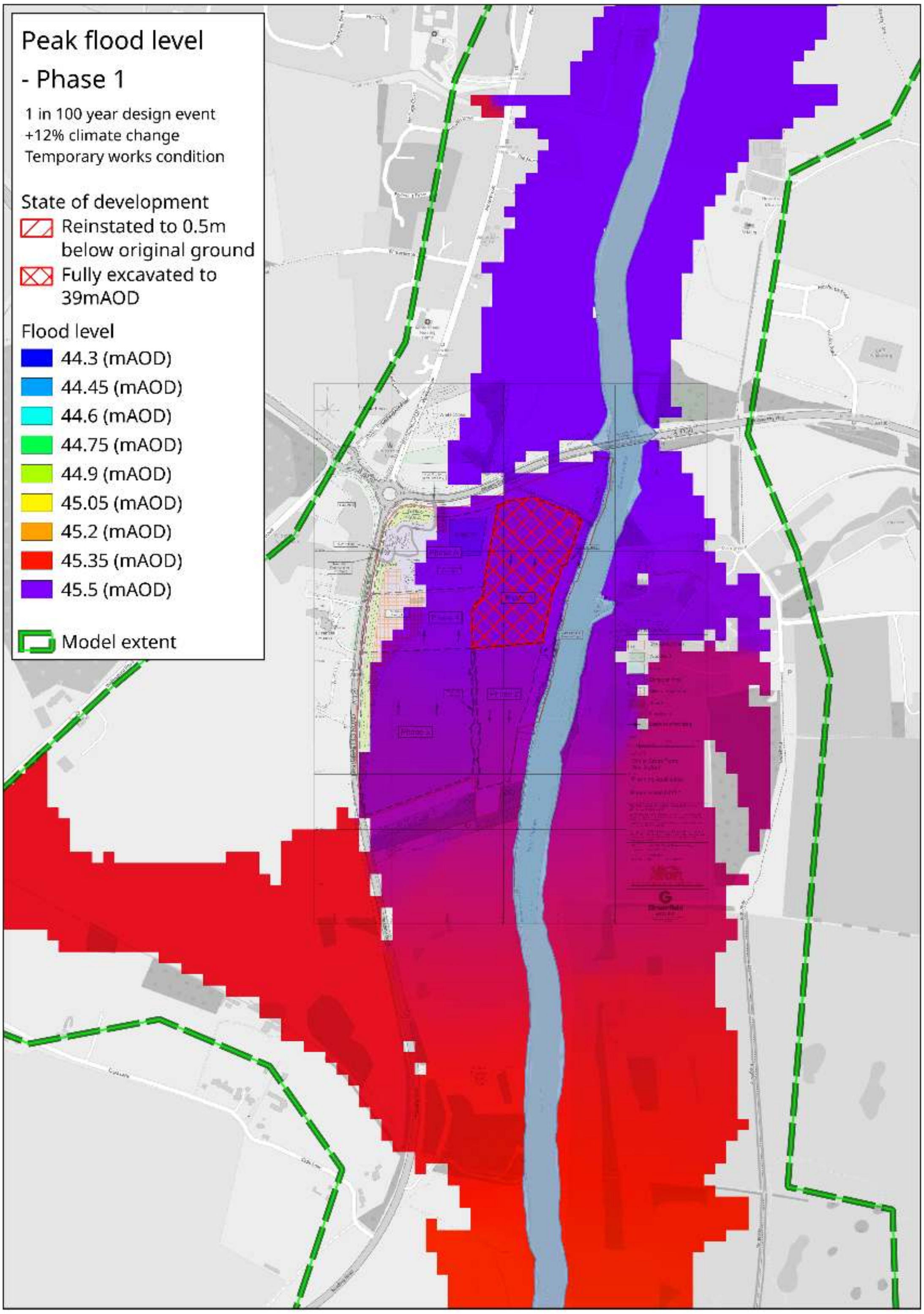

Figure B.2: Phase 1 Model Results - Peak Water Level for a 1% AEP event with an allowance of 12% for climate change

B.1.3 Phase 2

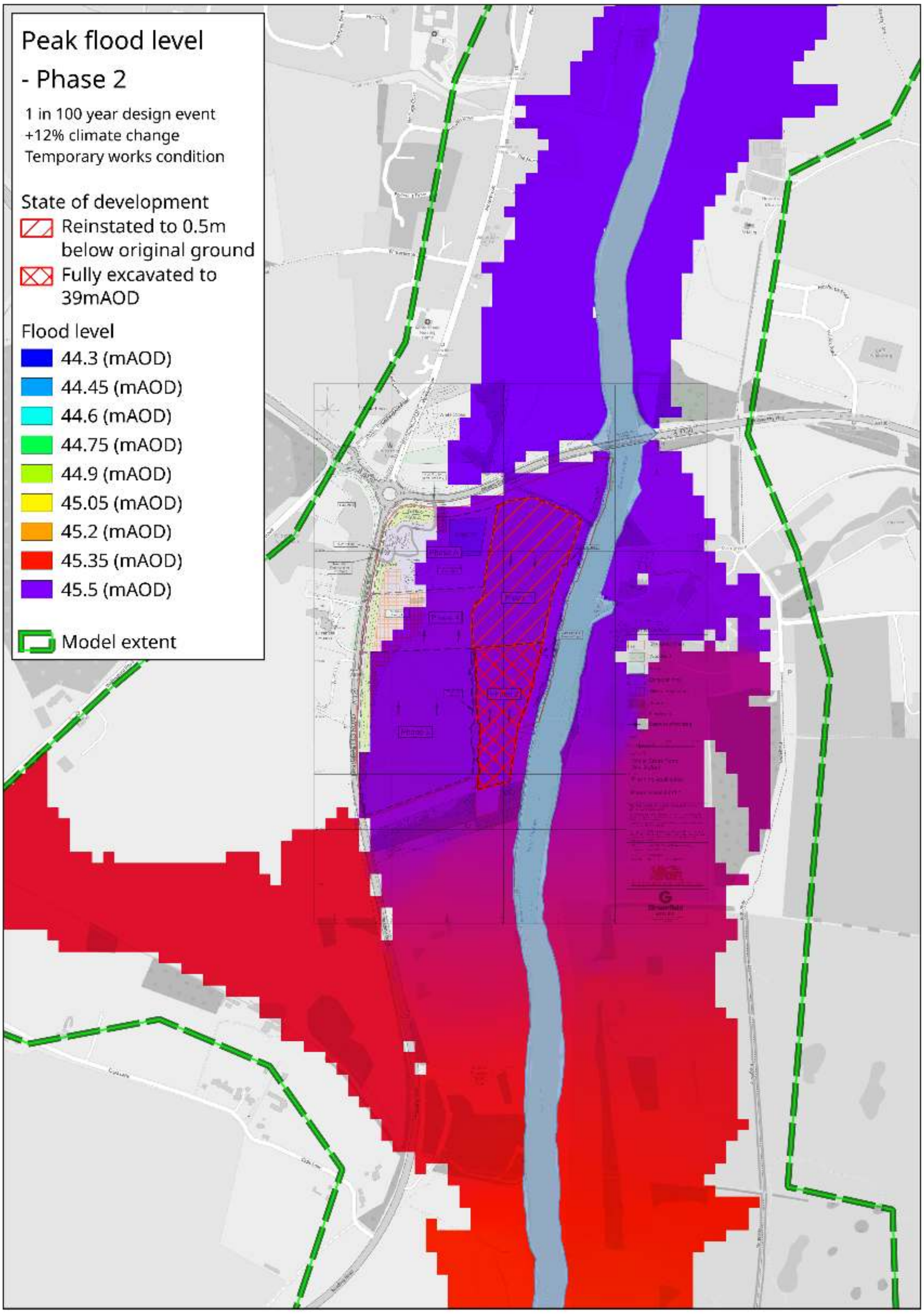

Figure B.3: Phase 2 Model Results - Peak Water Level for a 1% AEP event with an allowance of 12% for climate change

B.1.4 Phase 3

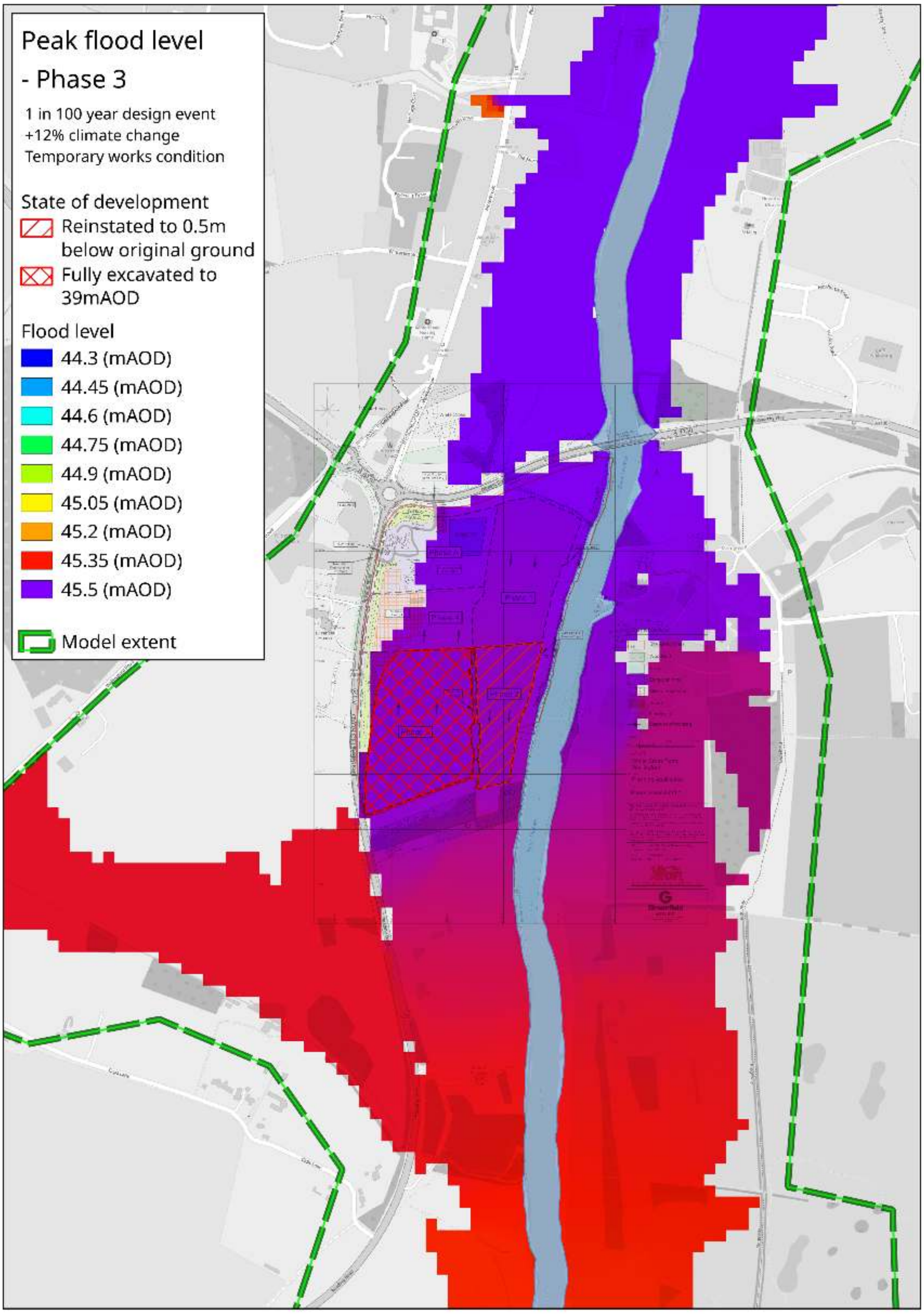

Figure B.4: Phase 3 Model Results - Peak Water Level for a 1% AEP event with an allowance of 12% for climate change

B.1.5 Phase 4

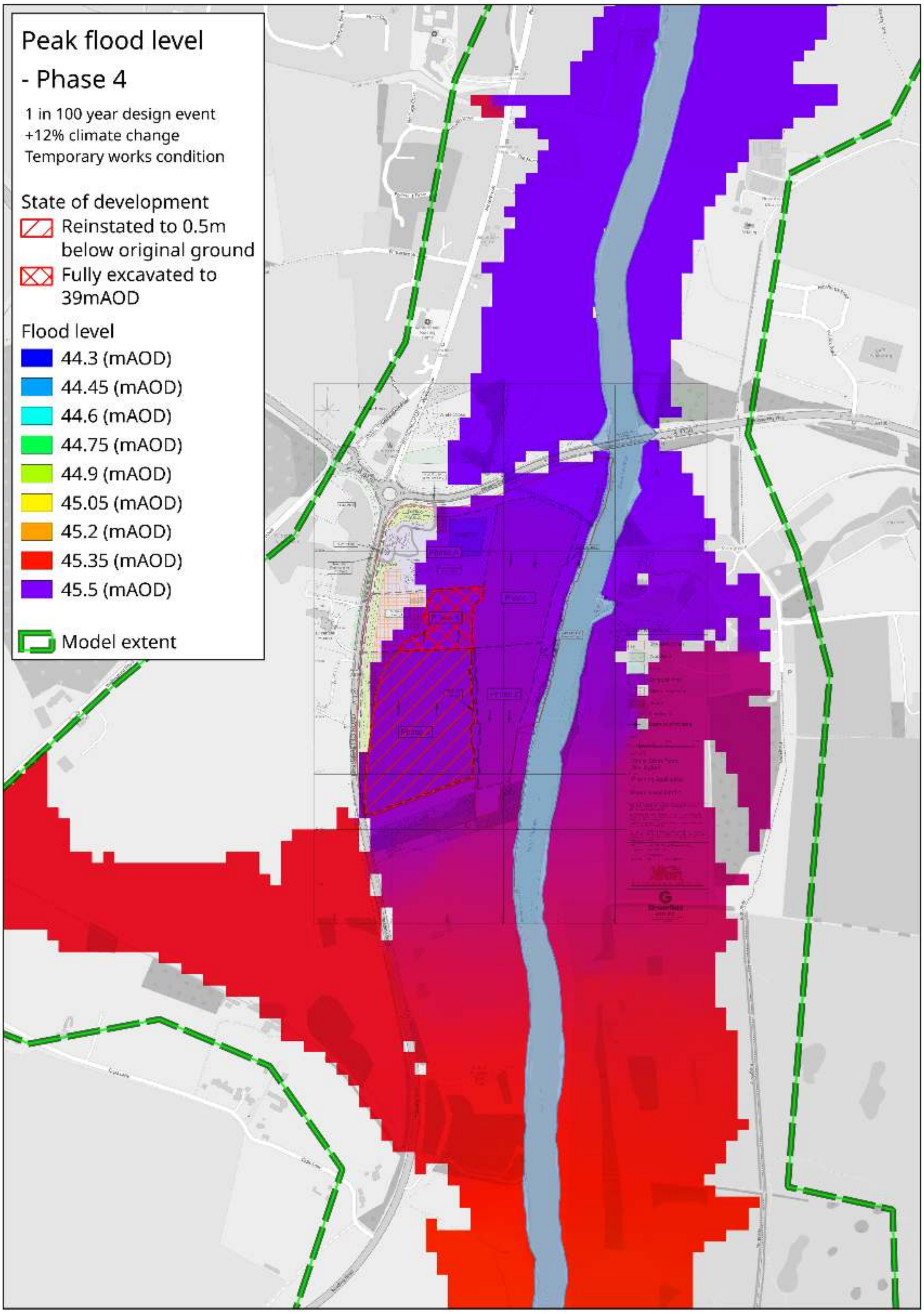

Figure B.5: Phase 4 Model Results - Peak Water Level for a 1% AEP event with an allowance of 12% for climate change

B.2 Depth

B.2.1 Baseline

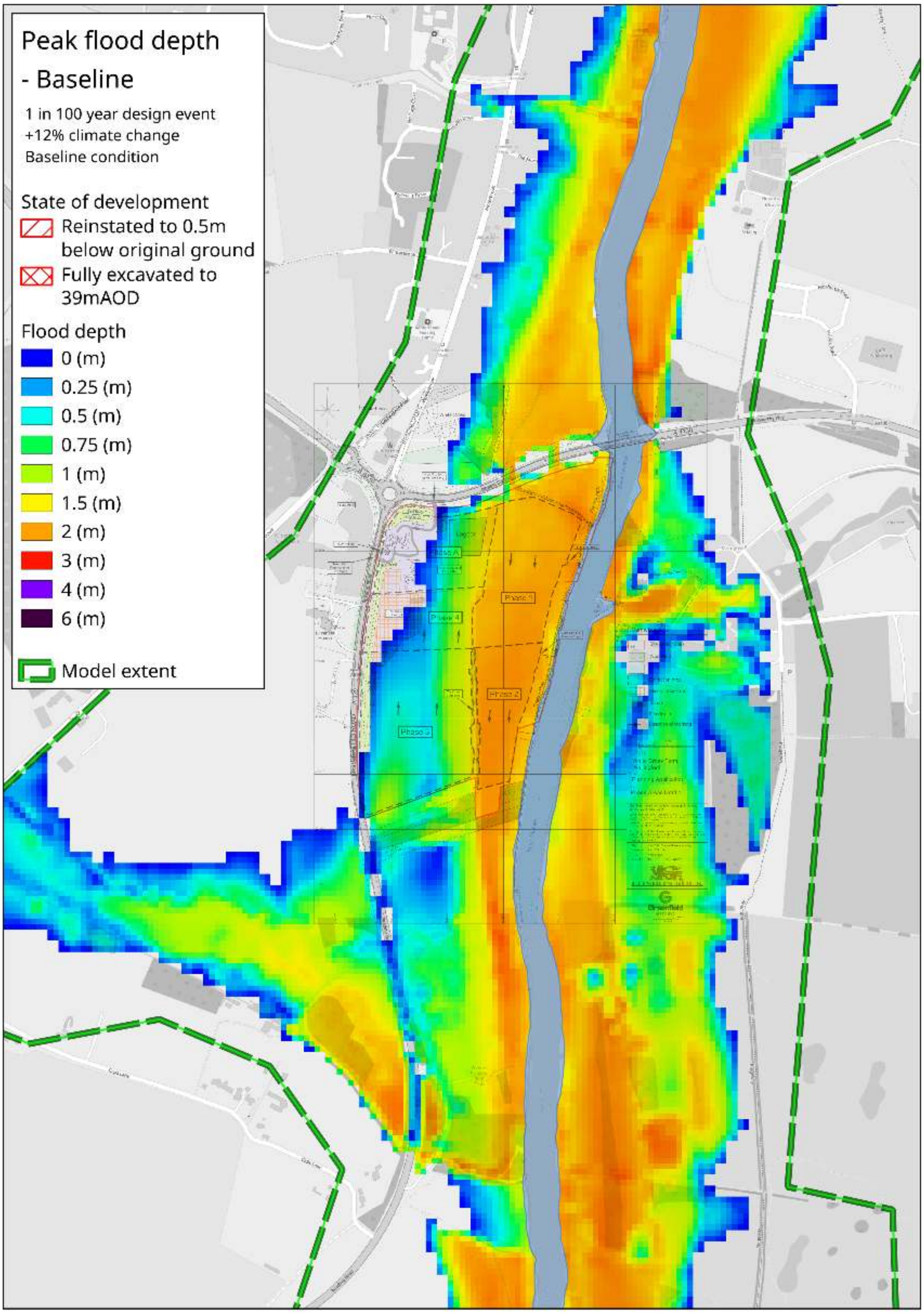

Figure B.6: Baseline Model Results - Peak Water Depth for a 1% AEP event with an allowance of 12% for climate change

B.2.2 Phase 1

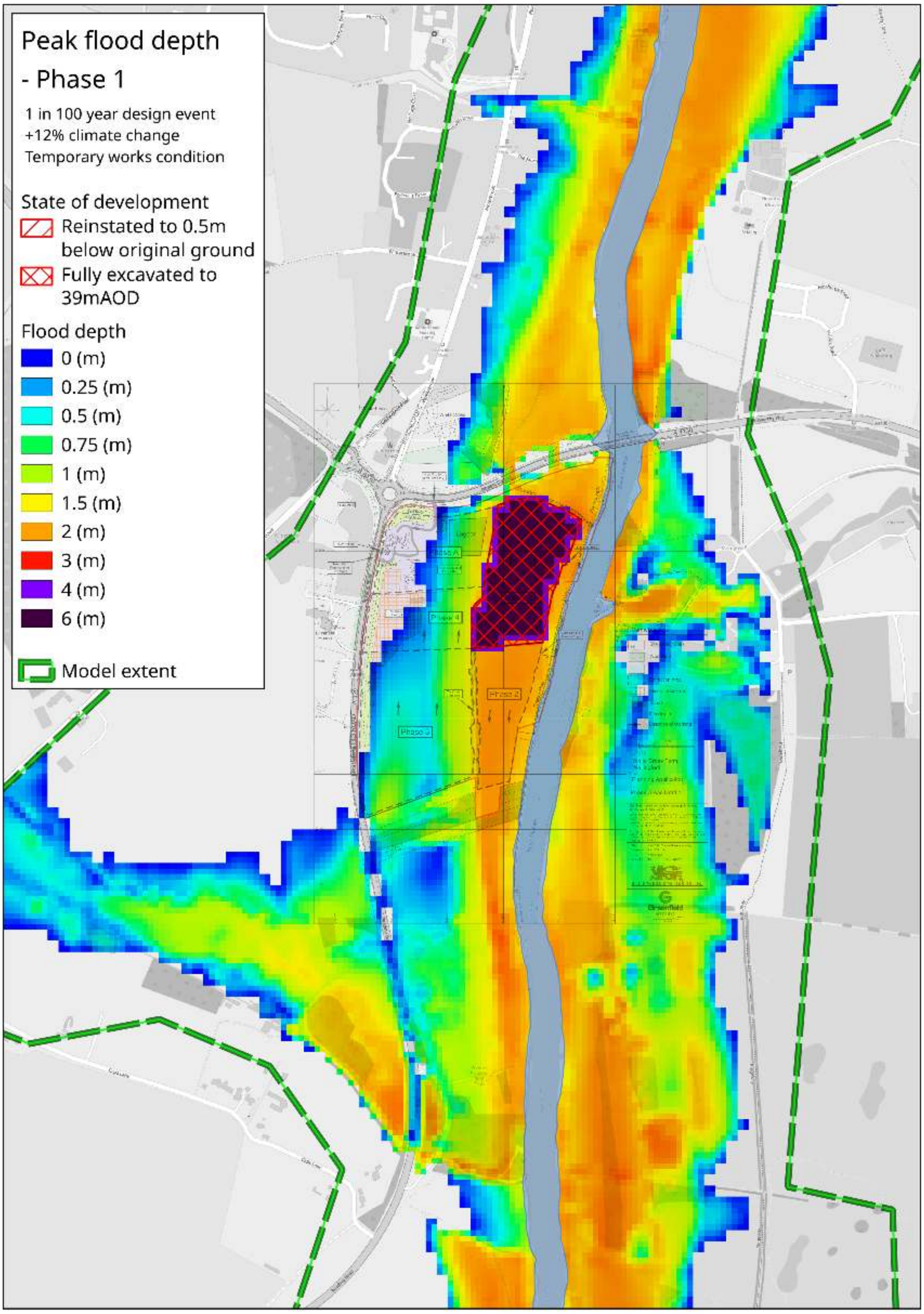

Figure B.7: Phase 1 Model Results - Peak Water Depth for a 1% AEP event with an allowance of 12% for climate change

B.2.3 Phase 2

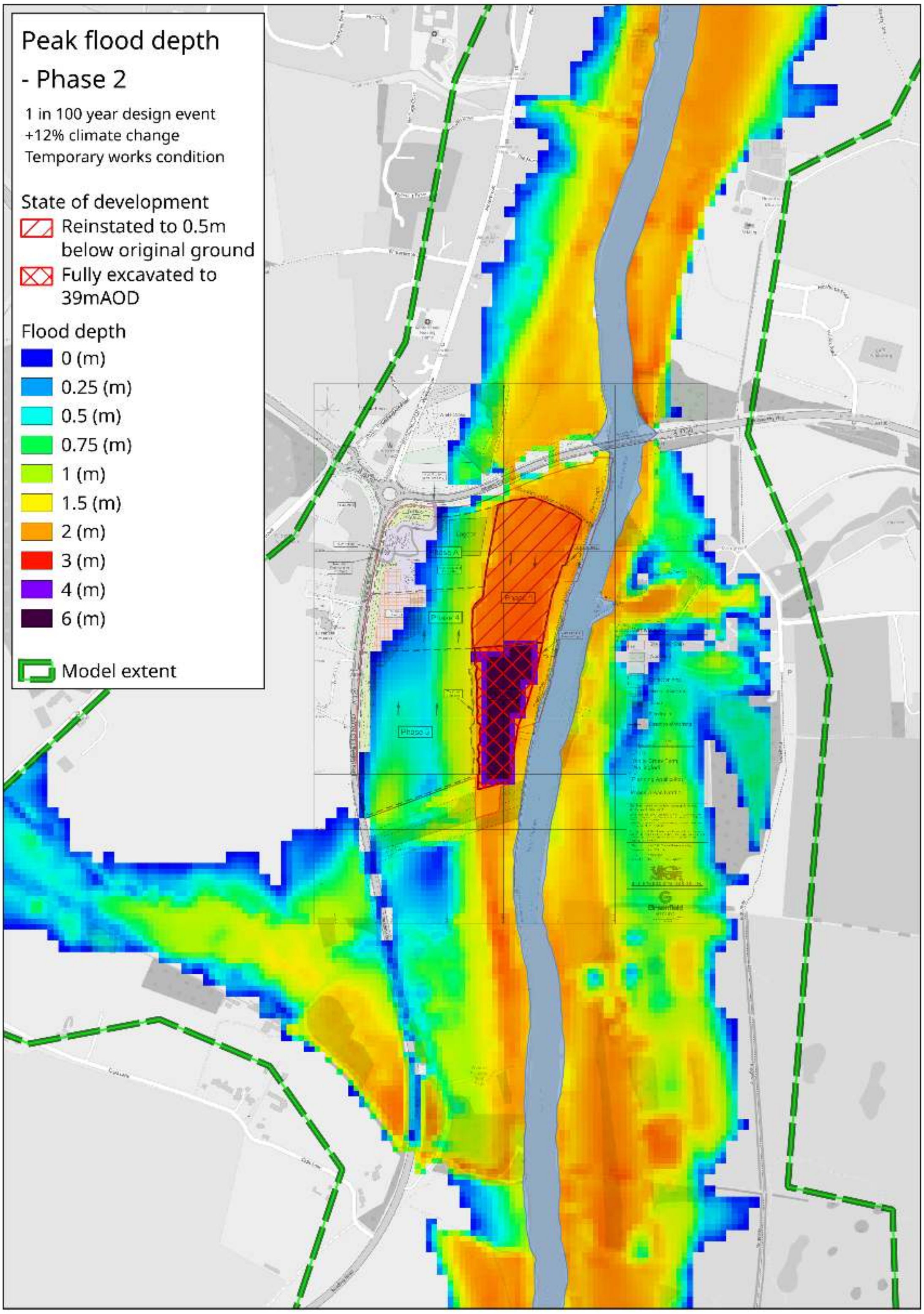

Figure B.8: Phase 2 Model Results - Peak Water Depth for a 1% AEP event with an allowance of 12% for climate change

B.2.4 Phase 3

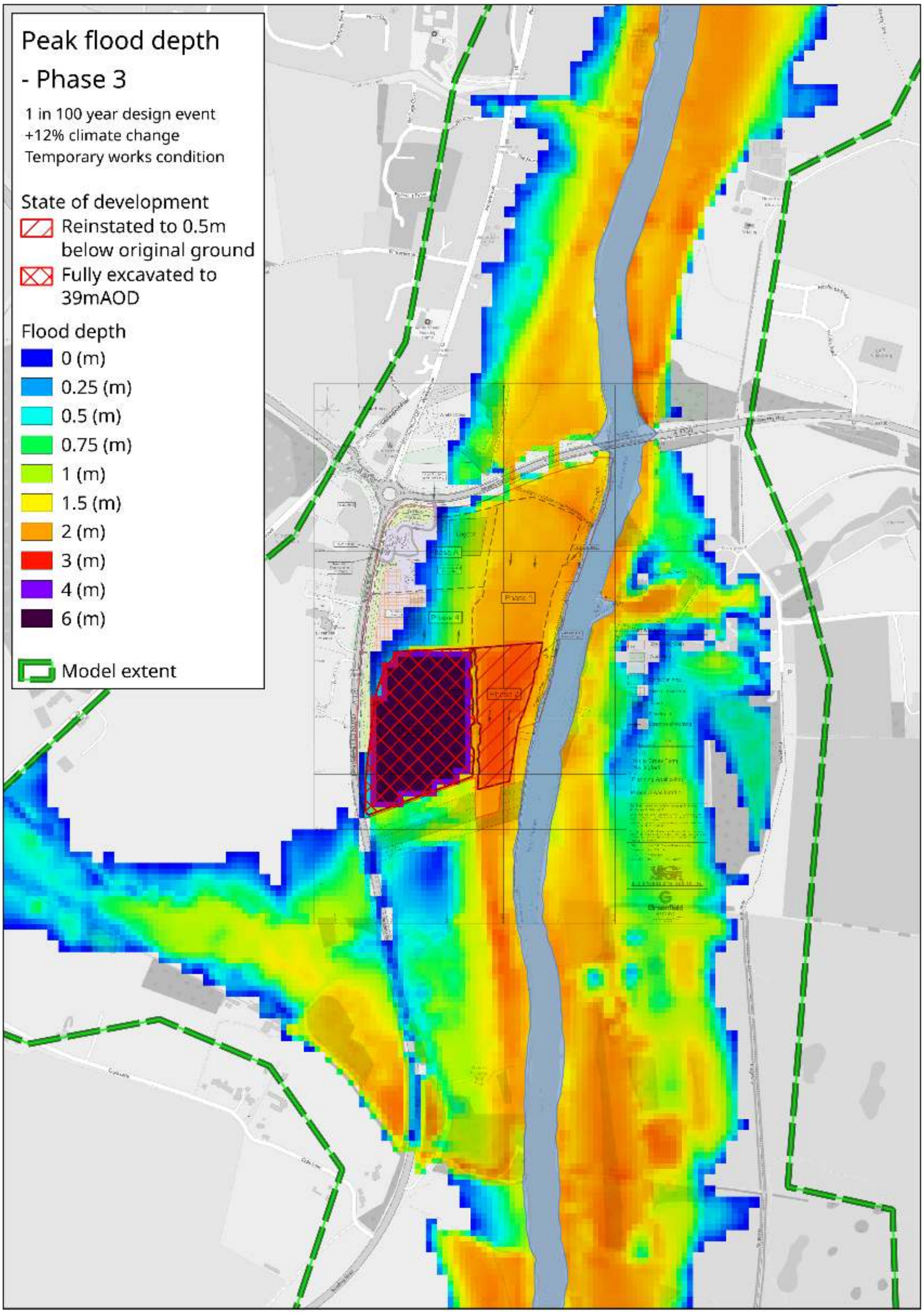

Figure B.9: Phase 3 Model Results - Peak Water Depth for a 1% AEP event with an allowance of 12% for climate change

B.2.5 Phase 4

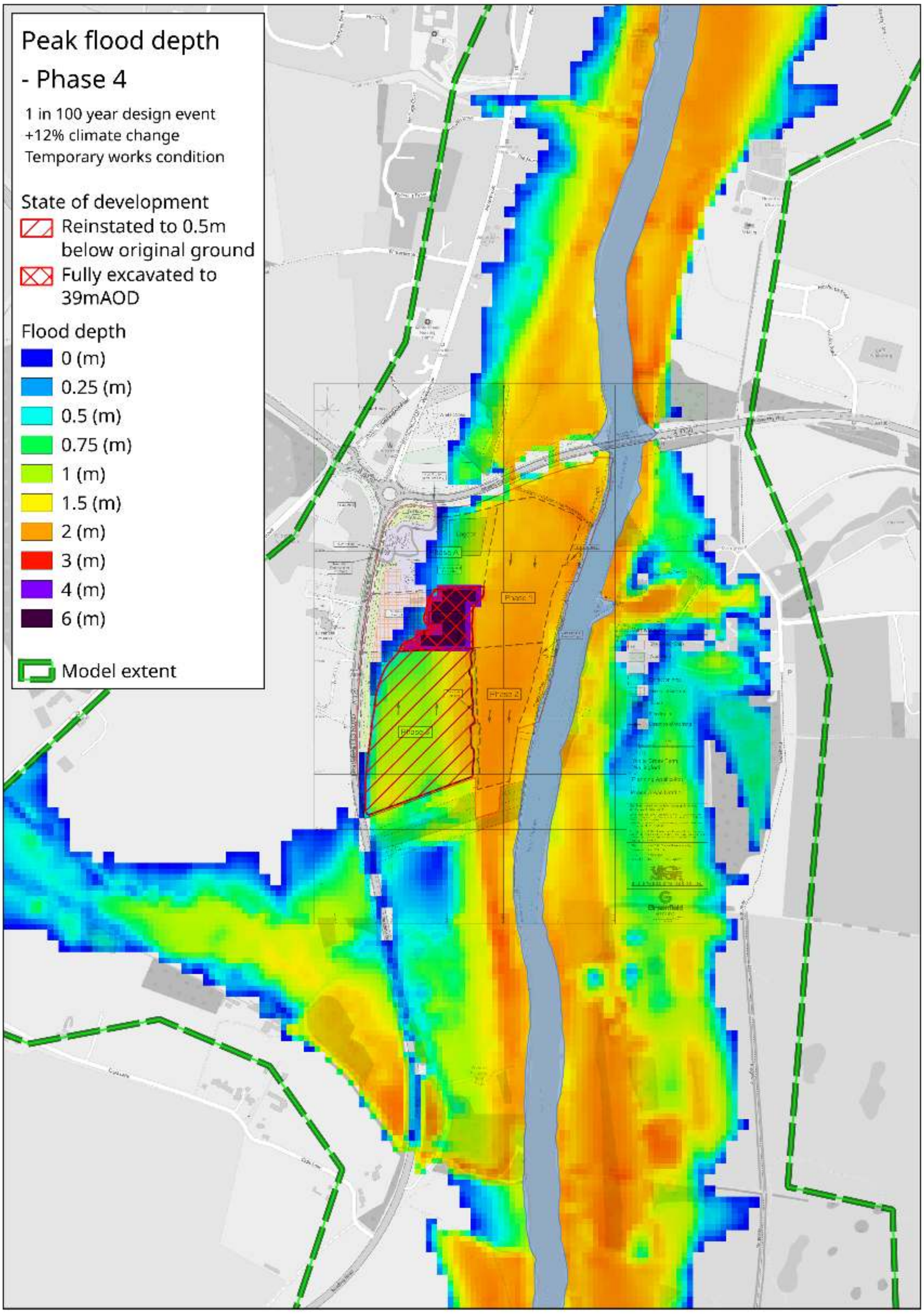

Figure B.10: Phase 4 Model Results - Peak Water Depth for a 1% AEP event with an allowance of 12% for climate change