



Radcliffe and Redvales Flood Risk Management Scheme (FRMS)

Environmental Assessment Report

May 2020



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Quality Assurance

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EIA Quality Mark

This Environmental Statement, and the Environmental Impact Assessment (EIA) carried out to identify the significant environmental effects of the proposed development, was undertaken in line with the EIA Quality Mark Commitments.

The EIA Quality Mark is a voluntary scheme, operated by the Institute of Environmental Management and Assessment (IEMA), through which EIA activity is independently reviewed, on an annual basis, to ensure it delivers excellence in the following areas:

EIA Management

EIA Team Capabilities

EIA Regulatory Compliance

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1 Introduction

1.1 Introduction

The Environment Agency (EA) has prepared this Non-Statutory Environmental Report (ER) for the Radcliffe and Redvales Flood Risk Management Scheme (FRMS) (hereafter referred to as 'the Scheme'), in order to document the EA's environmental assessment process undertaken during the detailed design stage and outline the likely environmental effects associated with the proposed Scheme.

Following receipt of an Environmental Impact Assessment (EIA) screening opinion from Bury Council, which determined the Scheme as non-EIA development; this ER has been prepared in line with EA requirements and is intended to support the planning application for the Scheme.

A Preliminary Environmental Information Report (PEIR) for the Scheme was produced in April 2018 by Mott MacDonald (MM) on behalf of the EA in support of the Outline Business Case. This ER builds on the findings of the PEIR.

1.2 The Problem

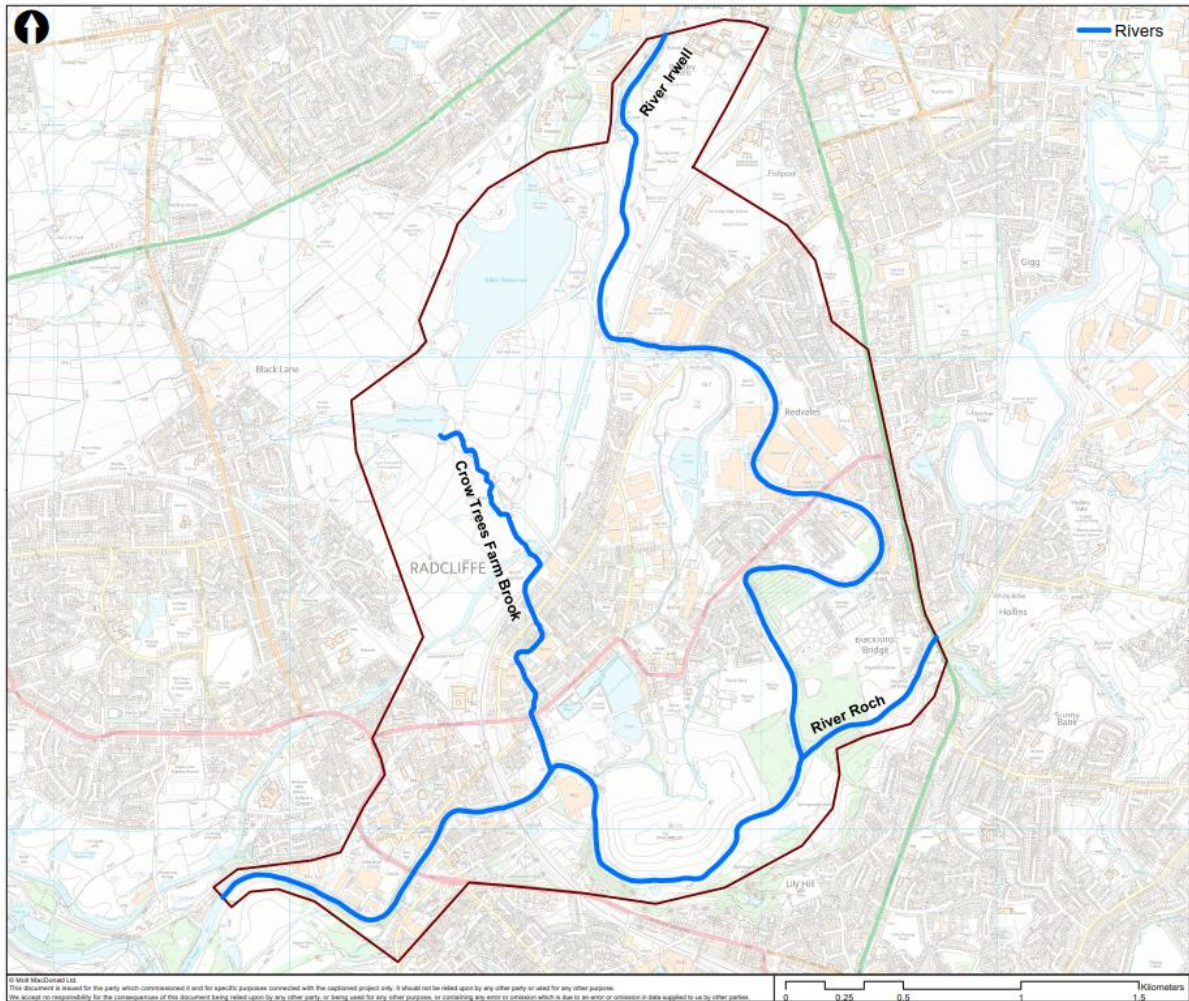
'Radcliffe and Redvales' is an area located on the outskirts of Greater Manchester, encompassing the southern extent of Bury and western extent of Radcliffe (National Grid Reference (NGR) SD 79592 08259). The River Irwell is the primary watercourse in the catchment and runs on a north-south alignment through the study area (see Figure 1 below).

Despite no history of flooding, on Boxing Day 2015 large areas of Radcliffe and Bury were flooded. This resulted in damage to numerous residential buildings, commercial property and critical infrastructure, such as Bury's main wastewater treatment works, which heavily polluted the flood water with sewage. The flood event was the result of heavy rainfall which caused the River Irwell to breach its' banks.

There are multiple sources of flooding within the study area, such as surface waters, artificial drainage systems and channel constraints, however the principal source is fluvial flooding.

Despite the flood risk there are no formal defences along the River Irwell around Radcliffe and Redvales. The potential impacts of any future flooding are made worse due to a number of large developments (both residential and commercial) which are planned within the predicted floodplain of the River Irwell.

Figure 1 Study Area Overview



Mott MacDonald, 2018

1.3 The Solution

In partnership with Bury Council, the EA have committed to delivering a Flood Risk Management solution to increase the Standard of Protection (SoP) to a 1% Annual Exceedance Probability (AEP). This would mean that the solution provides protection from flooding up to a size of flood with a probability of occurring in 1 in every 100 years. For reference, the Boxing day flood event experienced in Radcliffe and Redvales was a 3% AEP. As such, this Scheme will provide flood protection above the level experienced on Boxing Day 2015.

1.4 Structure

Chapter 1 of this ER establishes the background to the Scheme, outlining the problem and the subsequent solution for the Scheme. Chapter 2 describes the Scheme development and outlines why the preferred solution was selected. The proposed phasing of the Scheme delivery is also summarised.

Chapter 3 provides a detailed description of the Scheme and its component elements, along with a series of General Arrangement drawings. This is followed by Chapter 4

which summarises the construction strategy to deliver the Scheme. Chapter 5 outlines the methodology used in the assessment of environmental effects.

Chapter 6 presents details of the environmental baseline, key receptors, potential environmental impacts and effects, proposed mitigation measures and significant residual effects. Chapter 7 considers cumulative effects in relation to effects within the Scheme and also effects in combination with other nearby projects.

The final Chapter provides a summary and conclusion of the assessment of environmental issues.

2 Scheme Development and Phasing

2.1 Consideration of Options

An optioneering study was carried out in April 2017 to assess a 'long list' of possible scheme options for managing flood risk in the Radcliffe and Redvales area. The long list comprised a broad range of measures that could conceivably be used to help reduce flood risk, and included the following measures:

- Address the flood risk nearer to the 'Source';
- Modify the flood 'Pathway'; and
- Manage the flood risk at the 'Receptors'.

The long list considered options including water storage within the study area, upstream storage, raised linear defences and conveyance improvement measures. Each of these options were then assessed against the overall Scheme objectives. This assessment considered the overall impact of each complete option on flood risk, together with the primary technical issues and cost elements. Wider economic, social, environmental and operational impacts were also taken into consideration.

Following this long-list assessment, a 'short list' of five options were carried forward and included the 'Do-Nothing' and 'Do-Minimum' options. The 'Do-Something' options were then designed to explore different approaches, with additional component measures that included Natural Flood Management (NFM).

Of the 'Do-Something' options, Option 5C was selected as the preferred option as it was deemed best placed to meet the Scheme objectives and deliver the required SoP when compared to the other short-list options. Each of the Scheme design components has been revised and developed further during the detailed design process. An overview of the preferred option is presented below.

2.2 Preferred Option Overview

The Preferred Option Overview Plan illustrates each of the primary design components and their location within the site extent. These components are as follows with further description being provided in Chapter 4:

- Raised linear defences approximately 3200m length comprising earth embankments, sheet piled walls and concrete retaining walls;
- Raising of the parapet at Hardy's Gate Bridge;
- Minor land raising at Hutchinson's Goit culvert and associated culvert works and step to Warth Bridge footpath at Warth Road;
- Minor land raising at the perimeter of Bury Grammar School Buckley Wells playing fields to create an earth bund/small wall; and
- Habitat creation at two proposed locations (Lower Hinds, and land east of Close Park).

These components are correct as of the Scheme description in March 2019.

2.3 Proposed Phasing and Scheme Delivery

In order to meet the Scheme delivery programme, and ensure the EA's Outcome Measures (OM2) (*households with reduced risk of flooding or coastal erosion as a result of FCERM work*) are achieved within the desired timescale (implementation by 2021), the preferred option has been split into two construction delivery phases as follows:

- Phase 1: Close Park and Dumers Lane (downstream elements); and
- Phase 2: Lower Hinds, Warth Road, Keswick Drive, Redvales Business Park, York Street, Bury Point, Bury Grammar School bund, Warth Bridge works and Hardy's Gate Bridge parapet raising (upstream elements).

An ER has previously been submitted in relation to the Phase 1 design, to support the associated planning application. This planning application was approved as of March 2019 (planning application reference: 63559).

This ER will provide details of the Phase 2 design (Chapter 4), including an environmental assessment of the potential environmental impacts and effects relating directly to this phase of works (Chapter 6). Three previous planning applications were submitted in 2019 (planning application references: 64788, 64790, 64789, 65171) in respect of the following:

- One minor application for Component 10 (Warth Road);
- One minor application for Component 45 (Keswick Drive); and
- One major application for all remaining Components 6 (Lower Hinds), 37 (York Street), 38 (Redvales Business Park), and Bury Point.

This ER will also provide details of the proposed works at Hardy's Gate Bridge and Warth Bridge which will be delivered through a separate planning application to which this ER relates.

An overview of the Phase 1 design will also be provided in Chapter 4 for context to the Scheme as a whole, however this ER will not include an environmental assessment of these elements.

A Flood Risk Assessment (FRA) will include a discussion of Scheme wide flood risk, and an assessment of Phase 2 in isolation. Full details can be found in the FRA (see ENV0000389C-BMM-DZ-4ZZ-RP-Z-0215016).

2.4 Site Description and Environmental Context

The environmental sensitivity of the study area likely to be affected by the Scheme is considered below. For Radcliffe and Redvales this is in particular regard to Water Framework Directive (WFD) waterbodies, ecological sites, visual amenity and landscape value and sites of historical and cultural interest.

Since the Industrial Revolution the area has been subject to considerable development, mills of various kinds formed prominent features in the townscape. To this day the area is still subject to significant development, with a number of business parks, retail units

and numerous residential properties having been constructed in recent times. The value of the industrial heritage of the area remains and can be seen in features such as the surviving sluice mechanisms at Bealey's and Hutchinson's Goits.

The prevalence of historic industrial land use, such as textile mills and paper mills has resulted in a deterioration of the River Irwell and its ability to support wildlife. The River's water quality remains at risk from current day activities, with several pollution events occurring in the past few years. However, the EA, amongst other statutory and non-statutory bodies, have committed to restoring the River Irwell, and creating a more resilient and higher quality ecological network. The Scheme provides an opportunity to enhance the ecological potential of the existing WFD waterbody, by creating a wildlife corridor that links new or improved priority habitats for the benefit of wildlife and people.

In an area with a high level of anthropogenic influence, maintaining pockets of land which support and booster biological diversity is key. Radcliffe and Redvales has a number of Sites of Biological Importance (SBI), these are non-statutory locally designated sites specific to Greater Manchester. These sites facilitate the preservation and protection of important flora and fauna. Several of these areas are hydraulically linked to the Irwell, so any improvement in water quality (biological, chemical or physical) in the Irwell would be mutually beneficial. A key component of the Scheme design is to realise these benefits and optimise opportunities to integrate water quality improvements and WFD objectives into the design.

In terms of sensitive sites, as defined in the Town and Country Planning (Environmental Impact Assessment) Regulations 2017; the study area contains the following:

1 Scheduled Monument (Radcliffe Tower); and

No Sites of Special Scientific Interest (SSSI), National Parks, World Heritage Sites, Areas of Outstanding Natural Beauty or European sites.

Invasive species (Japanese Knotweed, Giant Hogweed and Himalayan Balsam) are particularly prevalent along the Irwell. Despite limited areas of open ground for the plants to colonise, they have spread extensively along the banks of the Irwell. Where the land either side of the river does open out (Lower Hinds, and Close Park) however, the extent of their presence is particularly noticeable. Steps to minimise the spread of invasive species will form an integral part of the Scheme, this will be achieved through a Scheme wide Invasive Species Management Plan, led by up to date best practice guidance.

2.5 Legislative and Regulatory Context

The legislative and regulatory requirements relevant to the Scheme are outlined in the respective paragraphs below. Further detail relating to local policies are contained within the Planning Statements for each of the planning submissions (see ENV0000389C-BMM-DZ-4WR-RP-T-0905005, ENV0000389C-BMM-DZ-4KD-RP-T-0905006 and ENV0000389C-BMM-DZ-4ZZ-RP-T-0905007, ENV0000389C-BMM-DZ-4WR-RP-T-0905008).

Town and Country Planning (Environmental Impact Assessment) Regulations 2017

The Scheme falls within Schedule 2, Section 10 (h/i), of the Town and Country Planning (Environmental Impact Assessment) Regulations 2017 ('the EIA Regulations'), as a development with potential significant impacts on the environment due to its size. The Scheme would exceed the 1ha threshold for Schedule 2 developments.

Following submission of a screening request to the Local Planning Authority (LPA), (Bury Council) a negative screening decision was received, which confirmed that the proposed Scheme does not comprise EIA development. The site is not considered to be in a sensitive area and the works are not likely to have a significant adverse effect on the environment.

As such following EA policy, this ER provides a non-statutory assessment of potential environmental impacts and effects likely to arise from implementation of the Scheme.

Town and Country Planning (General Permitted Development) (England) Order 2015

The EA are afforded permitted development rights, as set out in Part 13, Class D of the Town and Country Planning (General Permitted Development) Order 2015. These rights enable the EA to carry out a number of activities under protected undertaker status, making them exempt from both permitting and EIA regulations.

Certain aspects of the Scheme construction (such as site compounds) may utilise the EA's permitted development rights if they are located in direct proximity to the River.

Water Framework Directive (WFD)

Protection of the River and its water quality is regulated under the WFD (2000/60/EC) and is transposed in England and Wales through the Water Environment (Water Framework Directive) (England and Wales) Regulations 2017. The Scheme is required to be WFD compliant and an assessment has been undertaken to confirm this is the case.

3 Scheme Description

3.1 Overview

The following chapter provides details relating to the Scheme design. Phase 1 has been the subject of a detailed design exercise, and having received planning approval in 2019, has begun construction as of July 2019. An overview of the Phase 1 elements is provided in section 3.2 below. As previously stated, this ER does not provide an environmental assessment of the Phase 1 scheme elements.

Phase 2 has undergone design development and is the subject of the three planning applications to which this ER provides supporting information.

3.2 Phase 1 Overview

The following provides a brief overview of the Phase 1 (downstream) works only.

Close Park

The proposed works at Close Park includes the following:

- Component 21A raised linear defences (sheet pile wall);
- Component 21B raised linear defences (embankment);
- Component 21C raised linear defences (sheet pile wall); and
- Land to the east of Close Park WFD enhancement area.

Dumers Lane

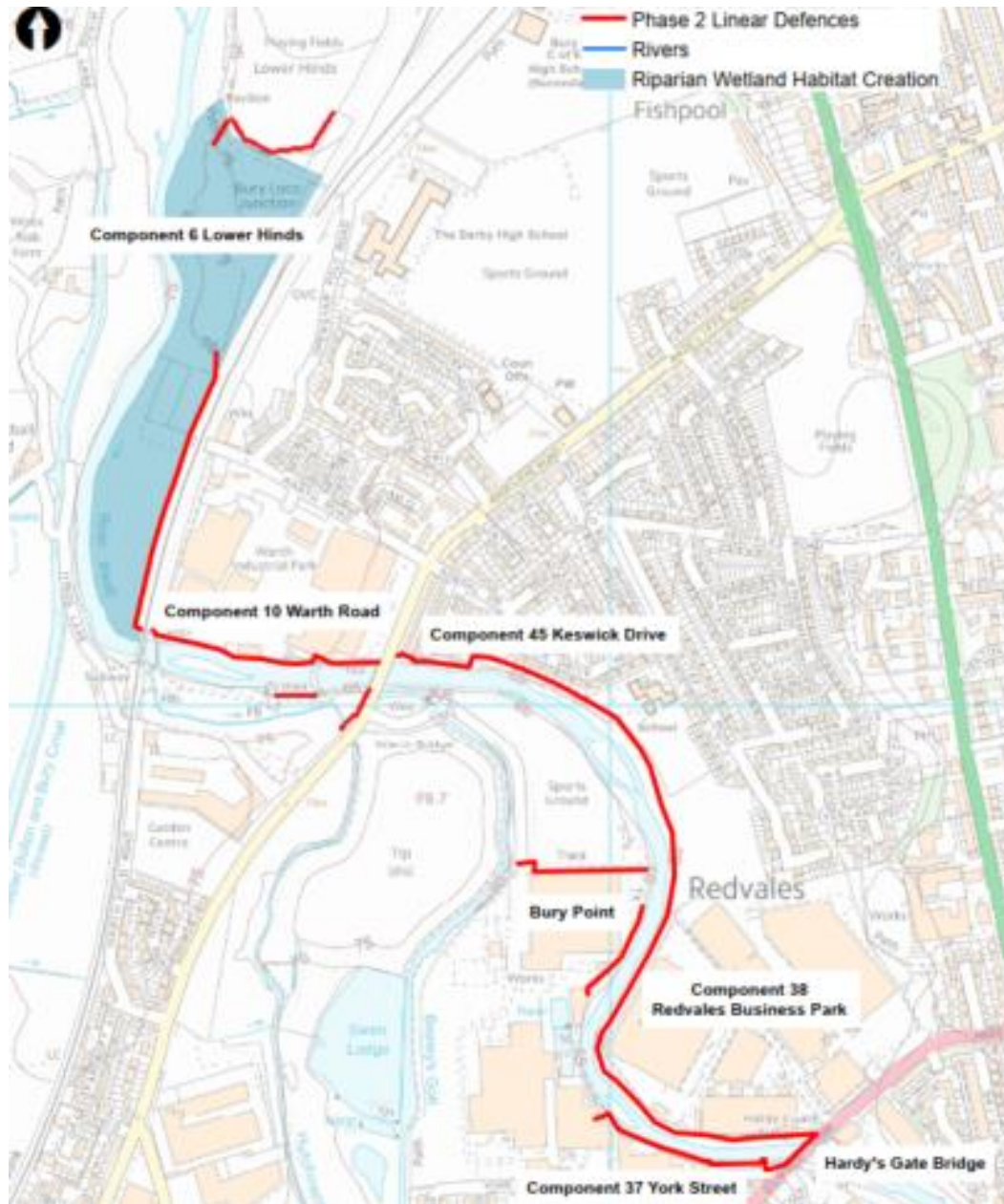
The proposed works at Dumers Lane includes the following:

- Component 19A raised linear defences (embankment); and
- Component 19B raised linear defences (sheet pile wall).

3.3 Phase 2 Design

The desired SoP for the Scheme is the 1% AEP flood event. This should be maintained throughout the 100-year appraisal period and as such, the possible future impacts of climate change will need to be considered. The location of the Phase 2 works is shown below in Figure 2. General Arrangement drawings for the design elements can be found in the respective sections below.

Figure 2 Phase 2 Elements



Mott MacDonald, 2019

3.3.1 Lower Hinds – Component 6

The works proposed at Lower Hinds will consist of a combination of flood embankment and small section of reinforced concrete retaining wall, totalling 460m in length. The alignment of the defence follows the Metrolink line north until reaching a mounded area of higher ground, at which point the defence will tie into this higher ground, incorporating it into the flood defence. The same applies for the land north of the mound, where the defence will tie into this higher ground to maintain the required flood levels throughout. See Figure 4 below for detail.

The embankment will be set-back from the river to maximise the land available for wetland habitat creation and floodplain connectivity, whilst utilising the space as

floodplain during a flood event. Informal pedestrian access will be maintained through the area, to connect to an existing footpath at the northern extent of the site.

The wetland habitat creation and floodplain connectivity works are a key requirement of the Scheme WFD mitigation measures. These works are anticipated to consist of:

- Treating of invasive species within the area, to include a burial bund of invasive species material within the landscaping design;
- Removal of part of an existing rubble embankment along the left (east) bank of the Irwell to create a wetland area inundated during higher flows (pending confirmation from third party this may be an offline intervention); and
- Re-profiling of land to create an informal floodplain, with scrapes and low points to the centre of the area, and grading to more terrestrial habitat to the edges.

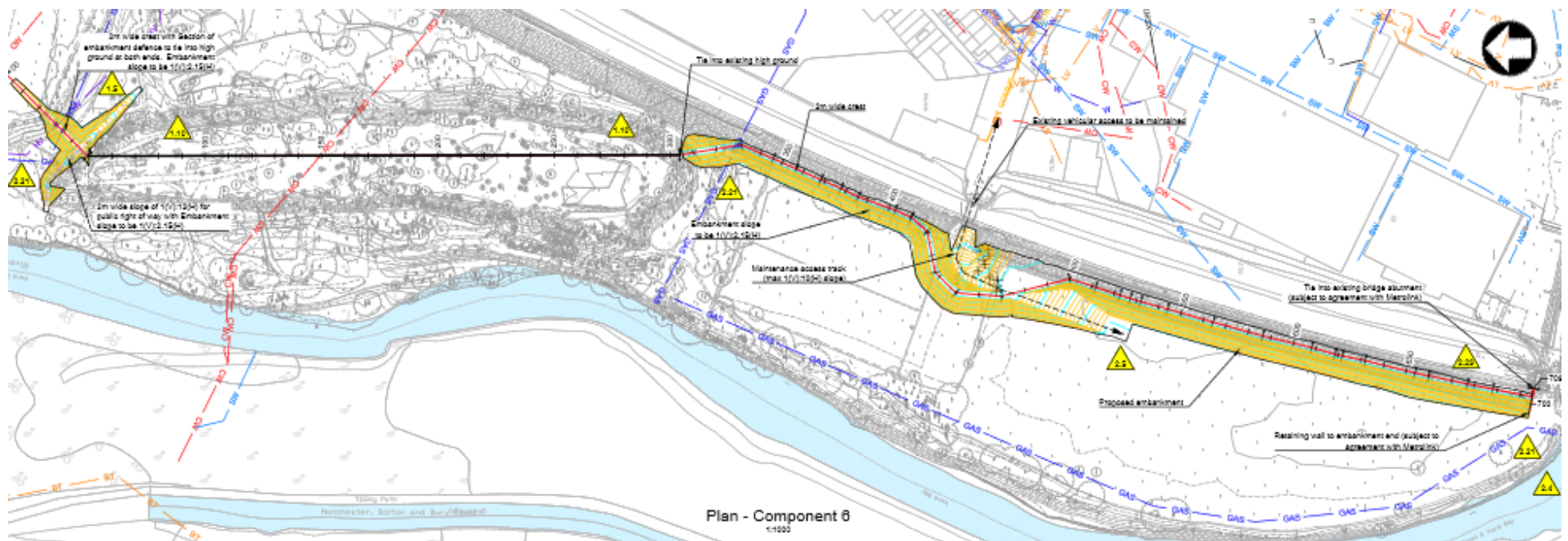
It should be noted these WFD and landscaping works are not within BMM JV scope of works and will be delivered separately by Groundwork.

Table 1 below outlines the key component design details.

Table 1 Lower Hinds Design

Component Reference	Location	Defence Type	Length (m)	Average Defence Raising (m)
6	Lower Hinds	Embankment	450	2-3
6	Lower Hinds	Retaining Wall (tie in to bridge abutment)	10	2

Figure 3 Lower Hinds Overview



Mott MacDonald 2019

3.3.2 Warth Road – Component 10

The works proposed at Warth Road will consist of a combination of vertical sheet piled retaining wall and precast concrete retaining wall, totalling 310m in length (see Figure 5 below).

The sheet pile section is anticipated to be exposed sheet pile facing on both the wet and the dry side of the defence. Downstream of Bealey's weir the sheet pile on the wet side will be faced with brick effect patterned concrete cladding to the top 4m of the wall, with exposed sheet pile on the bottom half of the wall.

The retaining wall facing will be brick effect patterned concrete to tie in with the weir stone and bridge stone on the wet side and plain finish concrete to the dry side.

The route of the defence follows a line from the Metrolink bridge downstream to Warth Road bridge, along the bank top adjacent to the commercial units in this area. The defence alignment serves to protect the existing businesses in this area.

Due to space availability, condition and presence of existing structures and land use, the alignment of the defence will require a degree of encroachment into the watercourse. Where proposed, this encroachment has been kept to a minimum, by use of a contoured alignment allowing for practical installation requirements for the proposed walls.

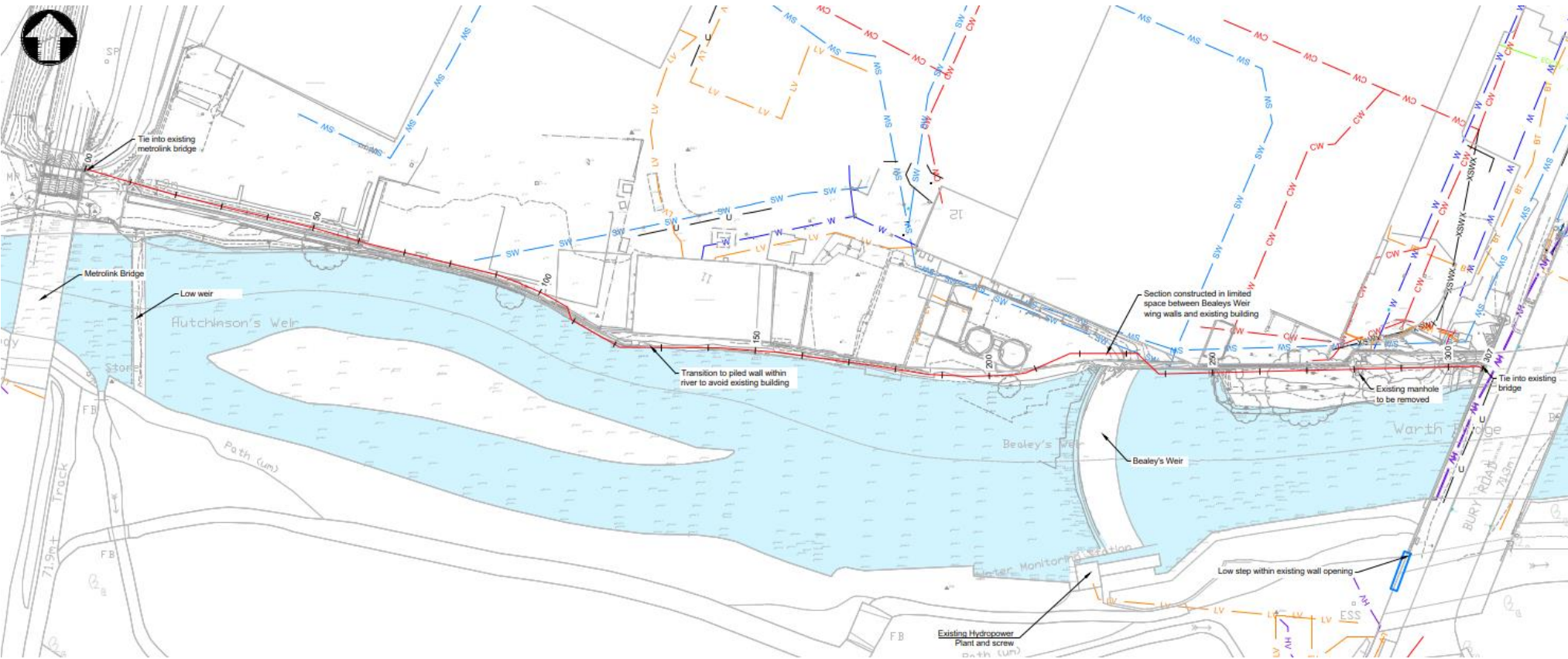
Additional minor works are proposed to Warth Bridge to address an identified low spot susceptible for overtopping onto the carriageway during peak flows. This will require addition of a small step in the existing gap in the masonry of the bridge. Temporary re-direction of the existing PRow on the right bank of the Irwell may be required during the works, to follow an existing desire line to Warth Road. Works will include refurbishment of the existing Hutchinson's Goit culvert inlet west of Warth Road to include removal of debris and silt build up. These works will also include minor land raising via an embankment structure set back from the pavement to raise ground level in an identified low spot (see Figure 5b below).

Table 2 below outlines the key component design details.

Table 2 Warth Road Design

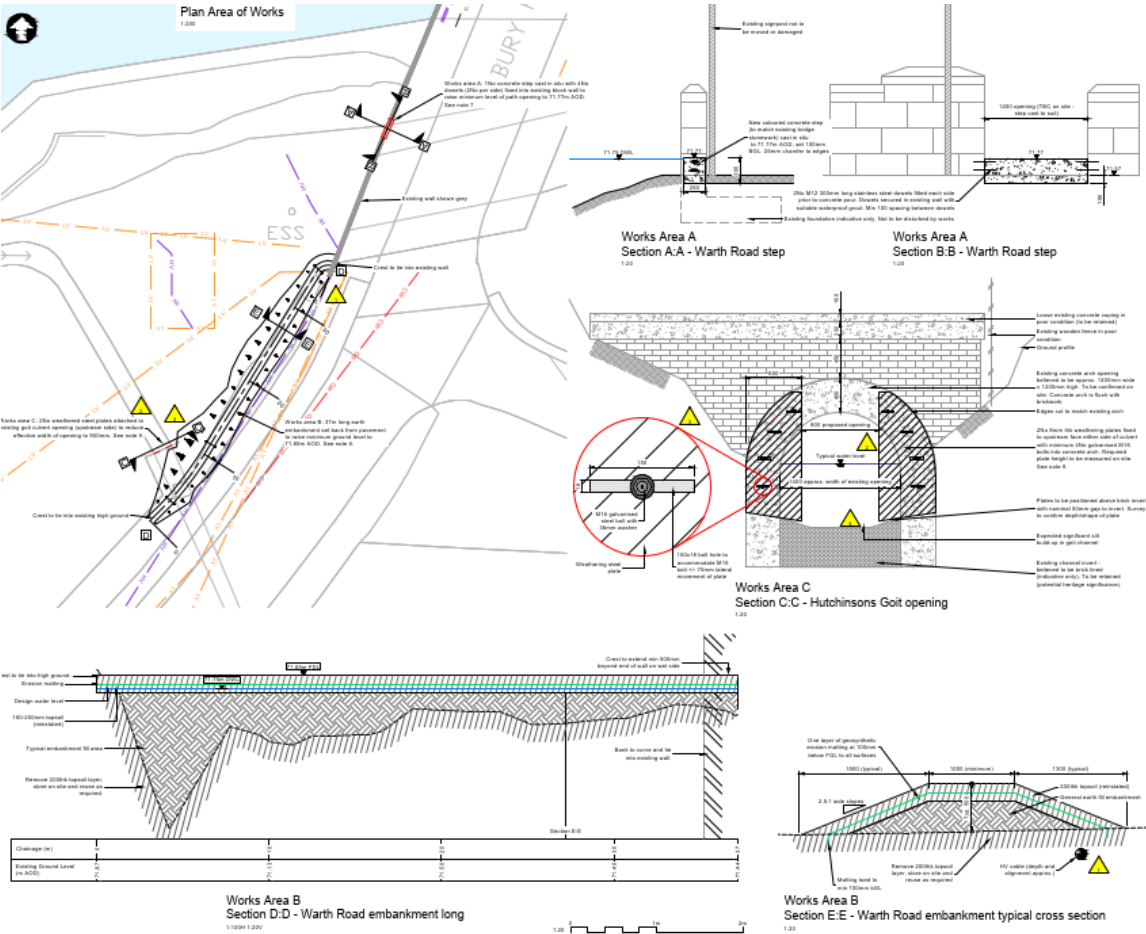
Component	Location	Defence Type	Length (m)	Average Defence Raising (m)
10	Warth Business Park	Retaining Wall	23	1-2
10	Warth Business Park	Sheet Pile Wall	287	2-4

Figure 4 Warth Road



Mott MacDonald, 2019

Figure 5b Warth Road



Mott MacDonald 2020

3.3.3 Keswick Drive – Component 45

The works proposed at Keswick Drive will consist of a combination of vertical piled retaining walls and concrete retaining walls (see Figure 6 below) to a total length of approximately 223m.

The retaining wall facing will be brick effect patterned concrete on both the wet and dry sides. The sheet pile facing will be exposed on the wet side and a combination of brick effect patterned concrete, and where viewed from residential properties will be sheet pile clad with timber trellis fencing to the rear of properties.

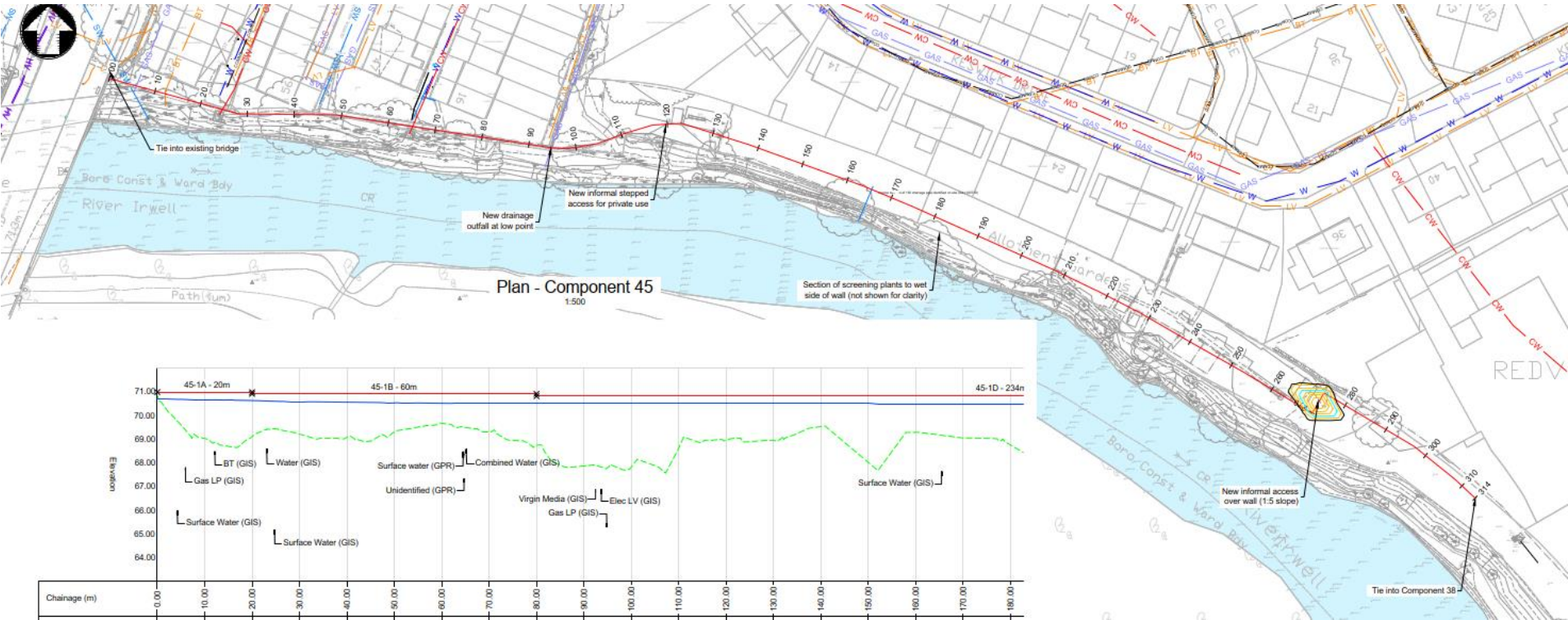
The route of the defence follows a line from Warth Road bridge downstream past residential properties at Keswick Drive, at which point the defence alignment will be set back from the river approximately 7m from the property boundaries. The defence will tie in to the Redvales Business Park (Component 38) defence at St Peter's Primary School.

Table 3 below outlines the key component design details.

Table 3 Keswick Drive Design

Component	Location	Defence Type	Length (m)	Average Defence Raising (m)
45	Keswick Drive	L-shaped Retaining Wall	80	1-2
45	Keswick Drive	Sheet Pile Wall	143	1-3

Figure 6 Keswick Drive



Mott MacDonald 2019

3.3.4 Redvales Business Park – Component 38

The works proposed at Redvales Business Park will consist of a combination of gravity retaining wall and sheet pile retaining wall, totalling approximately 789m in length (see Figure 7 sheets A and B below).

The sheet pile wall facing will be exposed sheet pile on both the wet and dry sides of the defence. The retaining wall will be a combination of brick effect patterned concrete on both wet and dry side, and plain finish coloured concrete on both the wet and dry side.

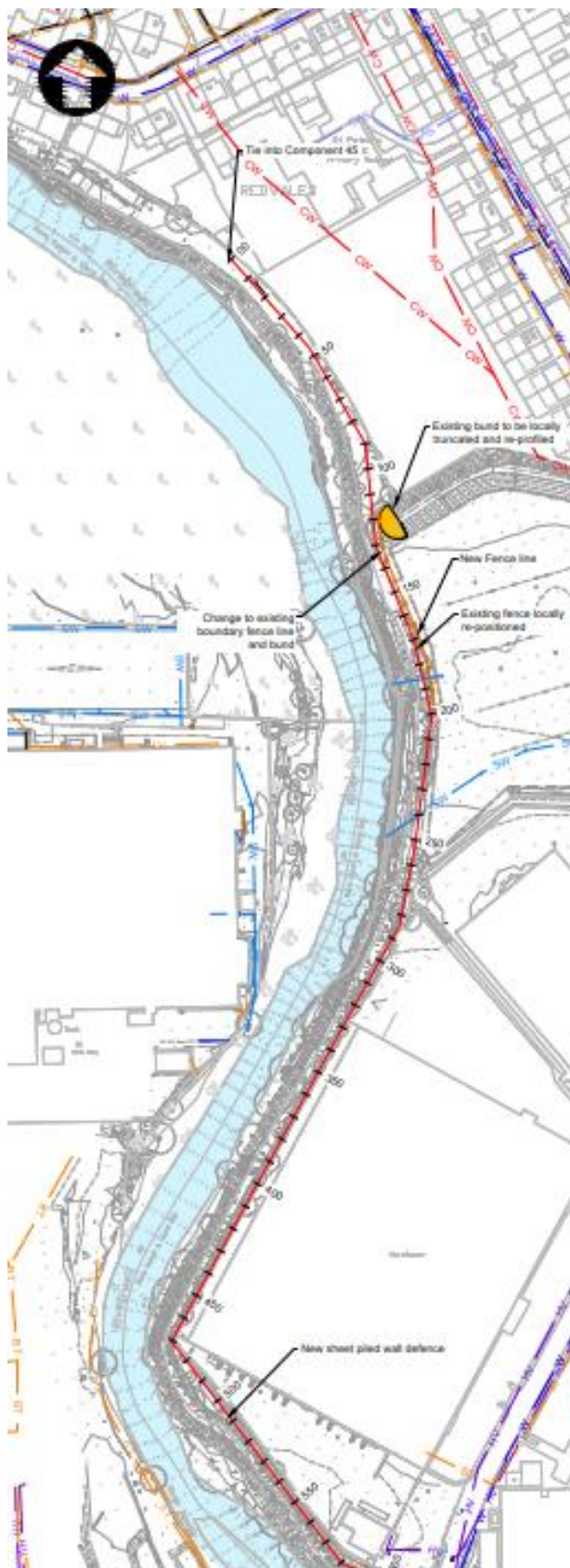
The alignment of the defence follows the bank top from St Peter's primary school south along the bank adjacent to Redvales Business Park, before tying in to Hardy's Gate Bridge. The alignment will be set-back from the river, along the bank crest, to avoid the steeply sloped banks along this section.

Table 4 below outlines the key component design details.

Table 4 Redvales Business Park Design

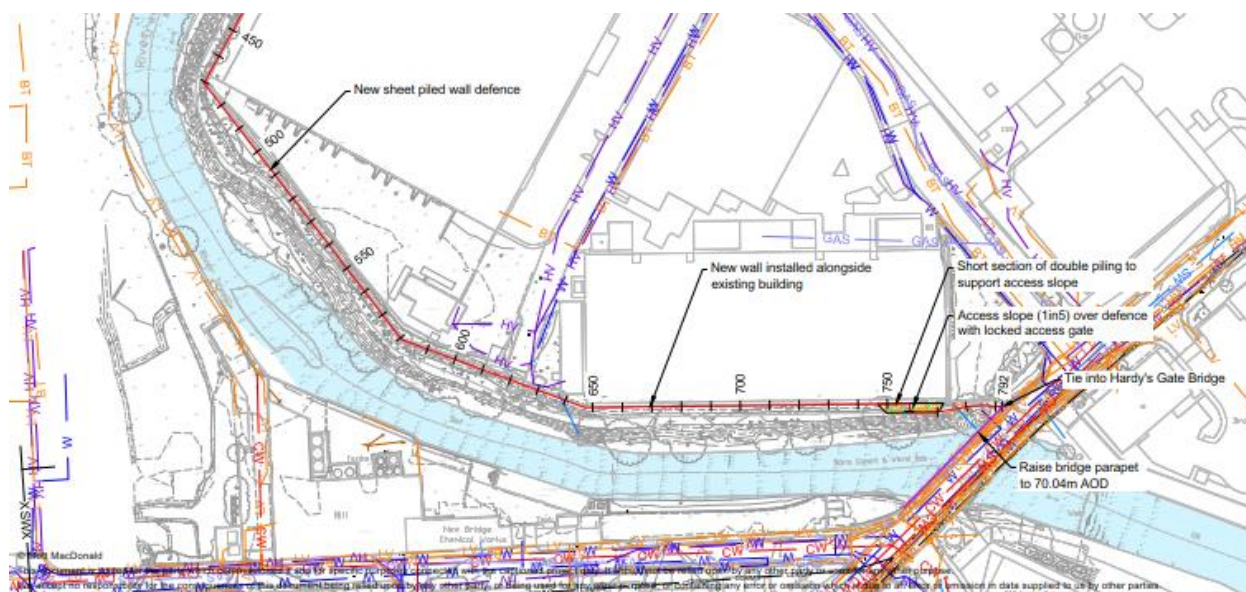
Component	Location	Defence Type	Length (m)	Average Defence Raising (m)
38	Redvales Business Park	Gravity Retaining Wall	252	1-2
38	Redvales Business Park	Sheet Pile Retaining Wall	537	2-3

Figure 7 Redvales Business Park – Sheet A



Mott MacDonald, 2019

Figure 8 Redvales Business Park – Sheet B



Mott MacDonald, 2019

3.3.5 York Street – Component 37

The works proposed at York Street will consist of a combination of L-shaped retaining wall, sheet pile and precast concrete units for a total length of 270m.

The retaining wall will be plain finish coloured concrete facing on both the wet and dry side of the defence. The sheet pile/precast units will be faced with exposed sheet pile (low level) and plain finish coloured concrete on the wet side and plain finish coloured concrete on the dry side.

The alignment of the defence follows the property boundary of Whewell Chemical Works along the top of the bank. Due to space availability, condition and presence of existing structures and land use, the alignment of the defence will require a degree of encroachment into the watercourse. Where proposed, this encroachment has been kept to a minimum, allowing for practical installation requirements for the proposed walls.

Table 5 below outlines the key component design details.

Table 5 York Street Design

Component	Location	Defence Type	Length (m)	Average Defence Raising (m)
37	York Street	L-shaped Retaining Wall	18	2-5
37	York Street	Combination of Sheet Pile and Precast units	252	7 (height due to drop on wet side)

Radcliffe and Redvales FRMS Phase 2 Non-Statutory Environmental Report

3.3.6 Bury Point

The works proposed at Bury Point will consist of two sections of retaining wall and a flood gate, included in the northern section alignment (see Figure 10 below). Both the north section and east section facing will consist of plain finish concrete, to both the wet and dry sides of the defence. The flood gate will be approximately 7m wide to allow vehicular access. A 1.5m wide pedestrian gate will be adjacent.

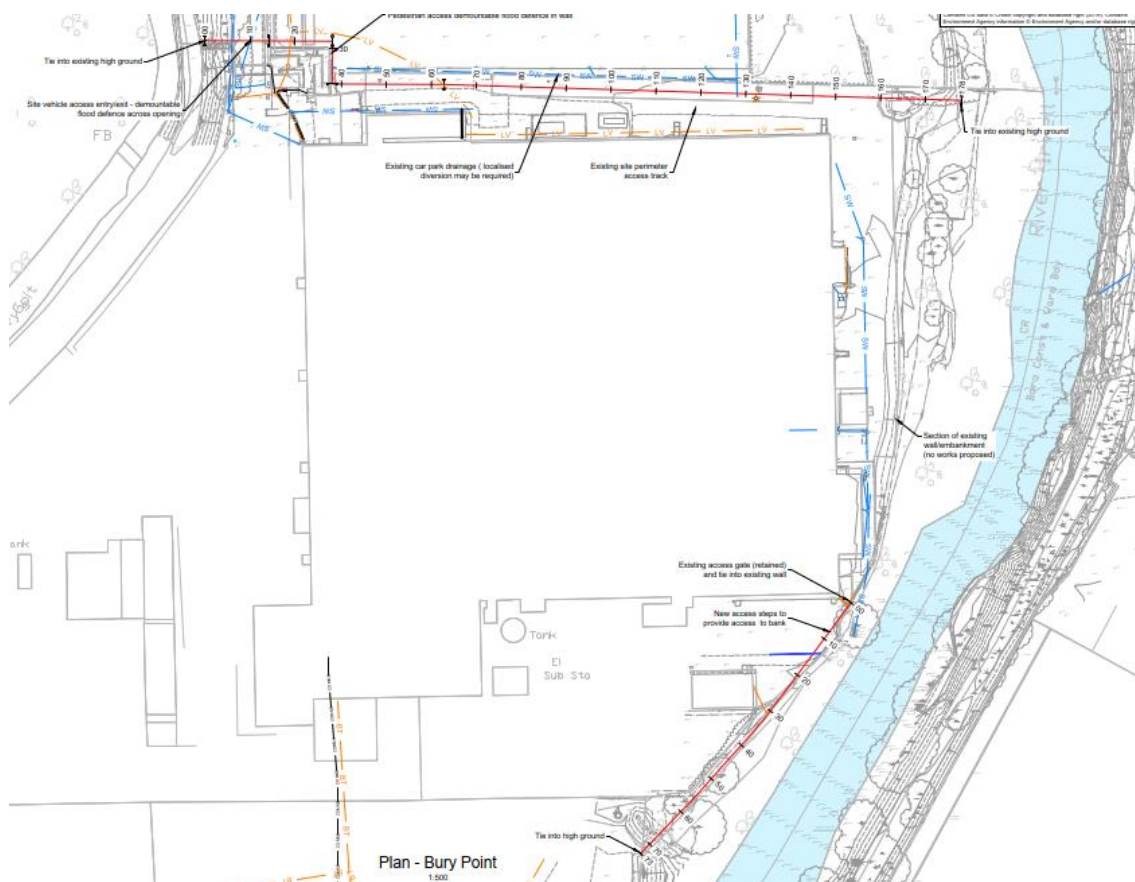
The route of the defence alignment ties in to existing high ground to the north and to the east, where a section of existing embankment material will be retained.

Table 6 below outlines the key component design details.

Table 6 Bury Point Road Design

Component	Location	Defence Type	Length (m)	Average Defence Raising (m)
Bury Point	North Defence	Gravity Retaining Wall	176	1-2
Bury Point	East Defence	Gravity Retaining Wall	144	1-2

Figure 10 Bury Point



Mott MacDonald, 2019

3.3.7 Hardy's Gate Bridge

The works at Hardy's Gate Bridge are understood to consist of raising of the parapet on the upstream side of the bridge. This will be undertaken by systematic removal of the masonry stonework currently across the top of the parapet. A new course approximately 250mm thick of matching stonework will be installed atop the lower course. The existing coping stones will be reinstated atop the new course.

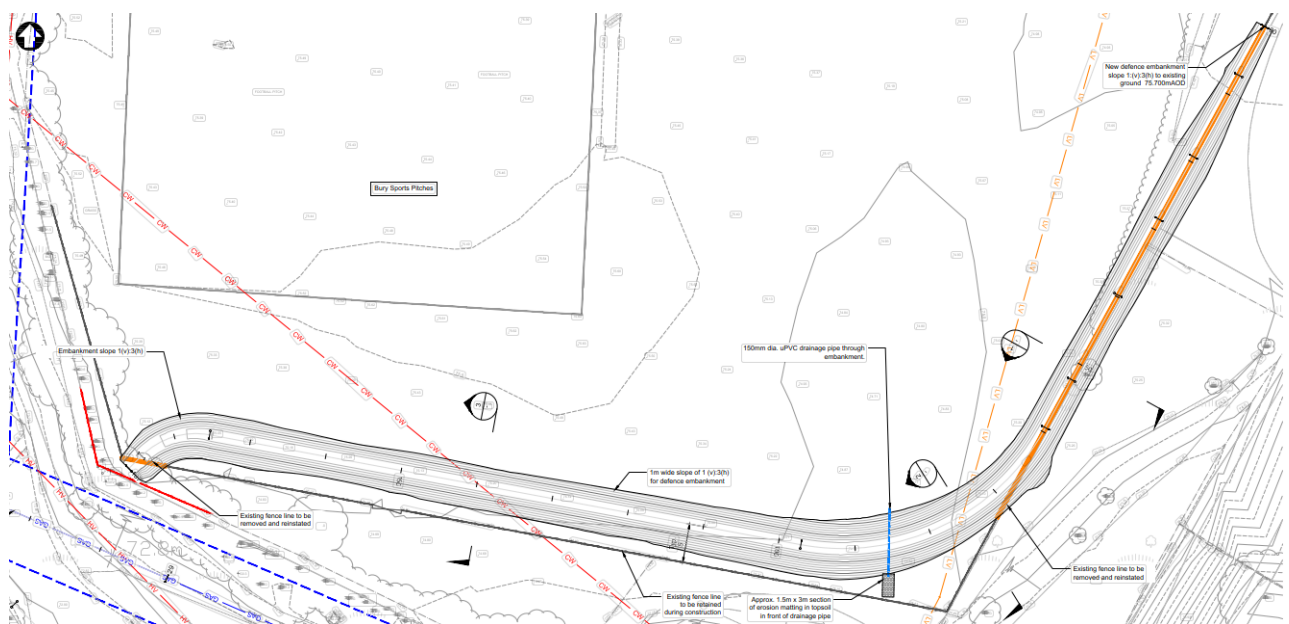
The bridge would be reinforced by vertical steel dowels drilled through the parapet into the bridge stonework below. A drawing detailing these works will be provided alongside the relevant subsequent planning application.

In order to prevent the risk of heavy debris impact to the upstream parapet, it is proposed that 2 No. cables are installed across the river between the newly constructed flood defences upstream of the bridge. These cables will be placed and designed to become effective during low-likelihood, high flood level events, to catch debris bound for impact with the parapet.

3.3.8 Bury Grammar School

The works at Bury Grammar School will consist of creation of a small bund of raised ground or combination with a dwarf wall at the perimeter of the Buckley Wells playing field. This bund will prevent minor spill of flood waters due to an isolated low spot at the south-east corner of the fields.

Figure 11 Bury Grammar School



4 Construction Considerations

4.1 Construction Site Management

4.1.1 Hours of Work

It is anticipated that the standard hours of work for all aspects of the Scheme construction will be between 0800 – 1800 Monday to Friday. Any work outside these hours will be subject to prior agreement. Night time working, along with any instances of large construction deliveries, will be restricted to exceptional circumstances.

4.1.2 Traffic Management

At the time of writing, access to the Scheme working areas will be off the A56 (to the north east). Site compounds will be required to house welfare facilities and material storage areas, it is anticipated these will consist of a primary compound and a number of smaller satellite compounds.

A small site compound will be located at each of the defences to house welfare facilities and facilitate the storage of materials for use on site. Access to compounds will be via designated construction haulage routes and signposted as appropriate for other site users, if required.

Appropriate provision of construction access signage will be provided along adjacent roads to identify the individual work areas, and off road parking facilities will be provided at all locations to mitigate any disruption to the public highway users. Information packs will be passed to all suppliers and delivery drivers to ensure compliance with the Projects Travel Plan.

Hardy's Gate Bridge

It is envisaged that works will be constructed under single file running traffic management controlled by traffic lights. It is not anticipated that full closure of the bridge will be required in order to complete the parapet raising works, however a lane closure will be in place for approximately 10 weeks. Please note this information is correct as of the time of writing and will be updated to prior to submission of subsequent planning applications relating to Hardy's Gate Bridge.

Pedestrian access over the bridge will be provided via the existing footway adjacent to the carriageway. This will require pedestrians to cross over the road at the traffic lights at Hardy's Gate Bridge. Appropriate signage will be provided to facilitate this crossing safely.

Appropriate provision of construction access signage will be provided along York Street to identify the additional works traffic likely to be encountered during the construction period.

Lower Hinds

Primary access to the working area will via Warth Road and Openshaw Fold Road, utilising the existing Metrolink underpasses. Appropriate signage will be provided along these areas to identify the additional works traffic required during construction. It is not envisaged that any long term traffic management restrictions will be required.

A site compound will be established on the existing tarmac surfacing in the central section of Lower Hinds to house the welfare facilities and storage areas.

Pedestrian access within the working area at Lower Hinds will be closed, this includes the existing PRow to the north which will be temporarily closed during the works.

The anticipated number of vehicle movements during construction of this component is unknown at present. Vehicle movements will be during off-peak times (between 9am and 3pm). Whilst restricting the times will increase the frequency of vehicle movement, having movements during off-peak times only is considered to have less of an impact on local residents and businesses.

Warth Road – Component 10

At the time of writing, primary access to the construction working area will be via Warth Business Park. Working restrictions may be required for companies currently operating on this site, to prevent un-authorised access to the construction areas. Works to Hutchinson's Goit culvert will be constructed where possible from land adjacent to the west of the culvert.

It is not envisaged that any long term traffic management restrictions will be required in the area, however appropriate provision of construction access signage will be provided along Radcliffe Road to identify the additional works traffic required during construction.

The anticipated number of vehicle movements during construction of this component is unknown at present. Vehicle movements will be during off-peak times (between 9am and 3pm). Whilst restricting the times will increase the frequency of vehicle movement, having movements during off-peak times only is considered to have less of an impact on local residents and businesses.

During construction a temporary floating platform or pontoon will be utilised to allow access to the wet side of the defence from the river. Appropriate permits will be obtained by the Contractor prior to these works starting.

Keswick Drive – Component 45

At the time of writing, primary access to the construction working area will be via Kendal Drive and Keswick Drive. Restrictions on site will be in place to ensure no un-authorised access to the construction areas.

It is not envisaged that any long term traffic management restrictions will be in place, however appropriate provision of construction access signage will be provided at Keswick Drive to identify the additional works traffic required during construction.

The anticipated number of vehicle movements during construction of this component is unknown at present. Vehicle movements will be during off-peak times (between 9am and 3pm). Whilst restricting the times will increase the frequency of vehicle movement, having movements during off-peak times only is considered to have less of an impact on local residents and businesses.

Redvales Business Park – Component 38

At the time of writing, primary access to the construction working area will be via the A6053 to Redvales Business Park. Restrictions on site will be in place to ensure no un-authorised access to the construction areas.

It is not envisaged that any long term traffic management restrictions will be in place, however appropriate provision of construction access signage will be provided at along the A6053 and the Business Park to identify the additional works traffic required during construction.

The anticipated number of vehicle movements during construction of this component is unknown at present. Vehicle movements will be during off-peak times (between 9am and 3pm). Whilst restricting the times will increase the frequency of vehicle movement, having movements during off-peak times only is considered to have less of an impact on local residents and businesses.

York Street – Component 37

Primary access to the construction working area will be via the A6053 and York Street. Restrictions will be in place to ensure no un-authorised access to the construction areas.

It is not envisaged that any long term traffic management restrictions will be in place, however appropriate provision of construction access signage will be provided along the A6053 and York Street to identify the additional works traffic required during construction.

The anticipated number of vehicle movements during construction of this component is unknown at present. Vehicle movements will be during off-peak times (between 9am and 3pm). Whilst restricting the times will increase the frequency of vehicle movement, having movements during off-peak times only is considered to have less of an impact on local residents and businesses.

During construction a temporary floating platform or pontoon will be utilised to allow access to the wet side of the defence from the river. Appropriate permits will be obtained by the Contractor prior to these works starting.

Bury Point

Primary access to the construction works area will be via Bury Road, utilising the existing DHL site access road. Restrictions will be in place to ensure no un-authorised access to the construction areas.

It is not envisaged that any long term traffic management restrictions will be in place, however appropriate provision of construction access signage will be provided along the Bury Road to identify the additional works traffic required during construction.

The anticipated number of vehicle movements during construction of this component is unknown at present. Vehicle movements will be during off-peak times (between 9am and 3pm). Whilst restricting the times will increase the frequency of vehicle movement, having movements during off-peak times only is considered to have less of an impact on local residents and businesses.

Bury Grammar School

Primary access to the works will be via an existing private access track off Bridge Road. Restrictions will be in place to ensure no un-authorised access to the construction areas.

It is not envisaged that any long term traffic management restrictions will be in place, however appropriate provision of construction access signage will be provided along the Bridge Road to identify the additional works traffic required during construction.

The anticipated number of vehicle movements during construction of this component is unknown at present. Vehicle movements will be during off-peak times (between 9am and 3pm). Whilst restricting the times will increase the frequency of vehicle movement, having movements during off-peak times only is considered to have less of an impact on local residents and businesses including peak times for the School drop off.

4.1.3 Dust and Air Pollution

Demolition dust will be controlled, where necessary, by a sheeted enclosure for containment and dampening down. Dust from site roads will be minimised by dampening down using water bowsers.

Exhausts from plant and equipment will be controlled by plant maintenance and a selection of appropriate equipment.

4.1.4 Noise and Vibration

For the driving of piles, vibration monitoring will be required at sensitive locations, such as the residential properties at Keswick Drive and York Street. This will ensure that legislative threshold levels for vibration are not breached, and any additional mitigation such as household condition surveys are undertaken as required. Property specific mitigation such as vibration insulation may be required, however, this will be determined prior to the works commencing and detailed further within the Construction Environmental Management Plan (CEMP).

4.1.5 Disposal of Site Water

In order to avoid contamination of existing local drainage systems, the site run-off water will be initially collected in holding tanks before discharging to the local foul sewerage system (subject to agreement with the relevant Statutory Undertaker).

4.1.6 Site Compounds

Several satellite compounds will be located in proximity to each of the components, with a central compound located at Morris Street/Dumers Lane for the duration of the Phase 2 works.

All compounds will be provided with min 1.8m high hoarding and secured. 24hr security will be provided at all compounds, including the use of guards, CCTV and motion sensor cameras.

Off road car parking provision will be made at all locations, to avoid any increase in on road parking. A minibus will also be employed to provide transport to any of the 'remote' working areas.

4.2 General Construction Considerations

Table 7 below provides an indication of the major type of materials expected to arise from the demolition phase.

Table 7 Indicative materials arisings

Material	Material Source
Concrete	Retaining Walls, hardstanding, bridge works
Stonework / Masonry	Bridge cladding / construction
Plastic Ducting	All areas
Trees and vegetation	All areas
Topsoil	All areas
Contaminated soil	All areas where invasive plant material located
Subsoil	All areas

The main materials required for the Scheme construction will typically include those as indicated in Table 8 below.

Table 8 Indicative materials

Material	Material Required For
Reinforced Concrete	Retaining walls
Steel sheet piles	Retaining Walls
Plastic Ducts	Service crossings at Lower Hinds
Structural Fill	Embankment
Class 2 clay	Embankment core
Masonry	Finish to retaining walls
Timber	Formwork and Cladding
Aggregates	Footpath and accessway construction

Consideration has been given to the types of plant and equipment that are likely to be used during the demolition and construction phases of the development. Table 9 presents an indication of typical plant and equipment associated with each key element of the construction process.

Table 9 Plant and Equipment Use

Plant and Equipment	Enabling Works	Demolition Works	Construction Works	Services and Finishes
Crawler Cranes	Y	Y	Y	N
Excavators 8 – 30T	Y	Y	Y	Y
Dumptrucks 25T	N	Y	Y	N
Sheet pile leader rig	N	N	Y	N
Silent Pile Press	N	N	Y	N
Telehandler	Y	Y	Y	Y
Dozer	N	N	Y	N
Tandem Roller	Y	N	Y	Y
Hydraulic Breaker	N	Y	Y	N
Pontoon	N	Y	Y	N

4.3 Indicative Construction Methodologies

Environmental constraints or risks specific to environmental features, such as pollution prevention measures, biosecurity measures, invasive species and associated methodologies will be detailed within the CEMP.

4.3.1 Lower Hinds

This section comprises primarily embankment works with significant imports and handling of earth. Construction of this section will be required to be undertaken alongside the existing Metrolink embankment and will be constructed within relevant working constraints. Primary activities will include:

- Creation of temporary access corridors;
- Removal of trees and vegetation along the line of the new embankments;
- Stripping of topsoil from the existing footprint, to be retained on site for re-use where appropriate;
- Application of a waterproof membrane to embankment face;
- Installation of clay core along the required sections of embankment;
- Placement and compaction of imported fill material to create extended and new embankment structures and reinstatement of topsoil;

- No deliveries to site will occur between the hours of 5pm and 8am due to the presence of residential properties along Openshaw Fold Road and the potential disturbance this would otherwise cause; and
- Construction of precast retaining wall to restore footpath access under Metrolink bridge.

A mixture of pre-cast and in-situ concrete will be required to tie in the new embankment into the existing Metrolink bridge.

4.3.2 Warth Road – Component 10

This section comprises a mix of concrete and piled wall structures, generally installed along the existing water front. It is envisaged construction will be undertaken in a number of key phases in accordance with the differing methodologies required along the alignment chainage. Primary activities will include:

- Removal of trees and vegetation along the line of the new wall as necessary for access;
- Establish a floating platform/pontoon for discrete sections along the desired length of the alignment to facilitate works from the wet side of the defence;
- Driving of sheet piles along the defence alignment with connection to precast elements near Metrolink bridge and to either side of Bealey's Weir;
- Excavation, preparation of foundations and placement of precast and in-situ concrete walls to tie in to piles; and
- Reinstatement of any topsoil / replacement of hardstanding on completion.

At component 10 the existing riverbank comprises masonry and concrete walls which have been modified and extended historically. The construction of these walls is unknown and their condition and structural integrity is uncertain and unreliable. As such, the scheme is unable to simply extend these structures upwards. These structures and adjacent buildings exist very close to the edge of the river, leaving insufficient space to construct a wall without construction of a new wall foundation within the watercourse. Encroachment into the watercourse has therefore been considered necessary, whilst being kept to a minimum by the use of a contoured alignment, allowing for practical installation requirements for the proposed wall.

Details relating to the Hutchinson Goit and minor land raising works will be provided alongside a subsequent planning application, as are not yet confirmed at the time of writing.

4.3.3 Keswick Drive – Component 45

This section comprises a mix of concrete and piled wall structures, generally installed set back from the existing water front, minimising disturbance to existing banks. It is envisaged construction will be undertaken in a number of key phases in accordance with the differing methodologies required along the alignment chainage. Primary activities will include:

- Creation of temporary access corridors;
- Removal of trees along the defence alignment to facilitate access for driving of piles (as required) and installation of pre-cast concrete sections;

- Excavation, foundation preparation and placement of pre-cast concrete walls along the alignment;
- Reinstatement of topsoil and land required for access, this may require use of residential gardens; and
- Planting of screening plants.
- Vibration monitoring will be in place for the full duration of the work and structural surveys as required, for existing properties adjacent to the alignment.

4.3.4 Redvales Business Park - Component 38

This section comprises a mix of concrete and piled wall structures, generally installed set back from the existing water front, minimising disturbance to existing banks. It is envisaged construction will be undertaken in a number of key phases in accordance with the differing methodologies required along the alignment chainage. Primary activities will include:

- Creation of temporary access corridors.
- Removal of trees and vegetation along the line of the new wall as necessary for access;
- Excavation, foundation preparation and placement of modular precast concrete wall;
- Driving of steel piles along the alignment; and
- Reinstatement of material excavated/stripped on completion of the works.

4.3.5 York Street – Component 37

This section comprises a mix of concrete and piled wall structures, generally installed along the existing water front. Primary activities will include:

- Site preparation, including removal of existing walls and building panels, as necessary for access;
- Installation of low level piles along the alignment from the dry side via semi-automated piling system to avoid working within the river;
- Concrete pile capping and preparation;
- Installation and fixing of vertical precast concrete panel sections above the low level piles;
- Backfill with filter material (stone) to allow ground water to flow out of the surrounding ground; and
- Reinstatement of buildings and surfacing on completion.

At component 37 the existing riverbank comprises masonry and concrete walls which have been modified and extended historically. The construction of these walls is unknown and their condition and structural integrity is uncertain and unreliable. As such, the Scheme is unable to simply extend these structures upwards. These structures and adjacent buildings exist very close to the edge of the river, leaving insufficient space to construct a wall without construction of a new wall foundation within the watercourse. Encroachment into the watercourse has therefore been considered necessary, whilst

being kept to a minimum, allowing for practical installation requirements for the proposed wall.

4.3.6 Bury Point

This section comprises precast concrete wall structures, generally installed set back from the existing water front, minimising disturbance to existing banks. Primary activities will include:

- Creation of temporary access corridors;
- Excavation, preparation of foundations and placement of precast concrete walls to tie in to existing embankment and wall structures;
- Installation of flood gate structures across vehicle and pedestrian access points; and
- Reinstatement of site on completion.

4.3.7 Bury Grammar School

This section comprises minor earthworks to create a small embankment and or combination of embankment and dwarf wall at the perimeter of the playing fields. Primary activities will include:

- Creation of temporary access corridors;
- Placement and compaction of imported fill material to create extended and new embankment structures and reinstatement of topsoil;
- Reinstatement of site on completion.

4.3.8 Hardy's Gate Bridge

This section comprises works to Hardy's Gate Bridge parapet. Primary activities will include:

- Creation of temporary access corridors;
- Removal of masonry parapet to level;
- Installation of dowel bars;
- Reconstruction of masonry parapet to new level;
- Reinstatement of site on completion.

5 Assessment Methodology

5.1 Overview

As previously stated, the Scheme is not considered EIA development and this report therefore comprises a non-statutory assessment of the likely environmental impacts and effects associated with the Scheme implementation. This chapter presents topics scoped in and out, details of the methodology applied to the assessment including the application of significance criteria, cumulative assessment and a list of assumptions and limitations.

5.2 Scoping of Environmental Topics

An environmental appraisal and scoping exercise was carried out to consider the potential for environmental effects that could arise during the construction and operation of the Scheme. Each of the topics included in Table 10 below has been scoped in or out of consideration within this ER. A reason for inclusion or exclusion has also been added.

Table 10 Environmental Scoping and Appraisal

Environmental Topic	Scoping Outcome	Key Issues During Construction	Key Issues During Operation
Flood Risk	Excluded from ER	No requirement for further assessment as the primary objective of the Scheme is to reduce flood risk. As such this issue can be scoped out . The Phase 2 planning application will submit a FRA to demonstrate that there will be no increase in flood risk as a result of the proposed Phase 2 works.	On completion the Scheme is intended to reduce flood risk, as such operational impacts are considered to be nil. This issue can be scoped out .
Ecology and Biodiversity	Included in ER	Scoping identified potentially sensitive ecological receptors that could be affected during construction. As such this issue is scoped in .	No operational impacts are anticipated as a result of the Scheme and as such operational issues have been scoped out . The EA are undertaking active treatment of invasive species within the footprint of existing assets, this will continue for any

Environmental Topic	Scoping Outcome	Key Issues During Construction	Key Issues During Operation
			future assets established as a result of the Scheme.
Geology, Soils and Contaminated Land	Included in ER	Scoping identified contaminated land present on site and potential for adverse impacts from the proposed works during construction. As such this issue is scoped in .	No operational impacts are anticipated as a result of the Phase 2 works and operational impacts have been scoped out .
Water Environment and Water Framework Directive	Included in ER	Scoping identified potential impacts to geomorphology and the water environment during construction. As such this issue is scoped in .	Potential impacts to the water environment are anticipated during the Phase 2 works operational phase. Operational impacts have been scoped in .
Townscape and Visual Amenity	Included in ER	Scoping identified potential for visual impacts and impacts to townscape from the proposed works during construction. As such this issue is scoped in .	Potential impacts to townscape and visual amenity are anticipated during the Phase 2 works operational phase. Operational impacts have been scoped in .
Cultural Heritage and Archaeology	Included in ER	Scoping identified potential impacts to cultural heritage assets during construction of the Phase 2 works. As such this issue is scoped in .	Potential impacts to cultural heritage are anticipated during the Phase 2 works operational phase. Operational impacts have been scoped in .
Land Use and Recreation	Included in ER	Scoping identified potential changes to land use and recreation during construction of the Scheme. As such this issue is scoped in .	Potential impacts to land use and recreation are anticipated during the Phase 2 works operational phase. Operational impacts have been scoped in .
Traffic and Transport	Included in ER	Scoping identified potential changes to local traffic during construction which require	No operational impacts to traffic and transport are

Environmental Topic	Scoping Outcome	Key Issues During Construction	Key Issues During Operation
		further consideration. As such this issue is scoped in .	anticipated as a result of the Phase 2 works, as such operational impacts have been scoped out .
Air Quality	Included in ER	Scoping identified potential impacts relating to air quality during construction, however, it is envisaged they can be successfully managed through a Construction Environmental Management Plan (CEMP). This issue is scoped in for completeness.	No operational impacts to air quality are anticipated as a result of the Phase 2 works. Operational impacts have been scoped out .
Noise and Vibration	Included in ER	Scoping identified potential impacts relating to noise and vibration during construction, however, it is envisaged they can be successfully managed through a Construction Environmental Management Plan (CEMP). This issue is scoped in for completeness.	No operational noise impacts are anticipated as a result of the Phase 2 works. Operational impacts have been scoped out .

5.3 Method of Assessment

The non-statutory environmental assessment process describes and assesses the potential significant effects which may arise directly or indirectly as a consequence of the size, location or nature of the Scheme and these are detailed within each assessment chapter.

Impacts have been assessed for each stage of the Scheme (construction and operation). There is no decommissioning stage included within the assessment as the defences will be maintained throughout their design life. Unless there is a change in the current flood risk or site management plan, the defences will be replaced/upgraded at the end of their design life (if failing).

Consideration has been given to the following features of impact:

- **Direct or Indirect** – whether the impact will affect receptors in the immediate locality, or whether it will influence features or processes which in turn result in indirect environmental impacts;
- **Timescale** – the duration of the impact on the environmental receptor, which may be temporary, associated with the construction activities, or permanent;
- **Beneficial or Adverse** – this will identify whether the impact is likely to be beneficial (positive and favourable) to the environmental receptor, or adverse (negative and damaging) or neutral, causing no change to the baseline conditions; and

- **Cumulative Effects** – other schemes and developments in the area have been considered which may result in cumulative impacts in association with this Scheme, as well as cumulative effects of the Scheme on single receptors.

5.4 Assessment Methodology

The following assessment methodology has been applied to each environmental discipline:

- Identification of the baseline conditions at the site;
- Assessment of the potential effects, taking account of the sensitivity of receptor and the magnitude of impacts; during both the construction and operational phases;
- Identification of mitigation measures (either embedded, e.g. design measures, or to be applied during implementation of the Scheme); and
- Identification of residual significance effects, following the implementation of mitigation measures as applicable.

5.5 Impact and Effect Criteria and Significance

The significance of effects has been determined by reference to impact criteria for each assessment topic. These criteria apply a common environmental assessment approach of classifying impacts according to whether they are major, moderate, minor or negligible in sensitivity/importance and magnitude and also whether they are considered to be adverse, neutral, or beneficial in terms of their effect.

- **Negligible** – Very minor effect, or is undetectable and of no significance;
- **Minor** – Some measurable effect, temporary or localised, of a reversible nature;
- **Moderate** – Effect is noticeable and is either temporary or permanent, unlikely to exceed the local influence; and
- **Major** – Effect is easily detectable and likely to be permanent with irreversible implications.

Table 11 below illustrates how sensitivity/importance and magnitude of effect are combined to identify the significance of an effect.

Table 11 Significance of Effects

		Sensitivity/Importance of Receptor		
		Low	Medium	High
Magnitude of Effect	Very Low	Negligible	Negligible	Minor
	Low	Negligible	Minor	Moderate
	Medium	Minor	Moderate	Major
	High	Moderate	Major	Major

Effects identified as major/moderate adverse or beneficial are regarded as significant in terms of planning considerations.

This non-statutory environmental assessment is based on qualitative assessments only and is based on available knowledge and professional judgement. Where uncertainty exists, this has been noted in the relevant chapter.

5.6 Mitigation

The assessment of significant effects assumes construction good practice is adhered to for all of the environmental topic chapters. Any mitigation measures outlined here on in therefore already assume construction good practice has been applied.

The environmental assessment considers mitigation measures, including embedded mitigation – those that have been incorporated into the design of the Scheme – and supplementary mitigation - those preventing, reducing and offsetting any remaining significant adverse effects. Examples of embedded mitigation relevant to the Scheme include:

- Reduction in defence heights through design evolution;
- Reduction in land take and construction footprint of embankments through design evolution;
- Realignment of defences to avoid sensitive receptors or services; and
- Amendment to construction materials and defence type (i.e. L-shaped retaining wall vs sheet pile wall) to reduce construction footprint and/or visual impact.

Examples of supplementary mitigation include:

- Adherence to a Construction Environmental Management Plan and Traffic Management Plan;
- Adherence to a Heritage Project Design (or Written Scheme of Investigation);
- The application of certain finishes/colours to flood defence structures;
- Landscape planting/screening; and
- Environmental mitigation/enhancement areas.
- Topic specific supplementary mitigation is described in more detail within Chapter 6 of this ER.

An Environmental Action Plan (EAP) will be developed to set out the environmental objectives, actions and targets of mitigation measures to be implemented prior to, during and after construction as a tool by which parties can manage the environmental impacts set out in this ER. These mitigation measures will be monitored throughout the pre-construction, construction and post-construction stages to ensure that the proposed mitigation measures are applied.

The EAP will be aligned with the Construction Environmental Management Plan (CEMP). The CEMP will also detail wider site management practices, procedures and guidelines to be followed by the contractor to ensure that both generic and site specific environmental aspects are managed adequately. Specific requirements will be stated in the contract documents issued to the contractor.

5.7 Cumulative Assessment

Cumulative effects are those effects considered to generate a non-significant effect in isolation, however, may result in a significant effect when combined with other potential non-significant environmental effects of the proposal, or one or more proposals.

In terms of this Scheme and the cumulative assessment discussed in Chapter 7, cumulative effects will be discussed in the context of the following factors:

- Combined or intra-scheme effects arising as a result of multiple effects generated by the Scheme upon the same receptors; and
- Inter-scheme effects, arising as a result of a combination of effects generated from adjacent or nearby scheme(s) believed to be constructed in a timescale which would overlap the Scheme.

5.8 Limitations and Assumptions

A number of assumptions have been made during the environmental assessment process which are set out below:

- Information provided by third parties, including databases and publicly available information is correct at the time of publication;
- Assessment of effects assumes the design remains as is at the time of writing. If future changes to the design occur, the assessment may need to be updated in line with these changes;
- Whilst baseline environmental conditions are assumed to have been correct at the time of the physical surveys, due to the dynamic nature of the environment, the baseline conditions may be subject to change.

5.9 Consultation

Public consultation exercises have been carried out by the EA and Bury Council throughout the Scheme design process, key dates of which were as follows: 17th January 2017, 27th April 2017, 15th March 2018, 10th December 2018, 27th June 2019 and 17th October 2019.

Stakeholder engagement has been ongoing throughout the option development and detailed design stages of the Scheme. The aim of this engagement is to ensure stakeholders are involved in the option development and their comments incorporated into the final design where reasonable and practicable. Consultation with statutory and non-statutory bodies has included the following:

- Greater Manchester Archaeological Advisory Service (GMAAS) (12th September 2018, various dates across July 2019);
- Greater Manchester Ecology Unit (GMEU) (3rd March 2018);
- Historic England (3rd October 2018);
- Bury Council - Case Officer, pre-application consultation (24th September 2018);
- Bury Council - Ecologist (3rd September 2018);
- Bury Council - Parks and Countryside Manager (5th September 2018);
- Bury Council - Communities and Wellbeing (5th September 2018);

- Canals and Rivers Trust (14th September 2018); and
- Coal Authority (12th September 2018).

Consultation with various utilities companies has also been undertaken by Mott MacDonald, on behalf of the EA. A summary of the issues raised following consultation from the above consultees along with a response where applicable is detailed in Table 12 below.

Table 12 Summary of Key Points Raised in Consultation for the Scheme

Topic Area	Issue Raised	Environmental Assessment Report Consideration
Cultural Heritage and Archaeology	The impact of the scheme on assets of local value – Hardy's Gate Bridge and Warth Bridge.	Heritage Desk-Based Assessment for the Scheme (Phase 1 and 2). Record of condition of Hardy's Gate Bridge and Warth Bridge to be undertaken.
Townscape and Visual	The potential for flood walls to be graffitied and become eyesores. Ensuring works are generally in-keeping with the area e.g. embankment, pavilion, flood wall design, tree planting.	The finish of the walls is intended to deter graffiti, , facing will be timber cladding in proximity to residential areas as detailed within the Final Landscape Masterplan (FLM). Requires presentation in planning statement. Design considers proximity of sensitive visual receptors and property boundaries. CEMP to cover all other information on working hours and arrangements/lighting.
Arboricultural	Scheme wide impacts from the removal of mature trees.	Land is limited for tree planting within the Scheme footprint, the Scheme will seek to deliver a minimum 1:1 ratio of tree replacement, but where possible will aim to deliver the EA target of 5:1 where feasible land permitting. Proposed locations will be detailed within the Final Landscape Masterplan (FLM).

Topic Area	Issue Raised	Environmental Assessment Report Consideration
Flood Risk	Potential for further flood risk caused by the scheme.	Scheme-wide Flood Risk Assessment.
Ecological	Methods of removal for invasive species encountered on the site. Assessment of impacts on nesting birds. Assessment of impacts on bats.	Spraying regime started, excavation planned for extensive areas in Lower Hinds. Five-year maintenance programme planned. Appropriate mitigation measures will be put in place prior to construction. Vegetation clearance and a nesting bird check will be required prior to the works commencing, under ecological supervision as detailed in the EAP. A Construction Environmental Management Plan (CEMP) will document all other potential impacts and mitigation as required. Environmental enhancement work planned across the Scheme. Soft felling measures to be taken during tree felling.
Ground Conditions	Site is located in a Development High Risk Area designated by the Coal Authority. Potential contaminated land risk.	Coal Mining Risk Assessment has been produced and detailed within the Ground Investigation Report. Preliminary Contaminated Land Risk Assessment has been produced to cover any requirement for remediation or removal.

Topic Area	Issue Raised	Environmental Assessment Report Consideration
Traffic	Issues regarding works to Hardy's Gate Bridge and potential impacts to traffic flow.	Coordination with Bury Council Traffic Officer. Traffic Modelling Survey produced by TfGM on behalf of MM. ConstuctionTraffic Management Plan will be submitted in support of the Hardy's Gate Bridge planning application.

Further information on consultation activities is provided within the Planning Statement(s). This outlines the strategy, approach and activities undertaken to consult with the local community and stakeholders on the proposed Phase 2 works.

The EA have developed a Communications Plan (EA, 2018) which details communication and engagement aims and objectives in relation to the proposed Scheme, along with the various channels of communication to be used. An Action Plan has been developed as part of the above Plan to log communication events throughout the course of the Scheme development, the target audience and the outcome of each activity.

6 Environmental Assessment

This chapter presents assessment of each environmental topic identified in Chapter 3 for further consideration, due to potential for adverse effects as a result of the Phase 2 construction and operation. The following chapters are inclusive of all aspects of the Phase 2 works.

6.1 Ecology and Biodiversity

6.1.1 Baseline Environment

A Preliminary Ecological Appraisal (PEA) was undertaken in September 2017 (Mott MacDonald, 2017) which informed the production of the Preliminary Environmental Information (PEI) Report. A desk study exercise was conducted to review information on designated sites, review biological record data and produce a Phase 1 Habitat survey and associated maps. A further PEA was undertaken in February 2020 (Mott MacDonald) to cover the additional land at Bury Grammar School playing fields.

There are no internationally or nationally important designated sites within 2km of the Scheme. There is one locally designated site within 2km, this is Hollins Vale Local Nature Reserve (LNR). There are a number of non-statutory designated sites within 2km of the Scheme, three of which are within the Scheme footprint and are as follows:

- Swan Lodge SBI;
- Hutchinson's Goit SBI; and
- Lower Hinds SBI.

The 2017 PEA identified habitat within the site boundary with potential to support protected species. Initial ecological Phase 2 Scoping surveys were undertaken in January 2018, with the aim to refine the potential scope of any further surveys required. These scoping surveys concluded that only ecological Phase 2 surveys relating to bats and otters were to be conducted.

All trees on site in proximity to the proposed works were assessed for their potential to support roosting bats via a Preliminary Roost Assessment (PRA). Of the trees surveyed, three had moderate potential to be used by bats. All others were regarded as having negligible potential. The trees with moderate potential were subject to two nocturnal bat surveys, the conclusions of which determined no bats were seen to use the trees for roosting, and soft felling measures should be adhered to when removing the trees (see Bat Nocturnal Surveys Technical Note ENV0000389C-BMM-DZ-4ZZ-TN-EN-0301053). A further PRA was conducted in 2020 in relation to trees identified in the 2020 PEA at Bury Grammar School. One tree was identified as having moderate potential however works were determined to avoid this feature following revision of the proposed alignment and a buffer put in place to minimise and disturbance.

Hardy's Gate Bridge was also subject to a PRA in July 2018 for bats which concluded the bridge has negligible potential for roosting bats (see ENV0000389C-BMM-DZ-4ZZ-TN-EN-0301052). This was due to its condition showing no visible crevices or gaps

suitable for roosting bats following what appeared to be recent masonry works. However the underside of the bridge was inaccessible, as such a further nocturnal survey was recommended to determine if any bats were using the bridge for roosting. On recommendation this survey was conducted in July 2019 to determine if the structure is used by roosting bats, the results of which confirm no bats were seen to emerge from the structure during the survey window. Therefore no further actions are required in relation to Hardy's Gate Bridge.

Results of the Phase 2 otter survey (conducted by MM in July 2018) concluded that the Irwell has potential to support foraging and commuting otters, following evidence to suggest they are using the stretch of the Irwell surveyed downstream of Hardy's Gate Bridge. However, no evidence of potential otter breeding activity was recorded within the survey areas searched (Mott MacDonald Otter Survey Technical Note ENV0000389C-MMD-XX-00-TN-EN-03010027). Recommendations were made for a pre-commencement survey 8 weeks prior to any works commencing to ensure no otter holts have been constructed since the ecological Phase 2 survey was conducted and the commencement of works. However, as the works to Hardy's Gate Bridge have since changed and no longer require works to remove the bridge or require works to the Bridge at a channel level which may have caused significant disturbance at this location, the requirement for a pre-commencement survey is deemed no longer present due to the anticipated negligible levels of disturbance. Any requirement for mitigation will be dealt with via construction methodology and working methods to minimise any in channel disturbance upstream of the bridge.

Invasive species were highlighted in the PEA as being highly abundant on site. As such an Invasive Species Management Plan (ISMP) has been drafted to detail the overall strategy to control and prevent the spread of invasive species. This will involve a combination of methods to include removal off-site to a suitable waste disposal facility, burial on site as part of an on-site treatment plan, spraying in-situ treatment and construction best practice to include biosecurity measures to prevent spread.

Targeted spraying has been undertaken by the EA to control the current growth of invasive species, however, due to the anticipated construction start date (January 2020) spraying in the locations of any immediate work would not be an appropriate method of long term treatment, and so biosecurity and quarantine methods are to be applied to prevent further spread. Biosecurity measures may include, but not limited to, the following:

- Wheel washing of machinery/plant;
- Washing of boots/shoes from site staff;
- Use of caterpillar tracks rather than tyres to reduce material transfer off site; and
- Ensure any site runoff from wash down areas is on hardstanding and directed to a public drain at least 10m from a watercourse.

An Arboricultural assessment was undertaken in July 2019 (Mott MacDonald, 2019) to assess the quality and value of the principal trees within or adjacent to the Scheme footprint (Arboricultural Report ENV0000389C-BMM-DZ-4ZZ-RP-EN-031033 for further details). There are no Tree Preservation Orders (TPOs) or Conservation Areas in the study area which would afford trees protected status. The majority of trees were of 'low' quality which indicates removal is acceptable. The assessment also considered any requirement for protection, pruning and targeted removal as a result of the proposed works. Individual tree root protection zones have also been identified where, if a tree were retained, the construction works are anticipated to conflict with this zone potentially adversely affecting the condition of the tree.

To facilitate construction, a total of five individual trees and three tree groups of 'moderate' value, and six individual trees and nine tree groups of 'low' value are recommended for removal. Partial removal of three tree groups of 'moderate' value and 13 tree groups of 'low' value will also be required. An approximate total of 460 trees have been identified as being at risk of removal.

An addendum to the 2019 Arboricultural assessment was undertaken in March 2020 to include the land at Bury Grammar School playing fields. This survey highlighted a single further tree that would require removal due to a direct intersection by the alignment of the proposed defence.

The River Irwell is believed to contain a number of fish species, following EA commitments to improve water quality, and the introduction of Brown Trout to the River. Consideration will be required to any in-channel works, specifically those relating to in channel works, that may adversely affect fisheries and fish migratory movements.

6.1.2 Assessment of Effects

Taking into consideration the conclusions of the PRA, the nocturnal bat surveys and the anticipated loss of trees, it is likely construction of the Scheme would have a negligible effect on roosting bats.

The disturbance to otters during construction would cause a negligible adverse effect to commuting and foraging otters believed to be using the Irwell downstream of Hardy's Gate Bridge.

The removal of 11 individual trees and 12 group trees would be required in order to facilitate construction. A total of approximately 460 trees have been identified as being at risk of removal, of which it is expected a significant proportion will be able to be retained by managed access and targeted pruning. The partial removal of 13 tree groups would also be required. The value and sensitivity of the trees is considered to be low, whilst the magnitude of the removal is considered to be high, however localised in its impact. As such, the removal of trees to facilitate construction would cause a moderate adverse effect.

The defences in Lower Hinds are located in areas known to be extensively covered by invasive species, as such construction and plant movements are likely to traverse over this land. Application of the methodologies outlined in the section above are anticipated to cause a negligible adverse effect on invasive species and the spread of these species. A potential moderate beneficial effect would result on completion of the works following the removal of invasive species throughout the Scheme working areas.

The works at Components 10 and 37 will require in-channel working associated with piling work. There is potential that works within the channel may adversely affect fisheries spawning due to increased siltation and sediments within the water column, which would reduce the success of spawning and have potential to affect fish populations.

Table 13 below summarises the assessment of effects following application of the methodology outlined in section 5, during construction and operation of the Phase 2 works, in relation to ecological receptors. The summary is prior to the application of mitigation outlined in section 6.1.3 below.

Table 13 Summary of Effects Ecology and Biodiversity

Receptor	Feature of Impact	Magnitude	Sensitivity	Effect
Construction				
Commuting and foraging otters	Indirect temporary impact during works upstream of Hardy's Gate Bridge	Low – working methods to minimise potential disturbance during any in channel works.	Low	Negligible adverse
Invasive Species	Direct temporary impact on the potential spread of invasive species within the Scheme footprint	Low – working methods and treatment to minimise the risk of spread.	Low	Negligible adverse
Invasive Species	Direct permanent impact following the removal of invasive species from within the Scheme footprint.	Medium	Medium	Moderate beneficial
Fisheries and fish migratory movements	Temporary impact on fisheries, migratory movements and increased siltation during in channel works.	Medium	Medium	Moderate adverse
Operation				
Disturbance to roosting bats	Direct permanent impact following removal of trees from Close Park.	Low – due to results of PRA and nocturnal surveys.	Medium	Negligible adverse
Trees to be removed/partially removed within the Scheme extent	Direct permanent impact on trees resulting from removal to	Low	High	Moderate adverse

	facilitate construction of flood embankment.			
Wetland habitat/woodland creation at Lower Hinds	Permanent beneficial impact due to the creation of wetland habitat and extensive tree replanting at Lower Hinds and reinstatement of riparian vegetation.	Medium	Medium	Moderate beneficial

6.1.3 Mitigation

As detailed in the Bat Nocturnal Surveys Technical Note (ENV0000389C-BMM-DZ-4ZZ-TN-EN-03010053), the two trees previously highlighted as having moderate potential to support bats should also be felled using 'soft felling' techniques.

A total of 10 2FN Schwegler bat boxes are to be erected to compensate for the number of roosting features lost that have been identified and to enhance areas around the proposed works.

Where a tree is to be removed it will be replaced at a minimum 1:1 ratio, however the aspiration remains to re-plant at a 1:5 ratio where possible land permitting as per EA recommendations noting this is significantly restricted by space available within the footprint of the works. A number of other positive landscape reinstatement works are included within the Scheme proposals, as follows:

- Opportunities for reinstatement of disturbed riparian areas, using appropriate native species of shrubs and trees;
- Installation of bird and bat boxes along the river corridor; and
- WFD mitigation/priority habitat creation at Lower Hinds.

Specific mitigation measures to reduce potential disturbance to otters, such as limitations to bank disturbance and site management practices, will be detailed within the CEMP.

The design components have been adapted where possible to minimise the potential impact on trees within the Scheme footprint and retain trees where possible. Temporary protective barriers will be used for any trees that are to be retained to protect the Root Protection Area and the above ground structure.

The works at Components 10 and 37 will require in-channel working associated with piling work. Any requirements in relation to fisheries or fish migratory movements will be detailed within the CEMP along with any associated actions required to ensure protection of fish and water quality throughout the works. Components 10 and 37 will require in-channel working which may adversely affect fisheries during sensitive spawning periods (June to September). As such, construction of these defences will

seek to be undertaken outside of spawning months for target fish species where possible. If due to the construction programme this is not possible, additional measures such as silt and sediment traps will be utilised to prevent increased sedimentation in the water column, to prevent the spread of silt downstream of the works.

6.1.4 Significant Residual Effects

Following incorporation of the above mitigation measures, the following residual effects are anticipated as a result of the Phase 2 works:

- There will be a temporary moderate adverse effect due to the loss of trees until trees are replanted and re-established.
- There will be a temporary minor adverse effect due to the potential spread of invasive species within the Scheme footprint.
- There will be a temporary minor adverse effect due to the in channel disturbance to fisheries during construction.
- There will be a permanent moderate beneficial effect due to the creation of wetland habitat and tree replanting at Lower Hinds and reinstatement of riparian vegetation.

None of the above residual effects are considered significant.

6.2 Townscape and Visual

6.2.1 Baseline

The Scheme lies within a predominantly urban area, where industrial buildings and residential properties form a dominant feature, however, green open spaces, such as Lower Hinds, are seen to intersect this urban landscape.

Natural England has selected and divided areas of England's countryside, based on the features that shape that landscape and associated ecosystem services. The proposed Scheme is within National Character Area No 54 – Manchester Pennine Fringe. The area is described as 'highly influenced by recreational use from adjacent urban areas and also by the diversification of farmland, which contributes to the area's distinct Pennine fringe character'. Natural habitat in the area has been influenced by human activity and is limited to narrow strips of woodland and pockets of pastoral land. As such, the Irwell forms an important natural feature for ecological connectivity.

Bury Council undertook a Landscape Character Assessment in 2009, and sub-divided the local area into a number of smaller landscape units. Radcliffe and Redvales is located within the 'Canal and River Corridor' unit, identified for its unique qualities and strong presence of waterways and river networks.

There are no nationally or internationally recognised landscape designations (Area of Outstanding National Beauty (AONB), National Park or Historic Parks and Gardens) within the study area. There are no Tree Preservation Orders within the site boundary.

Views within the study area are predominantly urban in nature and generally contained by built elements and low-level vegetation. The widest views are obtainable from open

areas associated with the Irwell, again generally contained by low level or riparian vegetation.

Individual receptors, particularly residents off Kendal Drive and Keswick Drive, visitors and receptors at leisure utilising Public Rights of Way (PRoW) adjacent to the Irwell generally have a high sensitivity to change in local views. Business and work-related receptors have a low sensitivity to change.

6.2.2 Assessment of Effects

The construction works within Lower Hinds would likely cause a moderate adverse effect on local receptors and townscape character, due to the temporary visual intrusion and alterations to the landscape character. However, this effect would be localised to Lower Hinds and would be limited by the presence of the Metrolink embankment which would largely screen views from sensitive receptors.

The construction works at Bury Grammar School playing fields would likely cause a minor adverse effect on the School and pupils due to restricted access to a section of the playing fields during construction. However it is understood that these fields at the Buckley Wells complex are not in daily use and are seasonally used, dependent on the School sports programme, and as such impacts may be mitigated through timing of the works to avoid peak use.

The construction of all other linear defences would cause a **moderate adverse** effect, due to a temporary effect during construction following the presence of construction plant, on residential receptors in proximity to the works.

The parapet raising works at Hardy's Gate Bridge would cause a **minor adverse** effect on local receptors and landscape character. All construction effects are temporary in their nature.

On completion the proposed works would have a permanent **moderate adverse** effect on townscape and visual amenity due to the introduction of permanent raised linear defences.

Table 14 below summarises the assessment of effects following application of the methodology outlined in section 5, during construction and operation of the Phase 2 works, in relation to townscape and visual receptors. The summary is prior to the application of mitigation outlined in section 6.2.3 below.

Table 14 Summary of Effects Townscape and Visual

Receptor	Feature of Impact	Magnitude	Sensitivity	Effect
Construction				
Local residents, users of, and townscape character, of Lower Hinds.	Direct, localised, temporary impact from visual intrusion as a result of the construction	Medium	Medium	Moderate adverse

	works in Lower Hinds and changes to existing landscape character.			
Bury Grammar School and Pupils	Direct localised temporary impact from visual intrusion as a result of the construction works at Bury Grammar School playing fields.	Medium	Low	Minor adverse
Local residents, and townscape character for all other Scheme defences.	Direct, localised, temporary impact from visual intrusion as a result of the construction works.	Medium	Medium	Moderate adverse
Local residents and townscape character at Hardy's Gate Bridge	Direct, localised, temporary impact from visual intrusion as a result of the works at Hardy's Gate Bridge.	Medium	Low	Minor adverse
Operation				
All local residents and changes to townscape character on completion of the works (Scheme wide)	Direct permanent impact from changes to existing landscape character and introduction of hard defences.	Medium	Medium	Moderate Adverse

6.2.3 Mitigation

A number of mitigation measures are to be included in the final landscape design and landscaping work associated with the defences, as follows:

- All embankment tops and toes rounded off, grassed areas to be seeded with perennial pictorial meadow mix;
- Replanting of trees at Lower Hinds and supplementary landscape design provided by Groundwork (see Landscape and Environmental Management Plan ENV0000389C-BMM-DZ-4ZZ-RP-L-0307039);
- Opportunity to clad any exposed retaining wall with brick effect cladding or timber cladding where appropriate;
- Minimised tree felling, where appropriate, along the river to maintain existing visual screen to commercial units surrounding Redvales Business Park;
- Parapet raising of Hardy's Gate Bridge on the upstream face will re-use the stone facing of the existing structure and infill with a suitable replica material to match existing, where possible.

6.2.4 Significant Residual Effects

Following incorporation of the above mitigation measures, the following residual effects are anticipated as a result of the Phase 2 works:

- There will be a permanent **minor adverse** effect to residents of Keswick Drive as a result of construction and operation of the defences.

None of the above residual effects are considered significant.

6.3 Cultural Heritage and Archaeology

6.3.1 Baseline

An initial High-Level Cultural Desk Based Appraisal was undertaken in November 2017 (Mott MacDonald) to inform the Scheme PEI report. This included identifying the impact on all designated heritage assets within 500m for designated assets and 250m for non-designated assets, off the centre line from the River Irwell. The High-Level Desk Based Appraisal has since been updated in line with the Phase 2 detailed design as a Cultural Heritage Desk Based Assessment (DBA) and can be found in Appendix D. A summary of the baseline specific to the Phase 2 elements is provided below.

Within 500m of the works the following designated heritage assets are present:

- Four Grade II listed buildings.
- There are no Scheduled Monuments, World Heritage Sites, Conservation Areas, Registered Battlefields and Registered Parks and Gardens within 500m of the works.

A full list of all non-designated assets and further information relating to the above can be found in the Cultural Heritage DBA (see ENV0000389C-BMM-DZ-4ZZ-RP-HE-0302020).

The River Irwell has provided the focus for settlement from the prehistoric period onwards, there is evidence for the survival of in-situ archaeological remains dating to multiple periods of significant importance, with the greatest potential for archaeological remains in the prehistoric, medieval and post-medieval periods. Systematic archaeological investigation has not been undertaken within the Phase 2 works areas.

A full list of all non-designated assets and further information relating to the above can be found in the Cultural Heritage DBA and a summary of the baseline specific to the Phase 2 elements is provided below.

Lower Hinds

The Lower Hinds area is characterised as informal grassland with scattered trees, used recreationally by the local community. The risk of encountering unknown archaeology in this area is low, due to the presence of a large concrete slab across a significant portion of the site which is likely to have disturbed any existing archaeological remains.

The proximity of designated assets (Grade II listed) Old Hall Farmhouse and Gate Piers suggests a low risk to the setting of these assets, as a result of the proposed Scheme. The proposed landscaping changes to this area are likely to be beneficial, reverting the river to a naturalised and rural setting as would have been prior to 20th century industrialisation.

There are no designated heritage assets within proximity to the defence.

Warth Road, Bury Grammar School, Keswick Drive, Redvales Business Park and York Street

Within proximity to the works at Warth Road is Hutchinson's Goit, a low value non-designated asset. The proposed works are to refurbish the culvert inlet orifice structure as such not understood to adversely impact the heritage value of the Goit and present a low risk. As part of these works vegetation and silt clearance will be undertaken adjacent to the culvert inlet. Warth Bridge is similarly a low value non-designated historic asset, as such sympathetic tying in of the defences to this structure is advisable to prevent damage to the fabric of the bridge. Consultation with GMAAS in July 2019 confirms the requirement to undertake photographic review of the works before and after construction to provide sufficient documentation of the Bridge.

There is potential on areas of undisturbed land for prehistoric archaeology to be present, however this presents a low risk as the river banks are largely previously developed at which point likely to have disturbed any existing finds.

There are no designated heritage assets within proximity to the defences.

Hardy's Gate Bridge

Hardy's Gate Bridge is a non-designated heritage asset and is not recorded on the GMAAS Historic Environment Record (HER). The bridge comprises a double span 19th century bridge, that has been widened and refaced in ashlar in 1911. It is unclear exactly when the bridge was built but its current form is likely to have replaced an earlier structure. The bridge would have acted as a crossing point over the River Irwell to connect the east and west sides of Radcliffe.

6.3.2 Assessment of Effects

Hardy's Gate Bridge is a low value non-designated asset of simple, recent construction. The bridge is not distinct or unique and thus possesses little architectural significance. As such the proposed parapet raising works associated with the bridge would cause a negligible adverse effect due to the intended scale of alteration.

Table 15 below summarises the assessment of effects following application of the methodology outlined in section 5, during construction and operation of the Phase 1 works, in relation to cultural heritage and archaeological receptors. The summary is prior to the application of mitigation outlined in section 6.3.3 below.

Table 15 Summary of Effects Cultural Heritage and Archaeology

Receptor	Feature of Impact	Magnitude	Sensitivity	Effect
Construction				
Hardy's Gate Bridge	Permanent impact to Hardy's Gate Bridge, although non-designated asset, following parapet raising works.	Low	Low	Negligible Adverse

6.3.3 Mitigation

Mitigation measures for impacts to Hardy's Gate Bridge and unknown archaeological remains have been developed in liaison with the Local Planning Authority (LPA) archaeologist at GMAAS and are as follows:

Hardy's Gate Bridge - Historic England Level 1 Historic Building Record to include a photographic survey to record the bridge before and after the parapet raising works. A watching brief will also be conducted during the proposed works to take a descriptive record of the works. All works will be carried out with the requirements and details outlined within Hardy's Gate Bridge Heritage Project Design (see ENV0000389C-BMM-DZ-4ZZ-RP-HE-0302019).

Warth Bridge - GMAAS have requested a photographic record of the bridge, to be appended to the survey report for Hardy's Gate Bridge. A watching brief for any works to Warth Bridge is not required.

6.3.4 Significant Residual Effects

Following inclusion of the above mitigation measures, there are no significant residual effects associated with heritage assets as a result of the Phase 2 works.

6.4 Water Framework Directive

6.4.1 Baseline

Two WFD classified surface waterbodies have been identified within the site boundary:

- Irwell (Rossendale STW to Roch) (GB112069064620);
- Irwell (Roch to Croal) (GB112069060840).

Both of the above surface waterbodies are classified as 'Heavily Modified' and are currently achieving an overall status/potential of 'Moderate' (EA Catchment Data Explorer, 2015). Many modifications associated with these waterbodies are historic (i.e. weirs associated with textile mills) and are present in varying condition. WFD classification data for the two above waterbodies can be found in the PEI report. The Manchester, Bolton and Bury Canal (North) artificial waterbody is located in the Scheme boundary but will not be affected.

The Scheme is located above the Manchester Northern Carboniferous Aquifer and the Manchester and East Permo-Triassic Sandstone Aquifer. Both of these WFD groundwater bodies are at 'poor' status. It is not anticipated that the Scheme would result in risks to these waterbodies and they have been screened out of any further assessment.

A Preliminary WFD Compliance Assessment (see ENV0000389C-MMD-XX-00-RP-EN-0301002) was conducted to summarise the existing river hydromorphology and present a number of recommendations for mitigation which must be included to ensure the Scheme is compliant with WFD objectives. These included: improvements to floodplain connectivity and creation of riparian wetland habitat (online or offline pending confirmation) to include removal of invasive species, bank re-profiling works to encourage water inundation and planting of riparian species. These measures are an integral part of the Scheme design and must be undertaken as mitigation for the hard defences. Please note this assessment is undergoing a revision to capture subsequent updates as part of the Scheme design.

6.4.2 Assessment of Effects

The introduction of hard defences as a result of the Scheme would cause a moderate adverse effect to the Irwell (Rossendale STW to Roch) WFD waterbody. At Component 37 there is a mid-channel gravel bar which may be 'trimmed' slightly if flow is narrowed by the new retaining wall. The bar shows evidence of changing its size and position over time, which will continue to occur depending on flood events and sediment load.

The creation of riparian wetland habitat and floodplain connection as part of the proposed works at Lower Hinds would cause a moderate beneficial effect to the WFD waterbody. However, it should be noted that at the time of writing further details of this proposal are awaiting approval by third parties and may be subject to change. As a minimum it is anticipated that an offline intervention would be delivered, to consist of riparian planting and minor landscaping works to encourage water inundation through an open culvert or inlet structure, where possible. Further details relating to the Lower Hinds design can be found in the Landscape and Environmental Management Plan (ENV0000389C-BMM-DZ-4ZZ-RP-L-0307039).

Table 16 below summarises the assessment of effects following application of the methodology outlined in section 5, during construction and operation of the Phase 2 works, in relation to WFD and water resources. The summary is prior to the application of mitigation outlined in section 6.4.3 below.

Table 16 Summary of Effects WFD

Receptor	Feature of Impact	Magnitude	Sensitivity	Effect
Construction				
Irwell (Rossendale STW to Roch) WFD waterbody	Permanent impact on the WFD waterbody as a result of the in channel works at Component 10 and Component 37 which will require additional channel in order to facilitate construction.	Medium	Medium	Moderate adverse
Operation				
Irwell (Rossendale STW to Roch) WFD waterbody	Permanent impact on the WFD waterbody as a result of the introduction of hard defences along the river bank.	Medium	Medium	Moderate adverse
Irwell (Rossendale STW to Roch) WFD waterbody	Permanent impact on the WFD waterbody as a result of habitat creation, removal of invasive species, bank reprofiling and floodplain connectivity proposed at Lower Hinds.	Medium	Medium	Moderate beneficial

6.4.3 Mitigation

Compliance with WFD objectives has been recorded and documented through a WFD Mitigation Proforma for each of the planning applications and associated components (ENV0000389C-BMM-DZ-4ZZ-RP-EN-0302022-27). A record of the inclusion of appropriate mitigation is included in the proforma, as evidence for the compliance with WFD objectives and is summarised as follows:

- Geomorphologist involvement in the design of any works relating to the river banks, to ensure they are sensitive to the banks and existing geomorphology;
- Existing riparian vegetation to be retained as far as possible;
- Potential to improve cross-section variation, floodplain connectivity and condition of riparian zone by sensitive design of floodplain reconnection/wetland habitat at Lower Hinds. To consist the following:
 - Treating of invasive species within the existing riparian scrub area;
 - Planting of suitable species tolerant to occasional inundation, such as willow and alder;
 - Excavation of existing bank to create a lower berm or terrace, inundated by smaller flows;
 - Planting of suitable species on lower level tolerant of inundation; and
 - Planting of more terrestrial vegetation on upper bank.

6.4.4 Significant Residual Effects

Following incorporation of the above mitigation measures, there are no residual effects associated with WFD waterbodies.

The inclusion of riparian wetland habitat, and floodplain connection, as stated above would counter potential adverse effects associated with the introduction of hard defences, would constitute an **overall neutral effect** to the WFD waterbody.

None of the above residual effects are considered significant.

6.5 Traffic and Transport

6.5.1 Baseline

Within the scope of the Phase 2 works, there are two main road bridges in the study area – Warth Bridge and Hardy's Gate Bridge. The former links central Bury and Fishpool to Radcliffe, via Radcliffe Road and Bury Road. The latter permits traffic both north and south along Dumers Lane and is a frequently used commuter route connecting local residents to Manchester Road and further afield to the M60 ring road.

There are several smaller local roads within the study area, in particular those in proximity to York Street, however access along them is limited by parked cars used by adjacent residential properties.

6.5.2 Assessment of Effects

The sensitivity of the environment for traffic and transport is minor, whilst no long term closures are planned as part of the works, an anticipated increase in construction vehicles on the local road network is anticipated. In an area with existing high traffic flows and a number of small local roads, this may result in a minor adverse effect to local road users and the local road network.

There are no operational effects associated with the Phase 2 works. The works to Hardy's Gate Bridge will not alter the local road network on completion. However, construction works are currently anticipated to require a temporary closure of two of the three existing lanes of traffic. During construction, traffic movements over the bridge will be managed through a single lane of traffic with traffic lights controlling flow in each direction.

Table 17 below summarises the assessment of effects following application of the methodology outlined in section 5, during construction and operation of the Phase 2 works, in relation to traffic and transport and associated receptors. The summary is prior to the application of mitigation outlined in section 6.5.3 below.

Table 17 Summary of Effects Traffic and Transport

Receptor	Feature of Impact	Magnitude	Sensitivity	Effect
Construction				
Local road users and the local road network.	Temporary impact as a result of construction works and associated traffic movements.	Low	Medium	Minor adverse
There are no operational effects associated with the Phase 2 works.				

6.5.3 Mitigation

Existing traffic data was provided by Transport for Greater Manchester (TfGM) to support the Phase 1 planning application, and was used to model a series of scenarios in relation to the proposed Phase 1 Hardy's Gate Bridge works (full closure, partial closure north and southbound) in order to understand the impact on local traffic and transport networks. The outputs of the model will be subject to interpretation by traffic modelling specialists in order to propose suitable mitigation measures and measures to minimise disruption for the Phase 2 parapet raising works.

The movement of construction vehicles is anticipated to be limited to non-peak commuting hours in order to reduce potential congestion and disruption. The bridge will not be closed during the works and will maintain traffic flow via single flow traffic

operated by traffic lights, for a duration of approximately 10 weeks. All of the above will be detailed further within a TMP.

6.5.4 Significant Residual Effects

The likelihood of significant residual effects remaining following inclusion of the above mitigation measures will be concluded on receipt of traffic modelling information. This section will be updated in due course.

6.6 Land Use and Recreation

6.6.1 Baseline

The Phase 2 works lie within a primarily urban area dominated by residential properties and small, local commercial businesses. Lower Hinds is one of a limited number of green spaces, and albeit derelict, has been adopted by the local community for recreational use. The area is currently un-managed and no formal maintenance of vegetation on site takes place, however the EA have undergone several rounds of spraying in this area to try to reduce the density and growth of invasive plant species in this area.

There is one designated Public Rights of Way (PRoW) at the northern most extent of Lower Hinds, however a number of informal paths are present throughout the area which are used by the local community. Another PRoW is present on land opposite Component 10, this directs users on an east-west alignment allowing access over Warth Bridge to follow Bealey's Goit south past the location of the proposed works at Bury Point.

6.6.2 Assessment of Effects

The construction works would cause a minor adverse effect on land use and recreational value, due to temporary restrictions on access to areas of land currently used by the public. However, on completion the works would seek to enhance the land available for public use at Lower Hinds and increase the recreational value of this space.

Table 18 below summarises the assessment of effects following application of the methodology outlined in section 5, during construction and operation of the Phase 2 works, in relation to land use and recreation and associated receptors. The summary is prior to the application of mitigation outlined in section 6.6.3 below.

Table 18 Summary of Effects Land Use and Recreation

Receptor	Feature of Impact	Magnitude	Sensitivity	Effect
<i>Construction</i>				
Users of Lower Hinds and informal	Temporary impact following	Minor	Minor	Minor adverse

publicly accessible land.	restrictions on access to areas of land available for public use during construction works.			
<i>Operation</i>				
Users of Lower Hinds	Enhancement of the area through landscape design to provide increased recreational value for the local community.	Medium	Medium	Moderate beneficial

6.6.3 Mitigation

The landscaping proposals include creation of a informal multi-stage floodplain that can be used on completion for informal recreational use by the local community. It is the EA's aspiration that on completion of these works the use of this area by motorcycles will be discouraged and instead encourage social use of the site by local residents.

The works to all other defences are not anticipated to affect land use and recreation on completion.

6.6.4 Significant Residual Effects

Following incorporation of the above mitigation measures, the following residual effects are anticipated as a result of the Phase 2 works:

- There will be a permanent **moderate beneficial effect** on landscape and recreational value due to the proposed landscaping works at Lower Hinds.

None of the above residual effects are considered significant.

6.7 Geology, Soils and Contaminated Land

6.7.1 Baseline

EA online mapping shows that the Scheme is not located within a Groundwater Source Protection Zone, however is located within a zone of 'Medium' to 'Medium-Low'

Groundwater Vulnerability. EA mapping indicates that the bedrock underlying Radcliffe and Redvales is a Secondary A aquifer, with superficial deposits designated as Secondary A and Secondary (undifferentiated) aquifer.

The geology across the site is highly varied, for a detailed description of the geological deposits on site and ground conditions, see the Ground Investigation Report (see ENV0000389C-MMD-XX-00-RP-GT-0110001). Solid geological deposits across the site predominantly comprise mudstone, siltstone and sandstone of the Pennine Middle Coal Measures Formation. These are largely overlain by superficial deposits primarily comprised of Alluvium (clay, sand and gravel), as well as River Terrace Deposits (sand and gravel) recorded to the north of Hardy's Gate Bridge.

A large area of ground was identified on site at Lower Hinds to consist of Galligu, a waste product of the sodium carbonate production process. This area has been largely confirmed to the location of the raised mound at the northern extent of the site.

There are two areas of indicative historic landfill within proximity to the proposed works:

- 'Lower Hinds' – waste details unknown; and
- 'Swan Lodge' – waste details unknown.

Both of the above have potential to have contaminated the surrounding ground.

The British Geological Survey (BGS) mapping indicates that the natural strata is generally not overlain by artificial ground, however given the historical use of the study area, Made Ground or re-worked ground is to be expected. This may be of substantial depth in some areas.

Potential sources of contamination at and adjacent to the site include:

- Historic filter and sludge beds;
- Historic bleach and chemical works; and
- Former landfill sites as mentioned above.

The study area is located within a Coal Authority Mining Reporting Area, however, the largest risk is associated with the Phase 1 area of works at Close Park.

6.7.2 Assessment of Effects

It is probable that some material from the site, along with imported material, will be excavated and re-used in order to construct embankments at Lower Hinds. There is potential for this material to be contaminated, due to Made Ground associated with historic industries in the area and also potential for this material to cause instability within the constructed embankment.

Possible ground subsidence must also be considered, due to the potential for unreported shallow coal workings to be present posing risks associated with the construction of embankments and sheet piled walls, however the information obtained from a Coal Mine Risk Assessment suggests a low risk of subsidence and **minor adverse** effect.

Downward migration of contaminants may be enabled by a variety of pathways. Sheet piling works have the potential to provide routes for a variety of contaminants to pollute any potential underlying aquifers. At the time of writing, a Ground Investigation (GI) has

been undertaken for Phase 2, however further GI since conducted in October 2019 confirmed a low risk in relation to alluvium beneath retaining walls.

The potential geotechnical impacts as mentioned above would cause a **minor adverse** effect during Phase 2 construction and operation, until further testing is undertaken to confirm the strata present.

Table 19 below summarises the assessment of effects following application of the methodology outlined in section 5, during construction and operation of the Phase 2 works, in relation to geology and contaminated land and associated receptors. The summary is prior to the application of mitigation outlined in section 6.7.3 below.

Table 19 Summary of Effects Geology and Contaminated Land

Receptor	Feature of Impact	Magnitude	Sensitivity	Effect
<i>Construction</i>				
Pollutant pathway to underlying aquifer	Permanent impact following sheet piling works during construction – opening pathway from potentially contaminated material to underlying aquifer.	Moderate – due to unknown strata beneath site at time of writing.	Medium	Moderate adverse
<i>Operation</i>				
Shallow coal workings	Permanent impact on the land due to potential subsidence as a result of increased load over coal workings.	Low	Medium	Minor adverse

6.7.3 Mitigation

Potential subsidence due to possible shallow coal workings will be mitigated by undertaking a GI to establish the presence or absence of such workings. Consideration has been given to all aspects of the design to mitigate potential geotechnical impacts, including consideration of materials used, placement of structures and consideration given to the ground conditions.

A Contaminated Land Risk Assessment (CLRA) has been produced to include methods to minimise impacts as a result of potentially contaminated material present on site. See the Contaminated Land Risk Assessments for more information (see

document reference ENV0000389C-BMM-DZ-4WR-RP-GT-0109001/ENV0000389C-BMM-DZ-4LH-RP-GT-0109002/ENV0000389C-DZ-4KD-RP-GT-0109003/ENV0000389C-BMM-DZ-4ZZ-RP-GT-0109004/ENV0000389C-BMM-DZ-4ZZ-TN-GT-0109005).

6.7.4 Significant Residual Effects

Following incorporation of the above mitigation measures, the following residual effects are anticipated as a result of the Phase 1 works:

- There will be a **minor adverse** effect resulting from contaminated land during construction.

None of the above residual effects are considered significant.

6.8 Noise and Vibration

6.8.1 Baseline

Sensitive receptors in proximity to the proposed Phase 2 works include a number of residential properties and St Peter's School. These receptors have potential to be affected by a temporary increase in noise and vibration levels due to the construction of the defences and plant movements on and around the sites. The closest of these receptors are residential properties at Keswick Drive, which are located approximately 10m from the proposed sheet pile retaining wall at Keswick Drive.

There is one Noise Important Area (NIA) identified within the study area, this is associated with the Metrolink rail line and is adjacent to the Phase 2 works at Lower Hinds and Warth Road.

6.8.2 Assessment of Effects

Material excavation, earthworks and general plant movements will cause a temporary localised increase in noise and vibration, above the existing background level. This will cause a temporary **moderate adverse effect** on receptors.

Construction activities, in particular piling, associated with Keswick Drive and York Street are in proximity to residential properties, and therefore are likely to cause a temporary moderate adverse effect to residents in these areas as a result of increased vibration.

There are no operational effects associated with noise and vibration as a result of the Scheme.

Table 20 below summarises the assessment of effects following application of the methodology outlined in section 5, during construction and operation of the Phase 2 works, in relation to noise and vibration and associated receptors. The summary is prior to the application of mitigation outlined in section 6.8.3 below.

Table 20 Summary of Effects Noise and Vibration

Receptor	Feature of Impact	Magnitude	Sensitivity	Effect
Construction				
Local residents and community in proximity to Keswick Drive and York Street.	Temporary localised impact due to increased noise and vibration from piling works associated with construction activities.	Medium	Medium	Moderate adverse
There are no operational effects associated with noise and vibration as a result of the Scheme.				

6.8.3 Mitigation

Potential effects relating to noise and vibration, as a result of construction work, will be managed through best practicable means, as detailed within the CEMP.

For the driving of piles, vibration monitoring will be required at sensitive locations, such as the residential properties at Keswick Drive and York Street. This will ensure that legislative threshold levels for vibration are not breached, and any additional mitigation such as household condition surveys are undertaken as required. Property specific mitigation such as vibration insulation may be required, however, this will be determined prior to the works commencing and detailed further within the CEMP.

A suitable threshold for construction noise will be discussed and agreed as appropriate with Bury Council prior to the works commencing.

6.8.4 Significant Residual Effects

Following incorporation of the above mitigation measures, the following residual effects are anticipated as a result of the Phase 2 works:

- There will be a temporary minor adverse effect on sensitive receptors due to a localised increase in noise and vibration.

None of the above residual effects are considered significant.

6.9 Air Quality

6.9.1 Baseline

There is one Air Quality Management Area (AQMA) located within the study area. This is the Greater Manchester AQMA, designated for NO₂. The primary source of NO₂ in the study area is the A56 road, a key transport link connecting Bury to Manchester.

Within proximity to the Phase 2 works there are a number of residential properties, schools and community facilities. Of these sensitive receptors, those in direct proximity have potential to be impacted by dust during construction of the linear flood defences, as a result of the demolition of any existing structures, earth-moving activities and plant movements on site. Those receptors in closest proximity are residents at Keswick Drive which are located approximately 10m from the proposed retaining wall.

6.9.2 Assessment of Effects

The activities associated with the Phase 2 works are considered to result in a temporary and localised reduction in air quality, due to increased plant movements structures on site and on surrounding highways. This will create a **minor adverse effect** on air quality.

No operational effects to air quality are anticipated as a result of the proposed works.

Table 21 below summarises the assessment of effects following application of the methodology outlined in section 5, during construction and operation of the Phase 2 works, in relation to air quality and associated receptors. The summary is prior to the application of mitigation outlined in section 6.9.3 below.

Table 21 Summary of Effects Air Quality

Receptor	Feature of Impact	Magnitude	Sensitivity	Effect
Construction				
Local air quality, and general public/residents in proximity to the Phase 2 works	Temporary, localised impact on air quality due to plant movements and demolition of structures on site – dust generating activities.	Low	Medium	Minor adverse
No operational effects to air quality are anticipated as a result of the proposed works				

6.9.3 Mitigation

Potential effects as a result of the Phase 2 works will be managed through best practicable means, as detailed within the CEMP.

6.9.4 Significant Residual Effects

There are no residual effects associated with air quality, as a result of the Phase 2 works.

7 Cumulative Effects and Inter-relationships

7.1 Introduction

Cumulative effects result from the combined effect of individual impacts within the Scheme, e.g. where different Scheme elements have a cumulative impact on a particular receptor, or the combined impact of multiple developments.

7.2 Intra-Scheme Cumulative Effects

It is not anticipated that there will be any likely intra-Scheme cumulative significant effects during either the construction or operational phases of the Scheme.

7.3 Inter-Scheme Cumulative Effects

A planning history search has been carried out for the application site and any relevant sites within a 50m buffer. Any relevant inter-Scheme cumulative effects of development are considered below.

East Lancashire Paper Mill, Church Street East, Radcliffe, Manchester M26 9PG (Planning Reference: 62969)

An outline application for up to 400 residential dwellings including demolition of existing buildings and structures. The application has been approved with conditions at the time of writing.

The anticipated construction start date is unknown, however it is not anticipated that the Paper Mill development will have any inter-Scheme cumulative effects during construction. Should inter-Scheme effects arise, it is anticipated that these will be limited to construction traffic and plant movements.

Land adjacent to Warth Road, Bury, BL9 9NG (Reference 60424)

Residential development comprising 65 no. dwellings and associated infrastructure and open space including a new estate road and vehicular and pedestrian access off Warth Road.

It is believed that construction works have already begun, however, it is not anticipated that this development will have any inter-Scheme cumulative effects due to the proposed start date of Phase 2 of the Scheme.

Land at Bury Road/York Street Radcliffe, PIN Property Consultancy. (Reference 56744)

Hybrid planning application for the erection of 153 no. dwellings together with associated works including the laying of public open space, and the undertaking of engineering operations to remediate the site.

This application was approved with conditions in 2015. Due to the location of the proposed Scheme and this development there is potential for intra-Scheme cumulative effects, however it is believed that construction of this development will not be delivered in parallel to the Scheme.

Radcliffe and Redvales FRMS Phase 1

The Phase 1 works associated with the wider Radcliffe and Redvales FRMS are anticipated to be completed prior to the Phase 2 works commencing. It is not anticipated that these works will have any inter-Scheme cumulative effects during construction due to the anticipated construction sequencing.

7.4 Summary

This chapter includes a summary of the environmental assessment. Effects identified as major/moderate adverse or beneficial are regarded as significant in terms of planning considerations.

<i>Key issue</i>	<i>Description of likely effect</i>	<i>Mitigation</i>	<i>Significant Residual Effect (following mitigation)</i>
Ecology and Biodiversity	Negligible effect on bats through disturbance and removal of trees.	Soft felling techniques to remove trees with bat roost potential and installation of bat boxes to provide replacement roosts.	None
	Negligible effect on otters downstream of Hardy's Gate Bridge.	Construction best practice to be adhered to, any additional measures to be document in a CEMP.	
	Moderate adverse effect on nesting birds following removal of trees.	Clearance works will be undertaken outside of nesting bird season wherever possible. Nesting bird checks will be undertaken prior to any vegetation clearance works which are undertaken within seasonal timings.	
	Moderate beneficial effect on the removal of invasive species.	Adoption of Invasive Species Management Plan (ISMP) and treatment methods to manage invasives from within the Scheme footprint.	

<i>Key issue</i>	<i>Description of likely effect</i>	<i>Mitigation</i>	<i>Significant Residual Effect (following mitigation)</i>
	Moderate adverse effect following in-channel disturbance to fisheries and fish migratory movements during construction works highlighted as being in-channel. Moderate beneficial effect following creation of wetland habitat and riparian planting at Lower Hinds.	Actions to protect fisheries and mitigate potential disturbance will be detailed within the CEMP. To include; seasonal working constraints and silt management measures. None	

<i>Key issue</i>	<i>Description of likely effect</i>	<i>Mitigation</i>	<i>Significant Residual Effect (following mitigation)</i>
Townscape and Visual	Temporary moderate adverse effect due to visual intrusion as a result of the construction works in Lower Hinds and changes to existing landscape character Temporary moderate adverse effect due to temporary visual intrusion during the construction works (all Components). Temporary minor adverse effect due to visual intrusion at Hardy's Gate Bridge during construction.	Design optimised to reduce construction time and duration of works where possible. Extensive landscaping and replanting proposals. Design optimised to reduce construction time and duration of works where possible. Design optimised to reduce construction time and duration of works where possible.	None
Cultural Heritage and Archaeology	Minor adverse effect during construction on Hardy's Gate Bridge and Warth Bridge.	Record of condition of Hardy's Gate Bridge via photographic survey as agreed with stakeholders.	None
Water Framework Directive	Moderate adverse effect associated with in channel works and permanent introduction of hard defences along the river bank.	Record of compliance with WFD mitigation via mitigation proforma and design development. Creation of riparian wetland habitat, bank reprofiling works and improved floodplain connectivity to mitigate potentially	None

<i>Key issue</i>	<i>Description of likely effect</i>	<i>Mitigation</i>	<i>Significant Residual Effect (following mitigation)</i>
	Moderate beneficial effects associated with the removal of invasive species, bank reprofiling and floodplain connectivity proposed at Lower Hinds.	adverse effects. None	None
Traffic and Transport	Moderate adverse effect to road users during construction of Hardy's Gate Bridge. Minor adverse effect to road users during construction works and associated traffic throughout other scheme components.	Traffic modelling being undertaken to assess effects of partial and full road closures. Production of a Traffic Management Plan (TMP) to detail measures to minimise disruption.	
Land Use and Recreation	Minor adverse effect on land use due to restricted access during construction. Moderate beneficial effect on completion due to enhanced recreational value.	Design development and ongoing consultation to reduce the potential closure of the Lower Hinds area for recreational users. None	None

<i>Key issue</i>	<i>Description of likely effect</i>	<i>Mitigation</i>	<i>Significant Residual Effect (following mitigation)</i>
Geology, Soils and Contaminated Land	Minor adverse effect due to presence of potentially contaminated land and associated geotechnical hazards. Minor adverse effect due to presence of shallow coal workings and failure of flood defences due to subsidence.	Ground investigation testing and geophysical GPR survey conducted to establish presence of absence of contaminated material and coal workings. Layer of impermeable glacial till present in Close Park which will prevent migration of contaminants.	None
Noise and Vibration	Moderate adverse effect on sensitive receptors during construction at Hardy's Gate Bridge, Dumers Lane and Close Park ..	Measures to minimise noise outlined within the Scheme CEMP. Vibration monitoring will be conducted at sensitive locations. Property specific vibration insulation may be required on commencement of the works, as detailed within the CEMP.	None
Air Quality	Minor adverse effect on localised air quality and sensitive receptors during construction.	Measures to minimise noise outlined within the Scheme CEMP.	None

8 References

Design Manual for Roads and Bridges, Volume 11 Environmental Assessment, Section 2 Environmental Impact Assessment, Part 5 HA205/08

Town and Country Planning (Environmental Impact Assessment) Regulations, 2017. [Online] Available at <http://www.legislation.gov.uk/ukxi/2017/571/contents/made>

Town and Country Planning (General Permitted Development Order) 2015. [Online] Available at <https://www.legislation.gov.uk/ukxi/2015/596/contents/made>

Water Environment (Water Framework Directive) (England and Wales) Regulations, 2017. [Online] Available at <https://www.legislation.gov.uk/ukxi/2017/407/contents/made>

9 List of abbreviations

FRMS	Flood Risk Management Scheme
EA	Environment agency
ER	Environmental Report
EIA	Environmental Impact Assessment
PEIR	Preliminary Environmental Information Report
MM	Mott MacDonald
NGR	National Grid Reference
SoP	Standard of Protection
AEP	Annual Exceedance Probability
NFM	Natural Flood Management
FRA	Flood Risk Assessment
WFD	Water Framework Directive
SBI	Sites of Biological Importance
SSSI	Sites of Special Scientific Interest
LPA	Local Planning Authority
CEMP	Construction Environmental Management Plan
DMRB	Design Manual for Road and Bridges
EAP	Environmental Action Plan
GMAAS	Greater Manchester Archaeological Advisory Service
GMEU	Greater Manchester Ecology Unit
FLM	Final Landscape Masterplan
PEA	Preliminary Ecological Appraisal
LNR	Local Nature Reserve
PRA	Preliminary Roost Assessment
ISMP	Invasive Species Management Plan

TPOs	Tree Preservation Orders
HER	Historic Environment Record
TfGM	Transport for Greater Manchester
PRoW	Public Rights of Way
BGS	British Geological Survey
CLRA	Contaminated Land Risk Assessment
NIA	Noise Important Area
AQMA	Air Quality Management Area

10 Glossary

Air quality management area (AQMA)	Area defined by the local authority as an area requiring management because air quality levels do not meet national air quality objectives
Aquifer	An underground layer of rock with water storage capability.
Area of Outstanding Natural Beauty (AONB)	Areas formally designated under the National Parks and Access to the Countryside Act (1949) to protect parts of the countryside of high scenic quality that cannot be selected for National Park status as they do not have opportunities for outdoor recreation. The Countryside Agency is the government agency responsible for designating AONBs and advising the government.
Baseline	A description of the present state of the environment with the consideration of how the environment would change in the future in the absence of the plan/programme/project as a result of natural events and other human activities.
Baseline studies/survey	Collection of information about the environment which is likely to be affected by the project
Catchment Flood Management Plan (CFMP)	A high level plan carried out by the Environment Agency in order to manage the risk of flooding to people, property and the environment in an integrated way. These plans form the basis of future flood risk management proposals.
Character area	An area of land with distinctive landscape features resulting from an interaction of wildlife, landforms, geology, land use and human activity as defined by the Countryside Agency.
Conservation Area	An area designated under the Town and Country Planning Act, 1990 to protect its architectural or historic character.
Countryside and Rights of Way (CROW) Act 2000	This Act applies to England and Wales and has five parts: - - Access to the countryside - Public rights of way and road traffic - Nature conservation and wildlife protection - Areas of outstanding natural beauty - Miscellaneous and Supplementary This act increases the protection of SSSIs. Environment Agency plans/programmes/projects must gain consent for works in or

	near SSSIs using a CRoW form.
Cumulative Impacts	The combined impacts of several projects within an area, which individually are not significant, but together amount to a significant impact.
Department for Environment, Food and Rural Affairs (DEFRA)	The government department responsible for flood management policy in England
English Heritage (EH)	Government statutory advisor on the historic environment, funded jointly by the government and by revenue from properties and members.
Environmental Action Plan (EAP)	A standalone report or section within another environmental impact assessment document which ensures that constraints, objectives and targets set in the main Environmental Report/Statement are actually carried out on the ground. Actions are separated into those to be carried out before, during and after construction.
Environmental Impact Assessment (EIA)	“EIA is an assessment process applied to both new development proposals and changes or extensions to existing developments that are likely to have significant effects on the environment. The EIA process ensures that potential effects on the environment are considered, including natural resources such as water, air and soil; conservation of species and habitats; and community issues such as visual effects and impacts on the population. EIA provides a mechanism by which the interaction of environmental effects resulting from development can be predicted, allowing them to be avoided or reduced through the development of mitigation measures. As such, it is a critical part of the decision-making process.” www.iema.net/eiareport
Environmental Report (ER)	(1) The document produced for projects that do not require statutory environmental impact assessment, but where environmental impact has been carried out. This includes projects that require planning permission from the local authority but the effects of the proposal will not be significant. An ER usually follows the same template as an Environmental Statement, but is less detailed. (2) The document produced to describe the strategic environmental assessment process carried out for strategies. This report can be standalone or contained as an appendix to a strategy.
Flood alleviation scheme (FAS)	Scheme designed to reduce the risk of flooding in a given area
Flood Cell	A discrete area subject to flooding from failure of defences at a specific point or length.
Flood defence	A structure (or system of structures) that reduce flooding from

	rivers or the sea
Flood risk management strategy (FRMS)	A long term (50 years or more) plan for coastal or river management to reduce the risk of flooding and carry out. They are more detailed than CFMPs.
General Permitted Development Order (GPDO)	The Town and Country Planning (General Permitted Development) Order 1995 sets out what may be built without needing planning permission. Part 15 applies specifically to the Environment Agency
Indicative landscape plan (ILP)	Overlay of existing environment and scheme proposals to highlight environmental constraints and opportunities including designated sites and landscape character.
Main river	A watercourse designated by DEFRA. The Environment Agency has permissive powers to carry out flood defence works, maintenance and operational activities on main rivers. Responsibility for maintenance rests on the riparian owner.
Mitigation measures	Actions that are taken to minimise, prevent or compensate for adverse effects of the development.
Natural Areas	Sub-divisions of England, characterised by wildlife and natural features. There are 120 Natural Areas in England. Designations are managed by English Nature.
Natural England	Natural England is an Executive Non-departmental Public Body responsible to the Secretary of State for Environment, Food and Rural Affairs. Their purpose is to protect and improve England's natural environment and encourage people to enjoy and get involved in their surroundings. Their aim is to create a better natural environment that covers all of our urban, country and coastal landscapes, along with all of the animals, plants and other organisms that live with us.
Riparian	Area of land or habitat adjacent to rivers and streams
Scheduled monument	Nationally important historic sites, buildings or monuments identified by English Heritage and designated by the Secretary of State for Culture, Media and Sport. Any work affecting a scheduled monument must gain consent from English Heritage under the Ancient Monuments and Archaeological Areas Act (1979).
Scoping	The process of deciding the scope or level of detail of an EIA/ SEA. During this stage the key environmental issues (likely significant effects) of a project/strategy are identified so that the rest of the process can focus on these issues. Issues may result from the proposal itself or from sensitivities of the site.
Screening	(1) For environmental impact assessment, the process of deciding which developments require an environmental impact assessment to be carried out and whether this will be statutory.

	(2) For strategic environmental assessment, the decision on which plans, strategies or programmes require strategic environmental assessment to be carried out and whether this will be statutory.
Screening opinion	Statutory opinion from the competent authority as to whether a proposed project requires statutory environmental impact assessment according to the Environmental Impact Assessment Regulations.
Standard of protection (SoP)	The level of protection from flooding, for example an SoP of 1 in 100 means that the flood defences in an area provide protection from floods up to a size of flood with a probability of occurring of 1 in 100 in any year
Water Framework Directive (WFD)	EC Directive (2000/60/EC) on integrated river basin management. The WFD sets out environmental objectives for water status based on ecological and chemical parameters, common monitoring and assessment strategies, arrangements for river basin administration and planning and a programme of measures in order to meet the objectives.

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