

Grangemouth Flood Protection Scheme Environmental Impact Assessment Report

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Acronyms

FRE	Frontiers of the Roman Empire
FSA	Flood Storage Area
HER	Historic Environment Record
HES	Historic Environment Scotland
ICOMOS	International Council on Monuments and Sites
ICCROM	International Centre for the Study of the Preservation and Restoration of Cultural Property
OG	Operational Guidelines for the Implementation of the World Heritage Convention
OUV	Outstanding Universal Value
UNESCO	United Nations Educational, Scientific and Cultural Organization
WSI	Written Scheme of Investigation
WHS	World Heritage Site

13. Cultural Heritage

13.1 Introduction

This chapter presents the results of the assessment of the effects of the Scheme on cultural heritage assets during its construction and operation.

A cultural heritage asset is an individual archaeological site or building, a monument or group of monuments, a historic building or group of buildings or a historic landscape which, together with its setting (where relevant), can be considered as a unit for assessment. Cultural heritage assets assessed include both those that are designated and undesignated. Undesignated heritage assets are buildings, monuments, sites, places, areas or landscapes identified as having a degree of significance meriting consideration in planning decisions because of their heritage interest but which do not meet the criteria for designated heritage assets. Designated assets either within the study area or predicted to be affected by the Scheme comprise World Heritage Sites, Scheduled Monuments and Listed Buildings.

World Heritage Sites are places of Outstanding Universal Value as set out in the 1972 UNESCO Convention Concerning the Protection of the World Cultural and Natural Heritage¹ (the World Heritage Convention). As a State Party to the Convention, the United Kingdom is required to identify, protect, conserve, present and transmit its World Heritage Sites (WHS) to future generations. Designation of a WHS by UNESCO brings no additional statutory controls, but protection is afforded through the planning system as well as through other designations, such as Scheduled Monuments, that cover elements, if not the whole, of the site. The World Heritage Site within the study area is the Antonine Wall, part of the overall Frontiers of the Roman Empire (FRS) World Heritage Site. World Heritage Sites (WHS) come with a commitment to protect the exceptional cultural significance of the Site and Outstanding Universal Values (OUV) for which it was inscribed. It is imperative that development does not compromise the values for which the Antonine Wall was inscribed as a World Heritage Site, its authenticity or integrity. To protect the important landscape setting of the Antonine Wall a Buffer Zone has been defined as a series of zones along the Wall, up to approximately 1-1.5 km from the Wall to the north and south.. The Buffer Zone does not act as an absolute barrier to development but defines a zone where added protection to the immediate setting of the World Heritage Site is given. Development proposals within the Buffer Zone will be given careful consideration to determine whether it is likely to significantly detract from the Outstanding Universal Value, authenticity or integrity of the Antonine Wall (Frontiers of the Roman Empire (Antonine Wall) World Heritage Site 2016).

Sections of the WHS are also Scheduled Monuments, including Antonine Wall and Mumrills fort, Sandy Loan to A905, Falkirk (SM8832), Antonine Wall, Millhall Burn to River Avon (SM9728), Antonine Wall, Nether Kinneil-Inveravon, rampart & ditch (SM3211) and Antonine Wall, fort and shell middens 240m WSW of The Tower, Inveravon (SM3209).

There are associated Scheduled Roman military sites such as Lochlands Roman camps (SM4259) and Camelon, Roman forts (SM1746).

Other Scheduled Monuments considered as part of the assessment include Mumrills, enclosure 250m E of (SM6416), an enclosed prehistoric settlement close to the line of the Antonine Wall and the prehistoric enclosure at Bowhouse, circular enclosure, Polmont (SM2207).

There is one Category A Listed Building within the study area, Dundas Church, Bo'ness Road (LB34041), 10 Category B Listed Buildings and 7 Category C Listed Buildings. There are no designated Battlefields, Gardens or Designed Landscapes or Marine Protection Areas.

¹ See: <http://whc.unesco.org/en/conventiontext/> [accessed on 16th August 2019]

Undesignated assets include some prehistoric midden sites but are mainly those associated with Grangemouth's industrial heritage, such as a ferry, churches, bridges, iron works, dry docks, distilleries, ropeworks, limekilns and watermills.

Based on guidance provided by The International Council on Monuments and Sites (ICOMOS 2011) and United Nations Educational, Scientific and Cultural Organization, (UNESCO), cultural heritage assets in this assessment are considered under the four areas of: Archaeological Remains, Built Heritage or Historic Urban Landscapes, Historic Landscape Types and Intangible Cultural Heritage or Associations (ICHA). Both designated and undesignated cultural heritage assets have been assessed.

- Archaeological Remains - the material remains of human activity from the earliest periods of human evolution to the present. These may be buried traces of human activities, sites visible above ground or moveable artefacts. Archaeological remains can encompass the remains of buildings, structures, earthworks and landscapes, human, animal or plant remains or other organic material produced by or affected by human activities or their settings;
- Built Heritage or Historic Urban Landscapes - standing historical structures, or groups of structures, that are usually formally designated or have some architectural presence. These may include structures that have no aesthetic appeal or structures not usually thought of as 'buildings', such as milestones or bridges;
- Historic Landscape - landscape is an area, as perceived by people, whose character is the result of the action and interaction of natural and/ or human factors; and
- Intangible Cultural Heritage or Associations - includes oral traditions, performing arts, social practices, rituals, festive events, knowledge and practices concerning nature and the universe or the knowledge and skills to produce traditional crafts.

The cultural heritage assets assessed are described and valued in the context of relevant legislation, relevant planning policy and guidance set out in Section 13.2.

The aims of the cultural heritage assessment are to:

- identify the presence and designation status of the cultural heritage resource;
- evaluate the value of cultural heritage assets;
- identify any potential impacts and effects associated with the design, anticipated construction method and operation of the Scheme;
- identify and present mitigation measures to address identified potential effects;
- assess the Scheme for cumulative impacts and effects in combination alone or with other plans and projects;
- assess the residual effects following the implementation of mitigation or additional mitigation required (during and post construction); and
- detail the monitoring required to assess the effectiveness of mitigation.

This chapter is set out as follows:

- Section 13.2 Policy and Legislative Framework
- Section 13.3 Methodology
- Section 13.4 Baseline
- Section 13.5 Impact Assessment
- Section 13.6 Mitigation
- Section 13.7 Residual Effects

- Section 13.8 Monitoring

This chapter has taken other technical chapters into account, or input into other chapters, where impacts of relevance to cultural heritage are assessed, including:

- Chapter 2: Legislative and Regulatory Framework
- Chapter 4: The Scheme
- Chapter 8: Noise and Vibration
- Chapter 9: Landscape and Visual Impact Assessment
- Chapter 10: Water Environment
- Chapter 11: Soils, Geology and Land Contamination
- Chapter 15: Cumulative Effects

This Cultural Heritage assessment is supported by the following appendices:

- Appendix B13: Figure B13.1 (a-f) – Heritage Asset Locations
- Appendix B13: Figure B13.2 (a-f) – Historic Landscape Types
- Appendix B13: Figure B13.3 – Antonine Wall Cross Section
- Appendix B13: Figure B13.4 – Baseline Flooding
- Appendix B13: Figure B13.5 – 200yr flooding
- Appendix B13: Figure B13.6 – 200yr flooding increase
- Appendix B13: Figure B13.7 – 200yr flooding decrease
- Appendix C13.1 – Desk Based Survey (DBS)
- Appendix C13.2 – Westquarter Burn Flood Storage Area Record of Outline Design Development

13.2 Policy and Legislative Framework

13.2.1 Regulatory Framework

The following legislation is relevant to this assessment.

- Historic Environment Scotland Act 2014. This Act established HES which took over the functions of Historic Scotland and the Royal Commission on the Ancient and Historical Monuments of Scotland (RCAHMS). The Act also changed processes for the designation of sites and buildings (by scheduling and listing) and for Scheduled Monuments, Listed Buildings and Conservation Areas Consent.
- Planning (Listed Buildings and Conservation Areas) (Scotland) Act 1997 (as amended by the Historic Environment Scotland Act 2014). Listed Buildings and Conservation Areas are protected under this Act and are recognised to be buildings or areas of special architectural or historic interest, the character or appearance of which is desirable to preserve or enhance. Planning authorities are required to have special regard to the desirability of preserving a Listed Building and its setting and to designate areas of special architectural or historic interest as Conservation Areas.
- Planning (Listed Building Consent and Conservation Area Consent Procedure) (Scotland) Regulations 2015 sets out the process for applying for and determining applications for listed building consent and conservation area consent.
- Ancient Monuments and Archaeological Areas Act 1979 (as amended by the Historic Environment Scotland Act 2014). This act defines sites that warrant protection due to their being of national importance as 'ancient monuments'. These can be either Scheduled Monuments or "any other

monument which in the opinion of the Secretary of State is of public interest by reason of the historic, architectural, traditional, artistic or archaeological interest attaching to it". Scheduled Monuments are, by definition, of National Importance and are protected by law under this act. It is a criminal offence to damage a Scheduled Monument, and Scheduled Monument Consent must be obtained from the Secretary of State before any works affecting a Scheduled Monument may take place. This Act also requires Scottish Ministers to compile and maintain an inventory of gardens and designed landscapes and an inventory of battlefields.

13.2.2 Policy Framework

The Historic Environment Policy for Scotland (HEPS) (HES, 2019a) is a policy statement for directing decision making for the whole of the historic environment. It is non-statutory but is relevant at both national and local levels. HEPS should be taken into account whenever a decision will affect the historic environment and is a material consideration for planning proposals that might affect the historic environment and in relation to Scheduled Monument and Listed Building Consent. Policies and plans relating to managing change include:

- HEP2 - Decisions affecting the historic environment should ensure that its understanding and enjoyment as well as its benefits are secured for present and future generations.
- HEP3 - Plans, programmes, policies and strategies, and the allocation of resources, should be approached in a way that protects and promotes the historic environment. If detrimental impact on the historic environment is unavoidable, it should be minimised. Steps should be taken to demonstrate that alternatives have been explored, and mitigation measures should be put in place.
- HEP4 - Changes to specific assets and their context should be managed in a way that protects the historic environment. Opportunities for enhancement should be identified where appropriate. If detrimental impact on the historic environment is unavoidable, it should be minimised. Steps should be taken to demonstrate that alternatives have been explored, and mitigation measures should be put in place.
- Scheduled Monument Consents Policy (HES, 2019d), which was published on 05 April 2019, sets out policy for making decisions about consents at scheduled monuments.

The Development Plan relevant to the study area is comprised of National Planning Framework 4 (NPF4) (The Scottish Government, 2023) and the Falkirk Local Development Plan 2 (LDP2) (Falkirk Council, 2020). NPF4 is the more recent publication, adopted by the Scottish Ministers in February 2023. FLDP2 was adopted by Falkirk Council in 2020. Both plans are read together, however where there is any difference in policy content the more recent publication takes precedence, in this case NPF4. NPF4 policy which is of relevance to this chapter is summarised below.

NPF4 Policy 7 Historic assets and places:

'a) Development proposals with a potentially significant impact on historic assets or places will be accompanied by an assessment which is based on an understanding of the cultural significance of the historic asset and/or place. The assessment should identify the likely visual or physical impact of any proposals for change, including cumulative effects and provide a sound basis for managing the impacts of change.

Proposals should also be informed by national policy and guidance on managing change in the historic environment, and information held within Historic Environment Records.

h) Development proposals affecting scheduled monuments will only be supported where:

- i. direct impacts on the scheduled monument are avoided;
- ii. significant adverse impacts on the integrity of the setting of a scheduled monument are avoided; or

iii. exceptional circumstances have been demonstrated to justify the impact on a scheduled monument and its setting and impacts on the monument or its setting have been minimised.

l) Development proposals affecting a World Heritage Site or its setting will only be supported where their Outstanding Universal Value is protected and preserved.'

The Falkirk Local Development Plan 2 (LDP2) contains the following policies in respect of the historic environment:

Policy PE05 Antonine Wall

The Council will seek to retain, protect, preserve and enhance the Antonine Wall, its associated archaeology, character and setting. Accordingly:

- There will be a presumption against development which would have an adverse impact on the 'Frontiers of the Roman Empire (Antonine Wall) World Heritage Site' as defined on the Proposals Map;
- There will be a presumption against development within the 'Frontiers of the Roman Empire (Antonine Wall) World Heritage Site' buffer zones, as defined on the Proposals Map, which would have an adverse impact on the Site and its setting, unless mitigating action to the satisfaction of the Council in consultation with Historic Environment Scotland can be taken to redress the adverse impact, and there is no conflict with other LDP policies; and
- Supplementary Guidance SG11 'Frontiers of the Roman Empire (Antonine Wall) World Heritage Site' will be applied in assessing development proposals along the line, or affecting the setting, of the Antonine Wall.

Policy PE06 Archaeological Sites

- Scheduled monuments and other identified nationally important archaeological resources will be preserved in situ, and within an appropriate setting. Developments which have an adverse effect on scheduled monuments, or the integrity of their setting will not be permitted unless there are exceptional circumstances;
- All other archaeological resources will be preserved in situ wherever feasible. The Council will weigh the significance of any impacts on archaeological resources and their settings against other economic, social and environmental merits of the development proposals in the determination of planning applications; and
- Developers may be requested to supply a report of an archaeological evaluation prior to determination of the planning application. Where the case for preservation does not prevail, the developer shall be required to make appropriate and satisfactory provision for archaeological excavation, recording, analysis and publication, in advance of development.

Policy PE07 Listed Buildings

- Development proposals within the curtilage or affecting the setting of a listed building should not adversely affect the character, appearance, special architectural or historic interest of the building, or its setting;
- Proposals affecting listed buildings or their setting should conform with SG12 'Listed Buildings and Unlisted Properties in Conservation Areas'.

Policy PE09 Areas of Townscape Value

- The Council recognises the architectural and historic merit and potential of the additional areas of townscape value identified on the Proposals Map, which do not currently have Conservation Area status.

- Within these areas the Council will undertake Character Appraisals to determine whether the areas merit designation as Conservation Areas, either as new Conservation Areas, or as extensions to existing ones; and
- Within these areas development proposals will be required to fit with the distinctive character of the area with particular reference to the historic pattern and density of development; its setting; the architectural style, massing and materials of buildings; landscape treatments; and boundary features.
- Policy PE10 Historic Gardens and Designed Landscapes
- The value of other historic gardens and designed landscapes not listed in the Inventory will be given due weight in the planning process, having regard to their historical significance, integrity and condition, and relationship to other associated historic buildings or structures.
- Scotland's National Marine Plan (NMP) (The Scottish Government, 2015) sets out strategic policies for the sustainable development of Scotland's marine resources out to 200 nautical miles. The Scottish Ministers must make authorisation and enforcement decisions, or any other decisions that affects the marine environment, in accordance with the NMP. Policies of the NMP of relevance to this chapter are as follows:
 - GEN 1 General Planning Principle: "There is a presumption in favour of sustainable development and use of the marine environment when consistent with the policies and objectives of the plan."
 - GEN 2 Historic Environment: "Development and use of the marine environment should protect and, where appropriate, enhance heritage assets in a manner proportionate to their significance."

13.3 Methodology

13.3.1 Guidance

Part of the Scheme and its study area fall within the boundary of the Frontiers of the Roman Empire (FRE) World Heritage Site (WHS) (the Antonine Wall). In order to fully assess the potential impact of the Scheme on the value of the WHS, this assessment has been undertaken in accordance with:

- guidance provided by The International Council on Monuments and Sites (ICOMOS 2011); and
- United Nations Educational, Scientific and Cultural Organization, ICOMOS, International Centre for the Study of the Preservation and Restoration of Cultural Property (ICCROM); and the International Union for the Conservation of Nature (IUCN) Guidance and Toolkit for Impact Assessment in a World Heritage Context (UNESCO et al. 2022), (2022 Guidance and Toolkit), the concept of which underpins the World Heritage Convention and all activities associated with properties inscribed on the World Heritage List. This recent Guidance, while not changing previously established methodology, introduces important new considerations of the linkages between cultural and natural heritage which, if present in a particular WHS, should be included in the assessment (UNESCO et al. 2022).

In order to have a standardised approach, this methodology has been applied to all areas of the Scheme for the cultural heritage assessment,

In addition to ICOMOS guidance, other policy documents and published guidelines considered in the preparation of this chapter include:

- Planning Advice Note 2/2011: Planning and Archaeology (PAN2/2011) (Scottish Government, 2011);
- Historic Environment Circular 1 (HES, 2016a);
- Managing Change in the Historic Environment: Setting (HES, 2016b);
- Managing Change in the Historic Environment: World Heritage (HES, 2016c);

- Frontiers of the Roman Empire (Antonine Wall) World Heritage Site Supplementary Planning Guidance (HES 2016d)
- Standards and guidance for historic environment desk-based assessment (Chartered Institute for Archaeologists, 2017); and
- EIA Handbook: (SNH and HES, 2018); and
- Operational Guidelines for the Implementation of the World Heritage Convention (WHC, 2021).

13.3.2 Scoping and Consultations

- In response to the EIA Screening and Scoping Report for the Scheme (Appendix C3.1), comments were received from both Historic Environment Scotland (HES) and Falkirk Council regarding cultural heritage (Appendix C3.2).
- In addition, both prior to and following submission of the EIA Screening and Scoping Report, consultation was undertaken with HES and Falkirk Council to discuss the design of the Scheme and the potential impacts arising from it. The consultation included a workshop held on 26 June 2019 with Falkirk Council and a series of six meetings, workshops and site visits with HES between 2017-2023, to take a collaborative design approach to addressing issues relating to heritage assets (namely the WHS) with the emerging proposals at the West Quarter Burn. Further details of how the design evolved to embed such mitigation are given in Appendix C13-2: Westquarter Burn Flood Storage Area Record of Outline Design Development.
- Details of these consultations are provided in Appendix C13-2: Westquarter Burn Flood Storage Area Record of Outline Design Development.

Changes to the scheme design were adopted to reduce potential significant adverse effects on cultural heritage. These included:

- proposed type and alignment of flood protection measures in Flood Cells 4 and 5 were remodelled such that the impact of the Scheme on the Antonine Wall WHS (Asset 1) was reduced and also to avoid any Scheduled sections of the WHS; and
- various alternative designs of flood storage areas and dams were explored and, following the remodelling of flood storage requirements, identified the preferred alignment of a flood wall along the line of the existing A9 and Grandsable Road that would retain enough water to obviate the need for a dam structure.

13.3.3 Study Area

The study area comprises the footprint of the Scheme plus a 300m buffer around the footprint which was agreed with the Falkirk Community Trust Heritage Engagement Officer. The study areas were identified according to the location of the six flood cells and take into consideration all the four sub-topics of cultural heritage discussed in this chapter (Archaeological Remains, Built Heritage or Historic Urban Landscapes, Historic Landscape Types, ICHA). Figures B13.1 (a-f) and B13.2 (a-f) in Appendix B show the study areas and record the associated Cultural Heritage assets therein. This study area is based on professional judgement and is considered appropriate to fully capture the potential impact of the Scheme. For the 300m study area, this includes potential physical impacts and impacts on heritage assets through more immediate changes within their settings. This study area also allows for a broader study of the archaeology within the area of the Scheme which can be used to infer the potential for the presence of unknown archaeological remains.

13.3.4 Baseline Conditions

To establish the cultural heritage baseline, the following sources of information were consulted:

- National Record of the Historic Environment (NRHE) (HES, 2019b);

- Historic Land use Assessment (HES, 2019c);
- Falkirk Community Trust for information on non-designated cultural heritage assets recorded within the Falkirk Sites and Monuments Record (SMR) (received July 2019, by March 2023, the HER baseline had not been updated)
- A review of online historic mapping held by the National Library of Scotland (National Library of Scotland, 2019)
- Archaeology Data Service/Oasis for published and unpublished reports.

A walkover survey of the areas of the Scheme, and assets outwith the Scheme that have the potential for impacts on their setting, was undertaken between the 29th and 31st of July 2019.

A full baseline and gazetteer are contained within Appendix C13.1: Desk Based Survey.

The development of the design options at Westquarter Burn is contained in Appendix C13.2: Westquarter Burn Flood Storage Area Record of Outline Design Development.

Other specialist chapters relevant to the preparation of this assessment comprise:

- Chapter 8: Noise and Vibration for potential impacts on Grangemouth Road, Avon Bridge (Asset 12).
- Chapter 9: Landscape and Visual Impact Assessment for potential impacts on Grangemouth Area of Townscape Value (HLT17).
- Chapter 10: Water Environment for potential impacts on increased flooding or dewatering of Scheduled Monuments.

13.3.5 Impact Assessment

13.3.5.1 Value

For all four sub-topics of cultural heritage, (Archaeological Remains, Built Heritage or Historic Urban Landscape, Historic Landscape and ICHA), an assessment of the value of each Cultural Heritage asset was undertaken on a six-point scale of Very High, High, Medium, Low, Negligible and Unknown, based on professional judgment and guided by the criteria provided in ICOMOS. Intangible cultural heritage is defined in the Glossary to the Management Plan 2014-19 (Historic Scotland et al. 2014) as: "the practices, expressions, knowledge and skills that communities, groups and sometimes individuals recognise as part of their cultural heritage. Also called living cultural heritage, it is usually expressed in one of the following forms: oral traditions; performing arts; social practices, rituals and festive events; knowledge and practices concerning nature and the universe; and traditional craftsmanship." The criteria used to assess the value of Cultural Heritage assets are provided in Table 13-1.

Table 13-1: Criteria to assess the value of cultural heritage assets

Value	Criteria
Very High	<p>World Heritage Sites (including buildings and those inscribed for their historic landscape qualities).</p> <p>Individual attributes that convey Outstanding Universal Value (OUV) of the World Heritage Site (WHS).</p> <p>Assets of acknowledged international importance.</p> <p>Assets that can contribute significantly to acknowledged international research objectives.</p> <p>Extremely well-preserved historic landscapes with exceptional coherence, time-depth or other critical factors.</p> <p>Areas associated with Intangible Cultural Heritage or Associations (ICHA) activities as evidenced by the national register or associations with particular innovations or individuals, technical or scientific developments or movements of international importance.</p>
High	<p>Scheduled Monuments (including standing remains).</p> <p>Designated historic landscapes of outstanding interest.</p> <p>Undesignated assets of schedulable quality and importance.</p> <p>Assets that can contribute significantly to national research objectives.</p> <p>Category A Listed Buildings.</p> <p>Other Listed Buildings that can be shown to have exceptional qualities in their fabric or historical associations.</p> <p>Conservation Areas containing very important buildings.</p> <p>Undesignated structures of clear national importance.</p> <p>Undesignated landscapes of outstanding interest, high quality or importance and of demonstrable national value.</p> <p>Well-preserved historic landscapes, exhibiting considerable coherence, time-depth or other critical factors.</p>
Medium	<p>Designated or undesignated assets that contribute to regional research objectives.</p> <p>Undesignated historic landscapes that would justify special historic landscape designations, or landscapes of regional value.</p> <p>Averagely well-preserved historic landscapes with reasonable coherence, time-depth or other critical factor.</p> <p>Category B Listed Buildings.</p> <p>Conservation Areas containing buildings that contribute significantly to its historic character.</p> <p>Historic Townscape or built-up areas with important historic integrity in their buildings, settings or built settings. This includes Areas of Townscape Value - a non - statutory designation within the Falkirk Council Area, for areas that form coherent and interesting groups of buildings.</p>
Low	<p>Designated and undesignated assets of local importance.</p> <p>Robust undesignated historic landscapes and historic landscapes with importance to local interest groups.</p> <p>Historic landscapes whose value is limited by poor preservation and / or poor survival of contextual associations.</p> <p>Assets compromised by poor preservation and/or poor survival of contextual associations.</p> <p>Assets of limited value, but with potential to contribute to local research objectives</p> <p>Category C Listed Buildings.</p> <p>Historic (unlisted) buildings of modest quality in their fabric or historical association.</p> <p>Historic Townscapes or built-up areas of limited historic integrity in their buildings or built settings.</p>

Value	Criteria
Negligible	Assets with very little or no surviving archaeological interest. Buildings of no archaeological or historical note, or buildings of an intrusive character. Landscapes with little or no significant historical interest.
Unknown	The value of the site has not been ascertained.

13.3.5.2 Impact Magnitude

Potential impacts can fall within the following types: direct or indirect; permanent or temporary; irreversible or reversible; cumulative; visual; physical; social, cultural and economic.

The magnitude of impact is the degree of change that would be experienced by a cultural heritage asset as a result of the Scheme, in comparison to the baseline conditions. The magnitude of impact is assessed without reference to the value of the cultural heritage asset and may include physical impacts on the cultural heritage asset or impacts on its setting or amenity value.

The assessment of impact magnitude was based on professional judgement, informed by the methodology and criteria provided by ICOMOS for archaeological remains, built heritage or historic urban landscape, historic landscape and ICHA. The criteria used to assess the impact of the Scheme on cultural heritage assets are provided in Table 13-2.

Table 13-2: Magnitude of impact on cultural heritage assets

Magnitude	Criteria
Major	Changes to attributes that convey OUV of the WHS. Change to most or all key archaeological materials, including those that contribute to OUV, such that the resource is totally altered. Change to key historic building elements that contribute to OUV, such that the resource is totally altered. Change to most or all key historic landscape elements, parcels or components; extreme visual effects; gross change of noise or change to sound quality; fundamental changes to use or access; resulting in total change to historic landscape character unit and loss of OUV. Comprehensive changes to setting. Major changes to the area that affect the ICHA activities or visual links and cultural appreciation.
Moderate	Changes to many key archaeological materials, such that the resource is clearly modified. Change to many key historic building elements, such that the resource is significantly modified. Changes to many key historic landscape elements, parcels or components, visual change to many key aspects of the historic landscape, noticeable differences in noise or sound quality, considerable changes to use or access; resulting in moderate changes to historic landscape character. Changes to the setting of a cultural heritage asset, such that it is significantly modified. Considerable changes to the area that affect the ICHA activities or visual links and cultural appreciation.

Magnitude	Criteria
Minor	Changes to key archaeological materials, such that the asset is slightly altered. Change to key historic building elements, such that the asset is slightly different. Changes to few key historic landscape elements, parcels or components, slight visual changes to few key aspects of historic landscape, limited changes to noise levels or sound quality; slight changes to use or access: resulting in limited changes to historic landscape character. Change to setting of a cultural heritage asset, such that it is noticeably changed. Changes to the area that affect the ICHA activities or visual links and cultural appreciation.
Negligible	Very minor changes to archaeological materials or setting. Slight changes to historic buildings elements or setting that hardly affect it. Very minor changes to key historic landscape elements, parcels or components, virtually unchanged visual effects, very slight changes in noise levels or sound quality; very slight changes to use or access; resulting in a very small change to historic landscape character. Very minor changes to the area that affect the ICHA activities or visual links and cultural appreciation.
No Change	No change to fabric or setting. No change to elements, parcels or components; no visual or audible changes; no changes arising from amenity or community factors. No change to ICHA

13.3.5.3 Assessment of Significant Effects

For all four sub-topics, the significance of effects was determined taking account of the value of the Cultural Heritage asset and the magnitude of potential impact. This was achieved using professional judgement informed by the matrix presented in ICOMOS (2011, p.9). Five levels of significance (Very Large, Large, Moderate, Slight or Neutral) were defined which apply equally to adverse and beneficial impacts. For the purpose of this assessment, impacts of Moderate or greater significance are considered to be potentially significant. Unless otherwise stated, all impacts are adverse. The criteria used to assess the significance of effects on Cultural Heritage assets are provided in Table 13-3.

Table 13-3: Matrix for determination of impact significance

		No change	Negligible	Minor	Moderate	Major
		Magnitude of Impact				
Value	Very High	Neutral	Slight	Moderate/Large	Large/Very Large	Very Large
	High	Neutral	Slight	Moderate/Slight	Moderate/Large	Large/Very Large
	Medium	Neutral	Neutral/Slight	Slight	Moderate	Moderate/Large
	Low	Neutral	Neutral/Slight	Neutral/Slight	Slight	Slight/Moderate
	Negligible	Neutral	Neutral	Neutral/Slight	Neutral/Slight	Slight

13.3.5.4 Impacts on Setting

Setting is defined by 'Managing Change in the Historic Environment: Setting' as "the way the surroundings of a historic asset or place contribute to how it is understood, appreciated and experienced" (HES, 2016, page 6). Based on the guidance provided by this document, a three-stage process was used to assess the effect of the Scheme on the setting of cultural heritage assets:

- Stage 1: Cultural Heritage assets where the setting may be affected by the Scheme were identified.
- Stage 2: Modern Ordnance Survey mapping, online aerial photography and walkover survey were used to define the setting of Cultural Heritage assets by establishing if and how their surroundings contribute to the ways in which the Cultural Heritage asset is understood, appreciated and experienced.
- Stage 3: The potential effect of the Scheme on people's ability to understand, appreciate or experience a Cultural Heritage asset was then assessed using professional judgement and paragraph 5.8 of Guidance on Heritage Impact Assessments for Cultural World Heritage Properties (ICOMOS, 2011). This was primarily informed by the walkover survey.

13.3.5.5 Limitations to Assessment and Assumptions

No intrusive archaeological investigations have been undertaken, which is considered appropriate for the purposes of this EIA due to the constrained ground disturbance areas. It is assumed that archaeological remains are present within the study area and consultation was undertaken with Falkirk Council to agree appropriate mitigation to be implemented at the construction phase should remains be encountered. It is noted that while the HER baseline was attained for the Scheme in 2019, no further data has been available from Falkirk Council since then to allow for a refresh of the baseline. It is however considered unlikely that the baseline for the Scheme area will have changed in the interim such that the assessment outcomes would differ.

13.4 Baseline

13.4.1 Introduction

In total, 137 Cultural Heritage assets were considered as part of the baseline comprising 79 archaeological remains, 40 historic buildings, 17 historic landscape types and one intangible cultural heritage asset. Full details of all assets are provided in Appendix C13.1: Desk Based Survey Annex A: Gazetteer.

There is a total of ten designated archaeological remains, comprising one World Heritage Site asset (the buffer zone for this World Heritage Site is also given an asset number for reference) and eight Scheduled Monuments (Table 13-4), and 18 designated historic buildings, comprising one Category A Listed Building, ten Category B Listed Buildings and seven Category C Listed Buildings (Table 13-5). There are no designated historic landscape types.

Table 13-4: Archaeological Remains - Designated

Asset No	Asset Name	Designation	Flood Cell	Value
Asset 1/2	Antonine Wall and Buffer Zone	World Heritage Site	4, 5, 6	Very High
Asset 3	Lochlands Roman camps	Scheduled Monument	1	High
Asset 4	Mumrills, enclosure	Scheduled Monument	4	High
Asset 5	Bowhouse, circular enclosure, Polmont	Scheduled Monument	4	High
Asset 6	Antonine Wall and Mumrills fort, Sandy Loan to A905, Falkirk	Scheduled Monument	4	Very High
Asset 7	Antonine Wall, Millhall Burn to River Avon	Scheduled Monument	5	Very High

Asset No	Asset Name	Designation	Flood Cell	Value
Asset 8	Antonine Wall, Nether Kinneil-Inveravon, rampart and ditch	Scheduled Monument	5	Very High
Asset 9	Camelon, Roman Forts	Scheduled Monument	1	High
Asset 10	Antonine Wall, fort and shell middens 240m WSW of The Tower, Inver	Scheduled Monument	5	Very High

Table 13-5: Historic Buildings - Designated

Asset No	Asset Name	Designation	Flood Cell	Value
Asset 11	Dovecot, Carron House	Category B Listed Building; Scheduled Monument	1	Medium
Asset 12	Grangemouth Road, Avon Bridge	Category C Listed Building	5	Low
Asset 13	Grangemouth, Inveravon Tower	Category C Listed Building	5	Low
Asset 15	Carron House	Category B Listed Building	1	Medium
Asset 16	Carron Company, Clock Tower Remnant of Former Office Block	Category C Listed Building	1	Low
Asset 18	Weir Carron Iron Works	Category B Listed Building	1	Medium
Asset 19	Former Railway Bridge Across River Carron Iron Works	Category B Listed Building	1	Medium
Asset 20	Grahamston Cast-Iron Gate	Category B Listed Building	1	Medium
Asset 21	Scared Heart Rc Church Dalratho Road and Drummond Place	Category C Listed Building	4	Low
Asset 22	Dundas Church, Bo'ness Road	Category A Listed Building	4	High
Asset 23	Carronflats Road, Abbotsgrange Middle School	Category B Listed Building	4	Medium
Asset 24	Ronaldshay Crescent and Park Road Grange Church and Church Hall	Category B Listed Building	4	Medium
Asset 25	Ronaldshay Crescent Zetland Parish Church (Old Parish Church)	Category B Listed Building	4	Medium
Asset 26	Swing Bridge, Western Channel And Carron Dock, Grangemouth Docks	Category B Listed Building	3	Medium

Asset No	Asset Name	Designation	Flood Cell	Value
Asset 27	Grangemouth Dock, Former Workshop Building	Category C Listed Building	2	Low
Asset 28	Grangemouth Station Road, Former La Scala Cinema	Category C Listed Building	4	Low
Asset 29	Zetland Park War Memorial and Park Gates, Grangemouth	Category B Listed Building	4	Medium
Asset 32	Fountain, Zetland Park, Dalratho Road, Grangemouth	Category C Listed Building	4	Low

The cultural heritage baseline of relevance to the Scheme is further discussed below in chronological order.

13.4.2 Palaeolithic and Mesolithic Periods (12,700 – 4,100 BC)

About 10,000 years ago, the whole of Scotland lay under a massive sheet of ice. As the climate slowly warmed and the ice retreated the land was colonised by grasses and shrubs. Trees followed, hazel and birch at first, then oak and pine. In their wake people began to occupy the area; hunting, fishing and where possible gathering plants and fruits. The retreat of the ice marked the end of the Palaeolithic period, and while primitive stone tools from this period have been found in southern England, evidence of people from this time is thought to have been lost through ice action in Scotland. A distinguishing feature of the Palaeolithic and Mesolithic archaeology of Scotland, in contrast to that of all later periods, is its low visibility. There are very few sites known by anything other than scatters of lithic artefacts. Palaeolithic and Mesolithic habitation evidence, apart from being relatively ephemeral in the first place, is far more vulnerable than that of any subsequent period due to the vicissitudes of time and chance; such factors as glaciation; permafrost; coastal erosion, changing sea level and consequent inundation; alluviation; peat growth, colluviation and talus formation have all contributed to its destruction or concealment. Nevertheless, evidence for a semi-permanent settlement dating to the Mesolithic period was recovered during advance works for construction of the Queensferry Crossing, comprising a small roundhouse with discreet working and food preparation areas.

Evidence for the Mesolithic period is represented exclusively by shell middens within the study area. Shell middens as the name suggests are refuse heaps of discarded shells that represent domestic waste and while predominantly comprised of shells in exceptional circumstances preservation can include bone (sometimes even disarticulated human bone) and organic material. There are 20 or so known shell middens in the wider locality mostly located on the southern shore of the Forth between Falkirk and Bo'ness. The size of these middens can be surprising with the example at Polmonthill (Asset 154) possibly 155m in length. However, there are problems with the middens relating to their origins and dates. Not all are Mesolithic in date, and indeed it has been argued that they are not much earlier than the Roman period (AD77 - AD211), however, those at Mumrills, Inveravon, Cadger's Brae and Braehead have returned dates from the 6th millennium BP², unfortunately while Mesolithic dates have been returned no artefacts dating to this period have been recovered from any of the Forth middens. Nevertheless, the possibility remains that well preserved artefacts dating to this period may yet be discovered within one or more of the middens.

² Before Present (BP) years is a time scale used mainly in archaeology, geology and other scientific disciplines to specify when events occurred in the past. Because the "present" time changes, standard practice is to use 1 January 1950 as the commencement date (epoch) of the age scale, reflecting the origin of practical radiocarbon dating in the 1950s. In a convention that is not always observed, many sources restrict the use of BP dates to those produced with radiocarbon dating.

13.4.3 Neolithic Period (4,100 – 2,500 BC)

The Neolithic period marks the change from a hunting and gathering subsistence model to one based largely on food production using domesticates and heralds the introduction of ceramic technology. It is usually represented in the Scottish archaeological record by the funerary and ritual monuments that characterise the period as it is during the Neolithic that standing stones (individual or rows of upright stones which may have had a ritual function or been used as territorial markers) and stone circles (upright stones arranged in a circle which are likely to be have been used as the focus for ritual activities) were erected and large communal funerary monuments were constructed.

Evidence for the Neolithic period in the study area is provided by a roundhouse located within New Grandsable Cemetery (Asset 150) recorded by the Falkirk SMR of which there are no further details. While not common, and there are examples of circular and sub-circular structures from Chapelfield in Stirling that date to the period, the form of domestic structures in the Neolithic was more usually rectilinear.

13.4.4 Bronze and Iron Age Periods (2,500 BC – AD 400)

While the Bronze Age introduced metallurgy as the defining technology, there was no concomitant major change in settlement or economy from the preceding Neolithic period, at least during the early Bronze Age, and neither is there archaeological evidence for political or social disruption at the time. Indeed, while funerary traditions evolved from communal to individual internments, (one of the defining characteristics of the Bronze Age), evidence for this change in rites begins during the late Neolithic period. Further evidence of continuity is provided by the ongoing erection of ritual monuments such as standing stones and stone circles. Settlement in this period is characterised by groups of hut circles (usually represented in the archaeological record as a circular depression sometimes accompanied by a low stone wall forming the foundations of a house) and field systems defined by stone field boundaries. Sub-surface remains of sites of this type have also been identified from aerial photographs.

For the Iron Age period (800 BC – AD 400) in Scotland the study of settlements dominates the archaeological record with artefact studies playing a minor role and it is the existence of copious, often complex settlement sites, that distinguishes the Iron Age from the preceding prehistoric periods. While the start of this period is given as 800 BC, it is recognised that the introduction of iron artefacts begins in the Late Bronze Age as is evidenced by their inclusion in hoards of metal work that were deposited at this time. Overall, while funerary and ritual sites remain elusive, the overwhelming evidence for the Iron Age in most of Scotland is that domestic settlement, both enclosed or open, was the principal forum for social interaction.

There is no definitive evidence for settlement during the Bronze and Iron Ages within the study area. However, this apparent bias is due to a lack of archaeological investigation rather than reflecting the realities of settlement during these periods, and there are several undated monuments that display the usual characteristics of the domestic settlement of these periods within the study area (Assets 3, 5, 135 and 137).

13.4.5 Roman Period (AD 77 – 211)

The Roman period in Scotland comprised a series of partial military occupations that cumulatively amounted to some 40 years. Evidence for this period is amply provided for in the study area with the presence of the Antonine Wall WHS (Asset 1) and associated monuments. Construction of the wall began c. AD 142 and the wall was garrisoned for around a generation before being abandoned c. AD 165, the frontier then being re-established on Hadrian's Wall. Debate continues as to the impact of the Roman period on the indigenous society but one effect that has been identified regards the supply of the garrison on the wall. Souterrains are a form of curving underground structure usually associated with a roundhouse that are believed to have served as a store for grain that was collected as a form of tax to feed the wall garrison; in the wider locality a good example survives at Castlecary (Canmore id: 45850).

There is growing evidence of a single souterrain abandonment horizon (when the souterrains were abandoned) in the late second or early third century AD. It is associated with evidence of a significant degree of ritual activity that has been taken as evidence of a change in the social and political structure of the indigenous people on the abandonment of the Antonine Wall and the withdrawal of the Roman military to Hadrian's Wall.

13.4.6 Medieval Period (AD 400 – 1500)

Reflecting the turbulent nature of politics and society in medieval Scotland, the most common and often best-preserved monuments from this period are defensive or religious in nature. Grangemouth, Inveravon Tower (Asset 13), a Category C Listed Building, comprises the dilapidated remains of a round tower formerly part of the Castle of Inveravon. Dating to the 15th century and formerly a possession of the Hamilton family, the castle was destroyed by James II following a siege in 1455. Throughout this period, the Church, including abbeys, were among some of the wealthiest landowners in Scotland. Along with the monasteries themselves, large farms or granges were required to support the monks. Abbots Grange (Asset 104) is presumed to be the location of the site of the principal building of the medieval grange of Holyrood Abbey; its extent was still observable at the time of the first Ordnance Survey and it is depicted on the 1st edition Ordnance Survey map as a ditched enclosure. It was during this period that the system of burghs, an incorporated town having its own charter and some degree of political independence, was introduced by King David I, stimulating the growth of towns and urban settlement in Scotland; the nearest burghs of this period to the study area are Linlithgow and Stirling. The growth and form of medieval town are well understood; conversely, the nature of medieval rural settlement in Scotland is still not well understood. While there were nucleated medieval village settlements in rural Scotland, smaller townships (or clachans) were more common, with families working the land in joint tenancies using the runrig system. Under this system, an area of land was divided into irregular strips, each of which was then allocated by lot to a tenant on a rotation system. The continual use and adaption of townships from this period until the Improvement Era, and the largely ephemeral nature of their construction, accounts for the lack of archaeological evidence for the vernacular architecture of this period.

13.4.7 Modern Period (1500 onwards)

The Cultural Heritage of the study area is dominated by assets dating to the modern period. During the modern period, Scotland underwent far reaching political and religious change. The Reformation Parliament of 1560 adopted the Scottish Confession of Faith, rejecting Papal authority and jurisdiction. The Union of the Crowns in 1603, and the subsequent disputes over legitimacy, religious reform and the preservation of the liberties of Scotland under an English Parliament, all dominated Scottish politics during the 17th century. With the 1707 Acts of Union the socio-political landscape of Scotland was altered once more. The Jacobite risings of the late 17th and early 18th centuries began with success at Killiecrankie and ended in failure at Culloden. The Carronshore Logboat (Asset 40) dates to this period and was discovered on the north bank of the River Carron in 2007. It was radiocarbon dated to c. 1730 and may be connected to the 1745/46 rising. There followed a brief period of the militarisation of Scotland in an attempt by the government to prevent further unrest.

Changes in landownership and a growing interest in agricultural improvement, coupled with the desire of major landowners to maximise the financial return from their land, saw a significant period of social and landscape change. Known as the Improvement Era, new forms of tenancy agreements encouraged tenants to take up these new ideas as more productive crop rotations in large, enclosed fields replaced the runrig system of cultivation which had supported a largely subsistence economy. With enclosure came further attempts at agricultural improvement of existing farmland and the exploitation of marginal land including the introduction of land drains and the burning of lime for use as a fertilizer; the sites of two limekilns are known within the study area (Assets 46 and 47). This period also saw new investment in farm buildings with the introduction of planned farms. These buildings remain a common building type within today's landscape, comprising large symmetrical farmhouses, groups of farm

buildings or steadings with specific functions, and combination courtyard farms which combine farmhouses and agricultural buildings. Frequently, these farmhouses and farmsteads were deliberately sited to be visible within the agricultural landscape and the principal elevation often faced onto established roads or routes; although converted into a restaurant a good example includes , Beanscross Farm (Asset 117). The 19th century also saw civilian investment in transport infrastructure which resulted in the improved movement of people and resources around the country. Networks of turnpike roads developed, enabling the movement of agricultural surpluses to urban centres. Structures such as bridges and culverts were constructed to carry the new turnpike roads, and tollhouses were erected at regular intervals. An extant example of a bridge of this time is Grangemouth Road, Avon Bridge (Asset 12) and the site of its associated tollhouse (Asset 156).

It was during this period that the industrialisation of the study area has its origins. Perhaps the most significant of the industrial sites in the study area was the Carron Iron Works (Asset 45). Founded in 1759 the ironworks were at the forefront of the industrial revolution and were one of the largest ironworks in Europe throughout the 19th century. The Carron Company went into liquidation in 1982. Various other assets are associated with the ironworks, including the Carron Iron Bridge (Asset 33) that linked the ironworks with the canal basin at Bainsford (Asset 88) by means of a wagonway; the Mungal Foundry (Asset 133) that was constructed as part of the modernisation of the iron works in the 1890s; the Carron Canal (Asset 34) which was a private canal built from the works to Carronshore; Fulderhaugh Boatyard (Asset 39) a dry dock constructed in the 1760s to service the vessels used by the Carron Company, Carronshore Village (Asset 41) that was the small hamlet of Quarrelshore that was greatly expanded by the Carron Company in the 1760s; and Carronshore (Coal Shore) Harbour (Asset 42) the site of a harbour built for the company. The Grangemouth Children's Day and fair (IH1) has been ongoing for over 100 years and is an integral part of the community life and sense of place in Grangemouth.

Today the economy of Grangemouth is primarily associated with the petrochemical industry, and the oil refinery located there is one of the largest of its kind in Europe, an echo back to the days of iron working.

13.4.8 Map Regression

It is noted in the Old Statistical Account for Falkirk which dates to 1777, that Grangemouth was built on the orders of Lord Dundas. By the time of the Account in 1797, Grangemouth was a considerable size and was active in the Baltic trade and the coastal trade with Scotland and England, and the Carron Shipping Company was trading with London.

The earliest depiction of the land within the study area is on Timothy Pont's maps of Scotland no.32 ca. 1583-1601, which depicts the town of Falkirk and Calendar Castle and Park and notes Abbots Grange, however the map is not comprehensive enough to be used to describe the study area in any detail. The Blaeu Atlas of Scotland 1654 is the first to depict the Antonine Wall where it is named the Valli Adriani, and while larger settlements such as Falkirk and Sterlin [sic] are noted, the map is not detailed. Clement Lempriere's military map of 1731 in some ways foreshadows the work of William Roy in that he depicts Roman antiquities including the Antonine Wall, this time named Grahams Dyke, and five of the western forts including Barrhill; also depicted is the Roman camp at Ardoch and the Roman road north from Carlisle. The line of the Antonine Wall is depicted terminating at Blackness Castle in the east and Old Kirkpatrick in the west.

William Roy's military survey of 1747-1755 is the first to depict the land within the study area in some detail and includes the farm of Mumrills; an enclosure at Weedings, Polmont Kirk and the then township of Inveravon, from which a stretch of the Antonine Wall is depicted heading east to the estate of Kinneil House. At this time the land within the study area is largely depicted as cultivated ground interspersed with farms and hamlets and a mill is depicted in the rough location of the site of Blackmill (Skaithmuir Nether Mill) (Asset 147).

By the time of the first edition Ordnance Survey map (1864), the land within the study area is a little more recognisable and industrialisation is well under way. The Carron Iron Works are depicted and so for the first time is Grangemouth, with the residential area bound to the north by the River Carron and to the south by Timber Basins now filled in, and the Wet Docks that are still extant and bisected by the Forth and Clyde Canal. By the time of the second edition Ordnance Survey (1899), Larbet Mill (Asset 129) is depicted and the expansion of Grangemouth to the south in the area of Carron flats is portrayed. The second edition is also the first depiction of Zetland Park (Asset 59), labelled "Public Park".

13.4.9 Future Baseline

The future baseline of the study area is likely to include erosion of land, and possible archaeological remains, by more frequent extreme flood events predicted with climate change. As a riverside town, Grangemouth has a long history of flooding and associated disruption and property damage. Such flooding events pose not only a danger to people and infrastructure but can also damage cultural heritage assets in the area.

More frequent and severe flooding pose a risk to the designated and non-designated assets, one that will increase through time with climate change making flooding events more common. Without intervention at this stage, cultural heritage assets may suffer irreparable flood damage to their fabric, having structural consequences.

13.5 Impact Assessment

13.5.1 Potential Impacts

Potential impacts on Cultural Heritage assets arising from construction of the Scheme can include:

- impacts on the Outstanding Universal Value (OUV) of the Antonine Wall;
- removal of archaeological remains;
- changes in groundwater conditions leading to dewatering of archaeological remains;
- demolition of historic buildings;
- changes to historic landscape as a result of construction of the Scheme;
- impacts to archaeological remains as a result of ground investigations or temporary works; or
- impacts on the setting of Cultural Heritage assets.

Potential impacts on Cultural Heritage assets arising from operation of the Scheme can include:

- impacts on the Outstanding Universal Value (OUV) of the Antonine Wall;
- impacts on the setting of Cultural Heritage assets, or
- changes to historic land use as a result of the presence and operation of the Scheme.

The impact assessment is separated into the construction and operation phases within each Flood Cell and then discussed by cultural heritage sub-topic.

13.5.2 Changes to Groundwater Levels

There are changes to groundwater levels and flows due to dewatering of excavations for bridge abutments and due to interception of artesian groundwater by sheet piles predicted within the Scheme. There are no significant reductions in the groundwater predicted (refer to Appendix B10.14 Impact Assessment Tables) with Neutral and Slight residual significance of effect identified. Therefore, there is no dewatering that would impact on designated cultural heritage assets that would lead to instability of historic buildings.

There are increased groundwater levels and flooding predicted as a result of the Scheme. There is no increased groundwater levels or flooding predicted on the Listed Buildings. Potential impacts to Scheduled Monuments are detailed below (see Figures 13.4-13.7).

13.5.3 Construction Phase

13.5.3.1 Flood Cell 1

13.5.3.1.1 Overview

There are potential impacts predicted on four historic buildings and seven historic landscape types as a result of the Scheme during the construction phase (see Table 13-6 below).

Table 13-6: Assets with Predicted Impacts during the Construction Phase of Flood Cell 1

Asset No	Asset Name	Sub-Topic	Designation	Impact Description	Magnitude of Impact	Significance of Impact
Asset 48	Carron Bridge	Built Heritage	Non-Designated	Construction of the flood wall, new footway, flood gates and stone clad wall with glass panels on existing infrastructure to the north and south of Asset 48 would have a non-physical impact on the asset. Together with the construction of the replacement New Carron Road Bridge to the east and bank protection to the east of Asset 48, the Scheme would introduce a new temporary source of noise and visual intrusion into the setting. (Appendix B Figure B13.1b)	Negligible	Neutral
Asset 127	Falkirk Tram Depot	Built Heritage	Non-Designated	Construction of the flood walls and flood gates, largely located on existing infrastructure, and the proposed bank protection will introduce a new temporary source of visual intrusion to the setting of the asset. Non-physical impact. (Appendix B Figure B13.1a)	Minor	Neutral
Asset 128	Stirling Road Bus Depot	Built Heritage	Non-Designated	Construction of the flood walls and flood gates, largely located on existing infrastructure, and the proposed bank protection will introduce a new temporary source of visual intrusion to the setting of the asset. Non-physical impact. (Appendix B Figure B13.1a)	Minor	Neutral
Asset 132	Lightwater Burn Bridge	Built Heritage	Non-Designated	Construction of the flood walls and flood gates, largely located on existing infrastructure, and the proposed bank protection will introduce a new temporary source of visual intrusion to the setting of the asset. Non-physical impact. (Appendix B Figure B13.1a)	Minor	Neutral

Asset No	Asset Name	Sub-Topic	Designation	Impact Description	Magnitude of Impact	Significance of Impact
HLT3	Late 20th Century - Present Industrial-Scale Farming Unit	Historic Landscape Types	Non-Designated	Construction of the flood walls (including a length with glass panels), earth embankment and bank protection will result in very minor physical changes to the asset with minor removal of some of the landscape. (Appendix B Figure B13.2a)	Negligible	Neutral
HLT4	19th Century - Present Recreation Area	Historic Landscape Types	Non-Designated	Construction of the proposed flood walls and bank protection will result in very minor physical changes to the asset with minor removal of some of the landscape (Appendix B Figure B13.2a-b)	Negligible	Neutral
HLT 7	19th Century - Present Urban Area	Historic Landscape Types	Non-Designated	Construction of the proposed wall with glass panels, earth embankment, flood walls and bank protection will result in very minor physical changes to the asset with minor removal of some of the landscape. (Appendix B Figure B13.2b)	Negligible	Neutral
HLT8	18th Century - Present Rectilinear Fields and Farms	Historic Landscape Types	Non-Designated	Construction of the proposed flood walls and bank protection will result in very minor physical changes to the asset with minor removal of some of the landscape (Appendix B Figure B13.2a-b)	Negligible	Neutral
HLT9	19th Century - Present Industrial or Commercial Area	Historic Landscape Types	Non-Designated	Construction of the proposed wall with glass panels, earth embankment, flood walls and bank protection will result in very minor physical changes to the asset with minor removal of some of the landscape(Appendix B Figure B13.1a-b)	Negligible	Neutral
HLT12	19th Century - Present Cultivated Former Parkland	Historic Landscape Types	Non-Designated	Construction of the proposed flood walls and bank protection will result in very minor physical changes to the asset with minor removal of some of the landscape (Appendix B Figure B13.2b)	Negligible	Neutral
HLT13	17th-20th Century Designed	Historic Landscape Types	Non-Designated	Construction of the proposed embankment will result in very minor physical changes to the asset with minor removal of some	Negligible	Neutral

Asset No	Asset Name	Sub-Topic	Designation	Impact Description	Magnitude of Impact	Significance of Impact
	Landscape			of the landscape. (Appendix B Figure B13.2b)		

13.5.3.1.2 Archaeological Remains

No impacts on archaeological remains are predicted during the construction of the Scheme. There are elevated noise levels along Stirling Road (see Chapter 8: Noise and Vibration Table 8-23) but the two Scheduled Monuments within Flood Cell 1, Lochlands Roman camps (Asset 4) and Camelon, Roman Forts (Asset 9), are distant from this and the increased noise will not be affected by the temporary increase in noise. There are no physical impacts on these Scheduled Monuments as a result of the Scheme and there are no impacts through changes to their settings as the Scheme construction works are at too great a distance from them and views of the works from these assets are limited by Falkirk Golf Course. They are also too distant from the works for visual intrusion to affect their significance. Their significance is due to their below ground remains and group value which will not be affected by the Scheme.

While construction of the Scheme has the potential to discover and disturb or to remove unknown archaeological remains, this risk is considered to be very low due to the siting of the proposed flood defences being predominantly on the line of existing infrastructure, and the largely urban nature of the flood cell where development will have removed or severely truncated any surviving archaeological remains.

13.5.3.1.3 Built Heritage or Historic Urban Landscapes

There are no impacts predicted on the designated built heritage in Flood Cell 1, which comprise Carron House (Asset 15), Dovecot, Carron House (Asset 11; also Scheduled Monument), Weir Carron Iron Works (Asset 18), Former Railway Bridge Across River Carron Iron Works (Asset 19) and the Grahamston Cast-Iron Gate (Asset 20), all of which are Category B Listed Buildings and Carron Company, Clock Tower Remnant of Former Office Block (Asset 16), which is a Category C Listed Building. Carron House (Asset 15) and its dovecote (Asset 11) are too distant from the Scheme and are screened in the house grounds to be impacted on by the Scheme. Weir Carron Iron Works (Asset 18) and Former Railway Bridge Across River Carron Iron Works (Asset 19) retain their riverine location and industrial nature and increased noise would not affect their significance. Clock Tower Remnant of Former Office Block (Asset 16) is too distant from the Scheme and Grahamston Cast-Iron Gate (Asset 20) is distant from the Scheme and has been relocated from its original location and therefore the Scheme will not impact on it.

Construction of the flood wall, new footway, flood gates and stone clad wall with glass panels on existing infrastructure to the north and south of the Carron Bridge, Carron (Asset 48) as well as the construction of a new bridge to the east and bank protection to the east would introduce a new temporary source of noise and visual intrusion into the setting of Carron Bridge, Carron (Asset 48) as a result of construction activities. The impact on the bridge's setting will be temporary and will not last beyond the construction programme, and this will not detract from the ability to understand the bridge, nor will it detract from the urban nature of its setting. Consequently, the impact on this negligible value Cultural Heritage asset has been assessed to be of negligible magnitude and **Neutral significance**. Considering the character of the construction methods, value of the asset and professional judgement, the significance of impact has been assessed to be **Neutral**.

Construction of the flood walls and flood gates, largely located on existing infrastructure, and the proposed bank protection will introduce a new temporary source of visual intrusion to the setting of the Falkirk Tram Depot (Asset 127), Stirling Road Bus Depot (Asset 128) and Lightwater Burn Bridge (Asset 132) as a result of construction activities in views to the north and east from the assets. However, the impact on their settings will be temporary and will not last beyond the construction programme and will

not detract from the ability to understand the historic buildings nor from the industrial nature of their setting. Therefore, the impact on these low value Cultural Heritage assets has been assessed to be of minor magnitude and **Neutral significance**. Considering the nature of the construction methods, significance of the assets and professional judgement, the significance of impact has been assessed to be **Neutral**.

13.5.3.1.4 Historic Landscape Types

Construction of the proposed embankment will result in very minor changes to 17th-20th Century Designed Landscape (HLT13) by introducing a construction element into the landscape. However, the works will be confined to the western end of the landscape next to residential areas and will not impact on the tranquillity of the main grounds of Carron House. This will not affect the legibility of the medium value HLT and therefore the magnitude of impact has been assessed to be negligible and of **Neutral significance**.

Construction of the proposed flood walls and bank protection will result in very minor changes to 19th Century-Present Recreation Area (HLT4), 18th Century-Present Rectilinear Fields and Farms (HLT8) and 19th Century-Present Cultivated Former Parkland (HLT12) due to the introduction of construction machinery and the minor removal of the landscapes. This will not affect the legibility of these widespread and common HLTs. Therefore, the impact on these low value Cultural Heritage assets has been assessed to be of negligible magnitude and **Neutral significance**.

Construction of the proposed wall with glass panels, earth embankment, flood walls and bank protection will also result in very minor removal of parts of Late 20th Century-Present Industrial-Scale Farming Unit (HLT3); 19th Century-Present Urban Area (HLT7) and 19th Century-Present Industrial or Commercial Area (HLT9). Again, this will not affect the legibility of these common and widespread HLTs. Consequently, the impact on these negligible value Cultural Heritage assets has been assessed to be of negligible magnitude and **Neutral significance**.

13.5.3.1.5 ICHA

No impacts on intangible heritage are predicted during the construction of the Scheme. There is no intangible heritage identified within Flood Cell 1.

13.5.3.2 Flood Cell 2

13.5.3.2.1 Overview

There are impacts predicted on three archaeological remains, one historic building and three historic landscape types as a result of the Scheme during the construction phase (see Table 13-7 below).

Table 13-7: Assets with Predicted Impacts during the Construction Phase of Flood Cell 2

Asset No	Asset Name	Sub-Topic	Designation	Impact Description	Magnitude of Impact	Significance of Impact
Asset 72	Grangemouth Public Institute (Town Clock)	Archaeological Remains	Non-Designated	Construction of the proposed site compound may remove any surviving remains. Physical impact.	Major	Slight

Asset No	Asset Name	Sub-Topic	Designation	Impact Description	Magnitude of Impact	Significance of Impact
				(Appendix B Figure B13.1c)		
Asset 86	Grangemouth United Presbyterian Church	Archaeological Remains	Non-Designated	Construction of the proposed site compound may remove any surviving remains. Physical impact. (Appendix B Figure B13.1c)	Major	Slight
Asset 87	Grangemouth Police Station	Archaeological Remains	Non-Designated	Construction of the proposed site compound may remove any surviving remains. Physical impact. (Appendix B Figure B13.1c)	Major	Slight
Asset 27	Grangemouth Dock, Former Workshop Building	Built Heritage	Category C Listed Building	Construction of the flood wall will introduce a new temporary source of noise and visual intrusion into the setting of Asset 27 because of construction activities in views to the north. Non-physical impact. (Appendix B Figure B13.1c)	Negligible	Neutral
HLT5	19th Century-Present Maritime Installation	Historic Landscape Types	Non-Designated	Construction of the earth embankment, ramps, flood gates and bare sheet pile wall will result in very minor	Negligible	Neutral

Asset No	Asset Name	Sub-Topic	Designation	Impact Description	Magnitude of Impact	Significance of Impact
				physical changes to the asset with minor removal of some of the landscape. (Appendix B Figure B13.2c)		
HLT7	19th Century-Present Urban Area	Historic Landscape Types	Non-Designated	Construction of the earth embankment, ramps, flood gates and bare sheet pile wall will result in very minor physical changes to the asset with minor removal of some of the landscape. (Appendix B Figure B13.2c)	Negligible	Neutral
HLT9	19th Century-Present Industrial or Commercial Area	Historic Landscape Types	Non-Designated	Construction of the proposed earth embankment, ramps, flood gates and bare sheet pile wall will result in very minor physical changes to the asset with minor removal of some of the landscape. (Appendix B Figure B13.2c)	Negligible	Neutral

13.5.3.2.2 Archaeological Remains

There are no designated archaeological remains in Flood Cell 2.

Construction of the proposed site compound may potentially remove any surviving archaeological remains associated with Grangemouth Public Institute (Town Clock) (Asset 72), Grangemouth United Presbyterian Church (Asset 86) and Grangemouth Police Station (Asset 87) because of construction

activities. The impact on these negligible value archaeological remains has been assessed to be of major magnitude and of **Slight significance**.

While construction of the Scheme has the potential to remove unknown archaeological remains this risk is considered to be very low due to the siting of the proposed defences mostly on the line of existing infrastructure and the industrial nature of the site. Previous development within this area may already have removed or truncated any surviving archaeological remains.

13.5.3.2.3 Built Heritage or Historic Urban Landscapes

There is one designated built heritage asset in Flood Cell 2. Construction of the proposed flood wall will introduce a new temporary source of noise and visual intrusion into the setting of Grangemouth Dock, Former Workshop Building (Asset 27), a Category C Listed Building, because of construction activities in views to the north. However, this will not detract from its significance as one of the last surviving buildings from the 19th century dock. Although the new flood wall would add in a new wall infrastructure between the workshop and the River Carron, the relationship between the workshop and the river will still be maintained and the relationship between the workshop and the docks will be unchanged. The impact on the low value historic building has been assessed to be of negligible magnitude and **Neutral significance**.

13.5.3.2.4 Historic Landscape Types

Construction of the proposed earth embankment, ramps, flood gates and bare sheet pile wall will also result in very minor removal of parts of 19th Century-Present Maritime Installation (HLT5), 19th Century-Present Urban Area (HLT7) and 19th Century-Present Industrial or Commercial Area (HLT9). Again, this will not affect the legibility of these common and widespread HLTs. Therefore, the impact on these negligible value Cultural Heritage assets has been assessed to be of negligible magnitude and **Neutral significance**.

13.5.3.2.5 Intangible Heritage

No impacts on intangible heritage are predicted during the construction of the Scheme.

13.5.3.3 Flood Cell 3

13.5.3.3.1 Overview

There are impacts predicted on one archaeological remains and two historic landscape types as a result of the Scheme during the construction phase (see Table 13-8 below).

Table 13-8: Assets with Predicted Impacts during the Construction Phase of Flood Cell 3

Asset No	Asset Name	Sub-Topic	Designation	Impact Description	Magnitude of Impact	Significance of Impact
Asset 64	Carron Lighthouse	Archaeological Remains	Non-Designated	Construction of the bare sheet pile wall and type 2 coastal revetment will introduce a new temporary source of noise and visual intrusion into the	Negligible	Neutral

Asset No	Asset Name	Sub-Topic	Designation	Impact Description	Magnitude of Impact	Significance of Impact
				setting of Asset 64. Non-physical impact. (Appendix B Figure B13.1d)		
HLT5	19th Century-Present Maritime Installation	Historic Landscape Types	Non-Designated	Construction of the bare sheet pile wall and coastal revetment will result in very minor physical changes to the asset with minor removal of some of the landscape. (Appendix B Figure B13.2c)	Negligible	Neutral
HLT9	19th Century-Present Industrial or Commercial Area	Historic Landscape Types	Non-Designated	Construction of the bare sheet pile wall and coastal revetment will result in very minor physical changes to the asset with minor removal of some of the landscape. (Appendix B Figure B13.1c-e)	Negligible	Neutral

13.5.3.3.2 Archaeological Remains

There are no designated archaeological remains in Flood Cell 3.

Construction of the proposed bare sheet pile wall and type 2 coastal revetment will introduce a new temporary source of noise and visual intrusion into the setting of Carron Lighthouse (Asset 64) because of construction activities in views to the south and east. The setting of the lighthouse on the coast gives a positive contribution to the lighthouse. This will not detract from the ability to understand the lighthouse remains, nor will it detract from the maritime industrial nature of the setting of this asset or its focus out to sea. Consequently, the impact on the negligible value former lighthouse has been assessed to be of negligible magnitude and **Neutral significance**.

While construction of the Scheme has the potential to remove unknown archaeological remains, this risk is considered to be very low due to the siting of the flood defences mostly on the line of existing infrastructure and the industrial nature of the area within the flood cell. Previous development within this area will have already removed or severely truncated any surviving archaeological remains.

13.5.3.3.3 Built Heritage or Historic Urban Landscapes

No impacts on historic buildings or historic urban landscapes are predicted during the construction of the Scheme. There is one designated built heritage asset in Flood Cell 3, Swing Bridge, Western Channel And Carron Dock, Grangemouth Docks (Asset 26), a Category B Listed Building. The Scheme is distant from the swing bridge and does not detract from the understanding of its function or its environs and therefore no impact on the bridge is predicted from the Scheme.

13.5.3.3.4 Historic Landscape Types

Construction of the proposed bare sheet pile wall and coastal revetment will also result in very minor removal of parts of 19th Century-Present Maritime Installation (HLT5) and 19th Century-Present Industrial or Commercial Area (HLT9). This will not affect the legibility of these common and widespread HLTs. The impact on these negligible value Cultural Heritage assets has been assessed to be of negligible magnitude and **Neutral significance**.

13.5.3.3.5 ICHA

No impacts on intangible heritage are predicted during the construction of the Scheme.

13.5.3.4 Flood Cell 4

13.5.3.4.1 Overview

There are impacts predicted on three archaeological remains, five historic buildings, four historic landscape types and one intangible cultural heritage asset as a result of the Scheme during the construction phase (see Table 13-9 below).

Table 13-9: Assets with Predicted Impacts during the Construction Phase of Flood Cell 4

Asset No	Asset Name	Sub-Topic	Designation	Impact Description	Magnitude of Impact	Significance of Impact
Asset 1	Antonine Wall WHS	Archaeological Remains	World Heritage Site	Construction of the flood wall on the western edge of Grandsable Road at Westquarter Burn, next to Asset 1 may potentially remove any surviving remains of the Antonine Wall WHS at this point. Physical impact. (Appendix B Figure B13.1e-f)	Negligible	Slight
Asset 6	Antonine Wall and Mumrills fort, Sandy Loan to A905, Falkirk	Archaeological Remains	Scheduled Monument	Construction of the flood wall on the western edge of Grandsable Road and groundworks for the proposed flood embankment south of the A9 at Westquarter Burn, next to Asset 6 may potentially remove any surviving remains of the Antonine Wall at this point. Physical impact. (Appendix B Figure B13.1f)	Minor	Moderate

Asset No	Asset Name	Sub-Topic	Designation	Impact Description	Magnitude of Impact	Significance of Impact
Asset 74	Bowhouse Mill	Archaeological Remains	Non-Designated	Construction of the proposed site compound may potentially remove any surviving archaeological remains associated with Asset 74. Physical impact. (Appendix B Figure B13.1f)	Moderate	Slight
Asset 21	Sacred Heart RC Church Dalratho Road and Drummond Place	Built Heritage	Category C Listed Building	Construction of the flood walls will introduce a new temporary source of noise and visual intrusion in the setting of Asset 21. Non-physical impact. (Appendix B Figure B13.1c)	Minor	Slight
Asset 24	Ronaldshay Crescent And Park Road Grange Church and Church Hall	Built Heritage	Category B Listed Building	Construction of the flood walls will introduce a new temporary source of noise and visual intrusion in the setting of Asset 24. Non-physical impact. (Appendix B Figure B13.1c)	Minor	Slight
Asset 29	Zetland Park War Memorial And Park Gates	Built Heritage	Category B Listed Building	Construction of the flood walls and a new bridge will introduce a new temporary source of noise and visual intrusion into the setting of Asset 29. Non-physical impact. (Appendix B Figure B13.1c)	Minor	Slight
Asset 59	Zetland Park	Built Heritage	Non-Designated	Construction of the flood walls, raised bridges and ramps, Dalratho Road Bridge modifications and Zetland Park Kiosk will introduce a new temporary source of noise and visual intrusion into the setting of Asset	Minor	Slight

Asset No	Asset Name	Sub-Topic	Designation	Impact Description	Magnitude of Impact	Significance of Impact
				59.Non-physical impact. (Appendix B Figure B13.1c)		
Asset 89	Madison Place (21 Abbots Rd)	Built Heritage	Non-Designated	Construction of the flood walls, raised bridges and ramps will introduce a new temporary source of noise and visual intrusion into the setting of Asset 89. Non-physical impact. (Appendix B Figure B13.1c)	Minor	Slight
HLT4	19 th Century-Present Recreation Area	Historic Landscape Types	Non-Designated	Construction of the flood walls, raised bridges and ramps, new bridge, Zetland Park Kiosk and site compound will result in very minor physical changes to the asset with minor removal of some of the landscape. Physical impact.. (Appendix B Figure B13.2c,e-f)	Negligible	Neutral
HLT5	19 th Century-Present Maritime Installation	Historic Landscape Types	Non-Designated	Construction of the flood walls, flood gates and ramps will result in very minor physical changes to the asset with minor removal of some of the landscape. Physical impact (Appendix B Figure B13.2c)	Negligible	Neutral
HLT7	19 th Century-Present Urban Area	Historic Landscape Types	Non-Designated	Construction of the flood walls, flood gates and ramps will result in very minor physical changes to the asset with minor removal of some of the landscape. Physical impact (Appendix B Figure B13.2c-f)	Negligible	Neutral
HLT9	19 th Century-Present Industrial	Historic Landscape Types	Non-Designated	Construction of the flood walls, flood gates and ramps will result in very minor physical	Negligible	Neutral

Asset No	Asset Name	Sub-Topic	Designation	Impact Description	Magnitude of Impact	Significance of Impact
	or Commercial Area			changes to the asset with minor removal of some of the landscape. Physical impact (Appendix B Figure B13.2c-f)		
IH1	Grangemouth Children's Day and fair (IH1)	Intangible Heritage	Non-Designated	Construction activities during the fair will result in visual and noise intrusion for this asset. Non-physical impact.	Minor	Slight

13.5.3.4.2 Archaeological Remains

Construction of the flood defence wall on the western edge of Grandsable Road at Westquarter Burn (Figure 13.3), next to the Antonine Wall and Mumrills fort, Sandy Loan to A905, Falkirk (Asset 6) may potentially remove any surviving remains of the Antonine Wall at this point which may lie within the footprint of the proposed flood wall (total loss could be up to a linear 35m² assuming any remains are present) and will introduce a new temporary form of noise and visual intrusion into the setting of the Antonine Wall WHS (Asset 1) because of construction activities. The flood defence wall is aligned next to the modern road and it is likely that buried remains here will be disturbed. While construction of the Scheme has the potential to remove previously unknown archaeological remains, this risk is considered to be low due to the siting of the flood defences mostly on the line of existing infrastructure and the largely urban/industrial nature of the area within the flood cell.

There are works proposed at the northern edge of the Scheduled Monument, south of the A9 (Figure 13.3). These works will involve closing the underpass under the A9 and regrading the footpath, which is partially located within the northern section of the Scheduled Monument. The ground excavation depths will be confirmed during the detailed design stage but are likely to be limited to topsoil stripping with an expected depth of less than 500mm. The ground from the low land in the SM up to the higher ground at the wall north of the SM will be also built up with earth to avoid a depression being created that would allow surface water to pond. The line of the Antonine Wall is partially located within this works area. Due to the expected shallow ground reduction, it is unlikely that remains of the Antonine Wall will be disturbed. The impact of the construction activities and movement within the site boundary for the works should be minimised, particularly within the Scheduled Monument boundary. Scheduled Monument Consent will be required for all works or movements of vehicles / plant within the Scheduled boundary.

The impact on the Antonine Wall and Mumrills fort, Sandy Loan to A905, Falkirk (Asset 6) has been assessed to be of minor magnitude and **Moderate significance**.

The OUV of the Antonine Wall WHS will not be impacted on as the flood defence walls will form part of the linear modern infrastructure along the roadside and the regrading works will not change the WHS or impact its OUV or any of the criteria under which it is nominated. Any remains removed by the construction works will not impact on the integrity of the WHS as only a very small percentage of the asset would be removed -, the original Antonine Wall was over 60km long, and the authenticity of the WHS will not be impacted. The impact on this very high value Cultural Heritage asset (Asset 1) has therefore been assessed to be of negligible magnitude and **Slight significance**.

There is no impact predicted on the second Scheduled Monument within Flood Cell 4, Bowhouse, circular enclosure, Polmont (Asset 5), as although there are flood defences designed around the edge

of Rannoch Park, the location and setting of the monument doesn't contribute to its significance as its significance lies in below ground remains. There is no increase of groundwater levels, increased flooding or dewatering of the site predicted as a result of the Scheme.

Construction of the proposed site compound may potentially remove any surviving archaeological remains associated with Bowhouse Mill (Asset 74) as a result of construction activities. The impact on the negligible value Cultural Heritage asset has been assessed to be of moderate magnitude and **Slight significance**.

13.5.3.4.3 Built Heritage or Historic Urban Landscapes

Construction of the flood walls will introduce a new temporary source of noise and visual intrusion in the setting of Ronaldshay Crescent and Park Road Grange Church and Church Hall (Asset 24), a Category B Listed Building and Sacred Heart RC Church Dalratho Road and Drummond Place (Asset 21), a Category C Listed Building, because of construction activities in views to the west. The impact on their settings will be temporary and will not last beyond the construction programme and so the impact on both the medium and low value Cultural Heritage asset has been assessed to be of minor magnitude and **Slight significance**.

Construction of the flood walls and modifications to Dalratho Road Bridge will also introduce a new temporary source of noise and visual intrusion into the setting of Zetland Park War Memorial and Park Gates, Grangemouth (Asset 29), a Category B Listed Building and in views to the west and north because of construction activities. Again, the impact on their settings will be temporary and will not last beyond the construction programme, nor will it detract from the urban nature of the setting of the historic buildings, consequently, the impact on both the medium and low value Cultural Heritage asset has been assessed to be of minor magnitude and **Slight significance**.

Construction of the flood walls, raised bridges and ramps, modifications to Dalratho Road Bridge and Zetland Park Kiosk will introduce a new temporary source of noise and visual intrusion into the setting of Zetland Park (Asset 59) because of construction activities. The impact on its setting will be temporary and will not last beyond the construction programme and, nor will it detract from the urban setting of the park. Therefore, the impact on this low value Cultural Heritage asset has been assessed to be of minor magnitude and **Slight significance**.

Construction of the flood walls, raised bridges and ramps will introduce a new temporary source of noise and visual intrusion into the setting of Madison Place (21 Abbots Rd) (Asset 89) because of construction activities in its principal view to the east towards Zetland Park. The impact on its setting will be temporary and will not last beyond the construction programme and, therefore the impact on this low value Cultural Heritage asset has been assessed to be of minor magnitude and **Slight significance**.

13.5.3.4.4 Historic Landscape Types

Construction of the flood walls, raised bridges and ramps, modifications to Dalratho Road Bridge, Zetland Park Kiosk and site compound will result in very minor changes to 19th Century-Present Recreation Area (HLT4), this will not affect the legibility of this common and widespread HLT, so the impact on this low value Cultural Heritage asset has been assessed to be of negligible magnitude and **Neutral significance**.

Construction of the flood walls, flood gates and ramps will also result in very minor changes to 19th Century-Present Maritime Installation (HLT5), 19th Century-Present Urban Area (HLT7) (HLT7 will also have a short section of bank protection) and 19th Century-Present Industrial or Commercial Area (HLT9). This will not affect the legibility of these common and widespread HLTs. The impact on these negligible value Cultural Heritage assets has been assessed to be of negligible magnitude and **Neutral significance**.

13.5.3.4.5 ICHA

The Grangemouth Children's Day and fair (IH1) is held on the third Saturday of June each year in Zetland Park, with the fairground open for the preceding week. The fair may be impacted on during the construction of the Scheme, as the construction activities could interfere with the community's enjoyment of the space and the fair due to visual intrusion and noise. However, the historical integrity of the fair will not be affected nor will the community affiliation with the event. The impact on this medium value Cultural Heritage asset has been assessed to be of minor magnitude and **Slight significance**.

13.5.3.5 Flood Cell 5

13.5.3.5.1 Overview

There are impacts predicted on three archaeological remains, one historic building and two historic landscape types as a result of the Scheme during the construction phase (see Table 13-10 below).

Table 13-10: Assets with Predicted Impacts during the Construction Phase of Flood Cell 5

Asset No	Asset Name	Sub-Topic	Designation	Impact Description	Magnitude of Impact	Significance of Impact
Asset 1	Antonine Wall WHS	Archaeological Remains	World Heritage Site	Construction of the flood defences will introduce a new temporary form of noise and visual intrusion into the setting of asset. Non-physical impact. (Appendix B Figure B13.1e-f)	Negligible	Slight
Asset 61	Jinkabout Mill	Archaeological Remains	Non-Designated	Construction of the wall and flood gate may result in the partial removal of any surviving archaeological remains associated with asset. Physical impact. (Appendix B Figure B13.1e-f)	Negligible	Neutral
Asset 156	Avon Bridge Toll House	Archaeological Remains	Non-Designated	Construction of the bare sheet pile wall may result in the partial removal of any surviving archaeological remains associated with asset. Physical impact. (Appendix B Figure B13.1e)	Negligible	Neutral
Asset 12	Grangemouth Road, Avon Bridge	Built Heritage	Category C Listed Building	Construction of the bare sheet pile walls, flood gates and bank protection will introduce a new source of noise and visual intrusion into the setting of the asset. Non-physical impact. (Appendix B Figure B13.1e)	Minor	Slight

Asset No	Asset Name	Sub-Topic	Designation	Impact Description	Magnitude of Impact	Significance of Impact
HLT8	18th Century-Present Rectilinear Fields and Farms	Historic Landscape Types	Non-Designated	Construction of the flood walls and flood gates will result in very minor physical changes to the asset with minor removal of some of the landscape. Physical impact (Appendix B Figure B13.2e)	Negligible	Neutral
HLT9	19th Century-Present Industrial or Commercial Area	Historic Landscape Types	Non-Designated	Construction of the bare sheet flood walls, ramps, flood gates, coastal revetment and bank protection will also result in very minor physical changes to the asset with minor removal of some of the landscape. Physical impact (Appendix B Figure B13.1e-f)	Negligible	Neutral

13.5.3.5.2 Archaeological Remains

Construction of the flood defences to the north of the River Avon will introduce a new temporary form of noise and visual intrusion into the setting of the Antonine Wall WHS (Asset 1) because of construction activities but will be temporary in nature. The impact on this very high value Cultural Heritage asset has been assessed to be of negligible magnitude and **Slight significance**.

Construction of the wall and flood gate may result in the partial removal of any surviving archaeological remains associated with Jinkabout Mill (Asset 61) as a result of construction activities. The magnitude of this potential impact on the negligible value Cultural Heritage asset has been assessed to be of negligible magnitude and **Neutral significance**.

Construction of the proposed bare sheet pile wall may result in the partial removal of any surviving archaeological remains associated with Avon Bridge Toll House (Asset 156) as a result of construction activities. The magnitude of this potential impact on the negligible value Cultural Heritage asset has been assessed to be of negligible magnitude and **Neutral significance**.

While construction of the Scheme has the potential to remove unknown archaeological remains, this risk is considered to be very low due to siting of the flood defences mostly on the line of existing infrastructure and the largely industrial/urban nature of the flood cell where development within it will have removed or severely truncated any surviving archaeological remains.

13.5.3.5.3 Built Heritage or Historic Urban Landscapes

Construction of the bare sheet pile walls, flood gates and bank protection will introduce a new source of noise and visual intrusion into the setting of Grangemouth Road, Avon Bridge (Asset 12), a Category C Listed Building. This is because of construction activities in views to the north and south and because of the risk of accidental damage to the bridge due to vibration impacts from construction of the bare sheet pile walls and bank protection. This impact on Asset 12 will be temporary and will not detract from the industrial nature of its setting. Therefore, the impact on this low value Cultural Heritage asset has been assessed to be of minor magnitude and **Slight significance**.

13.5.3.5.4 Historic Landscape Types

Construction of the flood walls and flood gates will result in very minor removal of parts of 18th Century-Present Rectilinear Fields and Farms (HLT8). This will not affect the legibility of this common and widespread HLT and therefore the impact on this low value Cultural Heritage asset has been assessed to be of negligible magnitude and **Neutral significance**.

Construction of the bare sheet flood walls, ramps, flood gates, coastal revetment and bank protection will result in very minor removal of parts of 19th Century-Present Industrial or Commercial Area (HLT9). Again, this will not affect the legibility of this common and widespread HLT so the impact on this negligible value Cultural Heritage asset has again been assessed to be of negligible magnitude and **Neutral significance**.

13.5.3.5.5 ICHA

No impacts on intangible heritage are predicted during the construction of the Scheme.

13.5.3.6 Flood Cell 6

13.5.3.6.1 Overview

There are impacts predicted on three historic landscape types as a result of the Scheme during the construction phase (see Table 13-11 below).

Table 13-11: Assets with Predicted Impacts during the Construction Phase of Flood Cell 6

Asset No	Asset Name	Sub-Topic	Designation	Impact Description	Magnitude of Impact	Significance of Impact
HLT1	Late 20 th Century-Present Landfill Site	Historic Landscape Types	Non-Designated	Construction of the bare sheet pile wall and bare sheet pile wall with earth embankment against it and ramp will result in very minor physical changes to the asset with minor removal of some of the landscape. Physical impact (Appendix B Figure B13.2d-e)	Negligible	Neutral
HLT8	18 th Century-Present Rectilinear Fields and Farms	Historic Landscape Types	Non-Designated	Construction of the bare sheet pile wall with earth embankment against it will result in very minor physical changes to the asset with minor removal of some of the landscape. Physical impact (Appendix B Figure B13.2e)	Negligible	Neutral
HLT9	19 th Century-Present Industrial or	Historic Landscape Types	Non-Designated	Construction of the bare sheet pile wall and bare sheet pile wall with earth embankment against it and ramp will result in very minor	Negligible	Neutral

Asset No	Asset Name	Sub-Topic	Designation	Impact Description	Magnitude of Impact	Significance of Impact
	Commercial Area			physical changes to the asset with minor removal of some of the landscape. Physical impact(Appendix B Figure B13.2d-e)		

13.5.3.6.2 Archaeological Remains

No impacts are predicted within Flood Cell 6 on archaeological remains as a result of the Scheme.

13.5.3.6.3 Built Heritage or Historic Urban Landscapes

No impacts are predicted within Flood Cell 6 on Built Heritage or Historic Urban Landscapes as a result of the Scheme.

13.5.3.6.4 Historic Landscape Types

Construction of the bare sheet pile wall with earth embankment against it will result in very minor removal of parts of 19th Century-Present Rectilinear Fields and Farms (HLT8). This will not affect the legibility of this common and widespread HLT and therefore the impact on this low value cultural heritage asset has been assessed to be of negligible magnitude and **Neutral significance**.

Construction of the bare sheet pile wall and bare sheet pile wall with earth embankment against it and ramp will also result in very minor removal of parts of 19th Century-Present Industrial or Commercial Area (HLT9) and on Late 20th Century-Present Landfill Site (HLT1). Again, this will not affect the legibility of these common and widespread HLTs and the impact on these negligible value Cultural Heritage assets has been assessed to be of negligible magnitude and **Neutral significance**.

13.5.3.6.5 ICHA

No impacts on intangible heritage are predicted during the construction of the Scheme.

13.5.4 Operational Phase

13.5.4.1 Flood Cell 1

13.5.4.1.1 Archaeological Remains

There are no impacts on archaeological remains predicted during the operation of the Scheme. There is no increase of groundwater levels, increased flooding or dewatering predicted at the Scheduled Monuments Lochlands Roman camps (Asset 4) and Camelon, Roman forts (Asset 9) as shown on Figures B10.11a and B10.11b, appendices to Chapter 10: Water Environment.

13.5.4.1.2 Built Heritage or Historic Urban Landscapes

There are no impacts on archaeological remains predicted during the operation of the Scheme. There is no increase of groundwater levels, increased flooding or dewatering predicted at the Listed Buildings and therefore there is no instability of the buildings predicted as a result of the Scheme.

13.5.4.1.3 Historic Landscape Types

There are no impacts on historic landscape types are predicted during the operation of the Scheme.

13.5.4.1.4 ICHA

No impacts on intangible heritage are predicted during the construction of the Scheme.

13.5.4.2 Flood Cell 2**13.5.4.2.1 Archaeological Remains**

No impacts on archaeological remains are predicted during the operation of the Scheme.

13.5.4.2.2 Built Heritage or Historic Urban Landscapes

No impacts on built heritage or historic urban landscapes are predicted during the operation of the Scheme.

13.5.4.2.3 Historic Landscape Types

No impacts on historic landscape types are predicted during the operation of the Scheme.

13.5.4.2.4 Intangible Heritage

No impacts on intangible heritage are predicted during the construction of the Scheme.

13.5.4.3 Flood Cell 3**13.5.4.3.1 Archaeological Remains**

No impacts on archaeological remains are predicted during the operation of the Scheme.

13.5.4.3.2 Built Heritage or Historic Urban Landscapes

No impacts on historic buildings or historic urban landscapes are predicted during the operation of the scheme.

13.5.4.3.3 Historic Landscape Types

No impacts on historic landscape types are predicted during the operation of the Scheme.

13.5.4.3.4 ICHA

No impacts on intangible heritage are predicted during the construction of the Scheme.

13.5.4.4 Flood Cell 4**13.5.4.4.1 Overview**

There are impacts predicted on two archaeological remains, three historic buildings, including one Category B and one Category C Listed Building, and one historic landscape type as a result of the Scheme during the operation phase (see Table 13-12 below).

Table 13-12: Assets with Predicted Impacts during the Operation Phase of Flood Cell 4

Asset No	Asset Name	Sub-Topic	Designation	Impact Description	Magnitude of Impact	Significance of Impact
Asset 1	Antonine Wall WHS	Archaeological Remains	World Heritage Site	The flood wall will introduce a new element of infrastructure into the setting of the asset. Non-physical impact. (Appendix B Figure B13.1e-f)	Negligible	Slight
Asset 29	Zetland Park War Memorial And Park Gates, Grangemouth	Built Heritage	Category B Listed Building	The flood walls and modifications to Dalratho Road Bridge will introduce a new element of infrastructure into the setting of this asset. Non-physical impact. (Appendix B Figure B13.1c)	Minor	Slight
Asset 6	Antonine Wall and Mumrills fort, Sandy Loan to A905, Falkirk	Archaeological Remains	Scheduled Monument	There will be new elements of infrastructure within the setting of the Scheduled Monument due to the introduction of the flood wall and there will be increased flood depths (in the scheduled area that already ponds) due to the underpass being blocked off, however no impact on this asset is predicted.	Negligible	Slight
Asset 59	Zetland Park	Built Heritage	Non-Designated	The proposed ramps, a modifications to Dalratho Road Bridge, earth embankment and the replacement Zetland Park Kiosk will introduce new elements of infrastructure in Zetland Park and impact on the setting of the park. Non-physical impact. (Appendix B Figure B13.1c)	Minor	Slight
Asset 89	Madison Place (21 Abbots Rd)	Built Heritage	Non-Designated	The flood walls, raised bridge and ramps will create new elements of infrastructure into the setting of this asset. Non-physical impact. (Appendix B Figure B13.1c)	Negligible	Neutral
HLT17	Grangemouth Area of Townscape Value	Historic Landscape Type	Non-significance	The flood wall, largely on the site of existing infrastructure, will introduce a new element of infrastructure that will result in very minor changes	Minor	Slight

Asset No	Asset Name	Sub-Topic	Designation	Impact Description	Magnitude of Impact	Significance of Impact
				to the character of the asset. Non-physical impact. (Appendix B Figure B13.1c-d, f)		

13.5.4.4.2 Archaeological Remains

As there are no surface remains of the Antonine Wall and Mumrills fort, Sandy Loan to A905, Falkirk Scheduled Monument (Asset 6) at this location, the regrading and the changes to the footpath which lies within the scheduled area and to the north of it, (refer to Appendix Figure B13.3) will not impact on the significance of this asset as the remains of the Scheduled Monument are below ground and the works would not affect the setting of the Scheduled Monument. Although there will be a new flood wall in place, it will be south of the A9 and will be along the line of the existing hedge next to the modern infrastructure of the A9 and will not introduce changes into the setting of the Scheduled Monument. Overall, an impact of negligible magnitude and **Slight significance** is predicted on the asset's significance.

The embankment/reggrading work is required to avoid flood water ponding at the low point (where the footpath crosses under the A9). The existing footpath will be removed, and a new crossing (at grade/road level) will be constructed across the A9. If the embankment was not to be constructed, flood water would pond at the low point. Currently, the only place for water to drain to is through the underpass which will be in filled. The embankment/reggraded slope has been designed to tie-in with an existing timber fence that bounds the field. The proposed embankment/reggrading work will require the existing stone revetment (which is also within the Scheduled Monument area) to be removed.

The flood wall will introduce a new element of infrastructure into the setting of the Antonine Wall WHS (Asset 1). The open setting of the Antonine Wall must be retained in order to retain its OUV, integrity and authenticity. A key aspect of the OUV of the Antonine Wall at Westquarter Burn is its unique placement on low-lying ground, rather than higher ground which is the dominant location of the Antonine Wall due to the military benefits of higher ground. The flood defence wall will be aligned next to the modern road (A9) and will not detract the focus from the WHS. The low-lying area directly south of the A9 which is already part of the floodplain and subject to periodic flooding and where water ponds during extreme events will periodically store water during flood events. However, this will be temporary in nature and, as the low-lying ground is liable to flooding, will not alter the understanding of the landscape or the OUV. The new flood wall will not have a perceptible cumulative impact on the WHS, as it is in keeping with current road infrastructure and furniture. The impact on the Antonine Wall WHS (Asset 1) has been assessed to be of negligible magnitude and **Slight significance**. The OUV of the WHS will not be impacted on as the flood defence walls will form part of the linear modern infrastructure along the roadside.

Baseline flood modelling indicates the Antonine Wall and Mumrills fort, Sandy Loan to A905, Falkirk Scheduled Monument (Asset 6) on the western (left) bank of Westquarter Burn currently experiences flood depths of up to 1.23 m from the River Avon during the 0.5% Annual Exceedance Probability (AEP) event, (refer to Figures 13.4a and 13.5a). This area will be used for flood storage, therefore the with-Scheme flood modelling for the 0.5% Annual Exceedance Probability (AEP) event shows an increase in these flood depths of approximately 2.42 m, resulting in a maximum flood depth of approximately 3.65 m (refer to Figure 13.6a). However, with-Scheme modelled flow velocities are low (typically <1m/s, with one isolated area at 1.5m/s). Therefore, no significant change in flow velocities or potential for erosion and scour of the floodplain are expected at this location. Given the area already floods to depths of up to 1.23m, no significant changes to waterlogging and therefore soil chemistry resulting from the

Scheme are anticipated from depth changes during these low frequency, high magnitude events. Decrease of water levels is not predicted as a result of the Scheme, (refer to Figure 13.7a) and therefore the Scheme will not result in dewatering of any waterlogged remains. Scheduled Monument Consent may be required for occasional flooding within the Scheduled area.

There are no increased groundwater levels, increased flooding or dewatering of the Scheduled Monument Bowhouse, circular enclosure, Polmont (Asset 5) identified as a result of the Scheme, as shown on Figures B10.11a and B10.11b, appendices to Chapter 10: Water Environment, and no impact is predicted on the asset.

13.5.4.4.3 Built Heritage or Historic Urban Landscapes

The flood defence walls and modifications to Dalratho Road Bridge, will introduce a new element of infrastructure into the setting of Zetland Park War Memorial And Park Gates, Grangemouth (Asset 29), a Category B Listed Building in views to the west. It will also reinforce existing elements of infrastructure in their settings in views to the west. This will not detract from the ability to understand the historic building, nor will it detract from the urban nature of the setting of the historic building, consequently, the impact on the medium value cultural heritage asset has been assessed to be of minor magnitude and **Slight significance**.

The proposed ramps, modifications to Dalratho Road Bridge, earth embankment and Zetland Park Kiosk will introduce new elements of infrastructure in Zetland Park (Asset 59). While the earth embankment and eastern flood wall will alter the topography of the park, they will not impact on the known archaeological remains of the park or detract from the understanding or urban setting of the park. Trees along the park's western boundary are likely to be removed, however these trees do not form part of the historical treelines of the park. There is one historical row of trees on the western park boundary depicted on the first edition Ordnance Survey map (1899) which is being retained. Therefore, the impact on this low value Cultural Heritage asset has been assessed to be of minor magnitude and **Slight significance**.

The flood defence walls, raised bridge and ramps will create new elements of infrastructure into the setting of Madison Place (21 Abbots Rd) (Asset 89) in views to the east. This will not detract from the ability to understand the historic building, nor from its urban setting, therefore the impact on the low value Cultural Heritage asset has been assessed to be of negligible magnitude and **Neutral significance**.

13.5.4.4.4 Historic Landscape Types

The flood wall, largely on the site of existing infrastructure, will introduce a new element of infrastructure that will result in minor changes to the Grangemouth Area of Townscape Value (HLT17). This change will not affect the legibility of the townscape, so the magnitude of impact on this medium value Cultural Heritage asset has been assessed to be minor and of **Slight significance**.

13.5.4.4.5 ICHA

13.5.4.5 No impacts on intangible heritage are predicted during the construction of the Scheme. Flood Cell 5

13.5.4.5.1 Overview

There is an impact predicted on one archaeological remains as a result of the Scheme during the operation phase (see Table 13-13 below).

Table 13-13: Assets with Predicted Impacts during the Operation Phase of Flood Cell 5

Asset No	Asset Name	Sub-Topic	Designation	Impact Description	Magnitude of Impact	Significance of Impact
Asset 1	Antonine Wall WHS	Archaeological Remains	World Heritage Site	The flood walls will introduce new elements of infrastructure into the setting of asset. (Appendix B Figure B13.1e-f)	Negligible	Slight

13.5.4.5.2 Archaeological Remains

The flood walls will introduce new elements of infrastructure into the setting of the Antonine Wall WHS (Asset 1). However, they will mirror the existing elements of infrastructure in the WHS buffer zone (Asset 2) and therefore the impact on this very high value Cultural Heritage asset has been assessed to be of negligible magnitude and **Slight significance**.

Baseline flood modelling (Figure B13.4b) indicates the Antonine Wall Millhall Burn to River Avon Scheduled Monument (Asset 7) on the southern (left) bank of the River Avon currently experiences flood depths of up to 1.70 m from the River Avon during the 0.5% Annual Exceedance Probability (AEP) event, (refer to Figure B13.5b). With-Scheme flood modelling for the 0.5% Annual Exceedance Probability (AEP) event shows an increase in these flood depths of approximately 0.80 m, resulting in a maximum flood depth of approximately 2.50 m, (refer to Figure 13.6b). Although the area of the Scheduled Monument which interacts with the River Avon floodplain is located on the outside of a meander bed, with-Scheme modelled flow velocities are very low (<0.11m/s). The adjacent riverbank is also heavily vegetated with mature trees and scrub; this would likely further reduce floodplain flow velocities. Therefore, no significant change in flow velocities or potential for erosion and scour of the floodplain are expected at this location.

Given the short duration that flood waters would be present in this area, no significant changes to waterlogging (refer to Figure 13.7b) and therefore soil chemistry resulting from the Scheme are anticipated from depth changes during these low frequency, high magnitude events.

Baseline flood modelling (refer to Figure B13.4b) indicates the Antonine Wall, Fort And Shell Middens Scheduled Monument (Asset 10) currently experiences flood depths of up to 1.30 m from the River Avon during the 0.5% Annual Exceedance Probability (AEP) event, (refer to Figure B13.5b). With-Scheme flood modelling for the 0.5% Annual Exceedance Probability (AEP) event shows an increase in these flood depths of approximately 0.80 m, resulting in a maximum flood depth of approximately 2.10 m, (refer to Figure 13.6b). Existing flow velocities in the floodplain at this location are not anticipated to be high as the field containing the Scheduled Monument is located on the inside of a meander bend, where flow velocities are typically lower. There is also no evidence of existing bank erosion along the adjacent river bank, which is heavily vegetated with mature trees and scrub; this would likely further reduce floodplain flow velocities. With-Scheme modelled flow velocities are low (<0.9m/s), therefore no significant change in flow velocities or potential for erosion and scour of the floodplain are expected at this location (refer to Chapter 10: Water Environment).

Given the depth to which the field and Scheduled Monument floods during the baseline, no significant changes to waterlogging (refer to Figure 13.7b) and therefore soil chemistry resulting from the Scheme are anticipated from depth changes during these low frequency, high magnitude events. Additionally, the field is actively managed through ploughing and crop planting, which is likely to have a greater influence on soil chemistry.

13.5.4.5.3 Built Heritage or Historic Urban Landscapes

No impacts on Built Heritage or Historic Urban Landscapes are predicted during the operation of the Scheme.

13.5.4.5.4 Historic Landscape Types

No impacts on historic landscape types are predicted during the operation of the Scheme.

13.5.4.5.5 ICHA

No impacts on intangible heritage are predicted during the operation of the Scheme.

13.5.4.6 Flood Cell 6

13.5.4.6.1 Archaeological Remains

No impacts are predicted within Flood Cell 6 on archaeological remains during the operation of the Scheme.

13.5.4.6.2 Built Heritage or Historic Urban Landscapes

No impacts are predicted within Flood Cell 6 on Built Heritage or Historic Urban during the operation of the Scheme.

13.5.4.6.3 Historic Landscape Types

No impacts on historic landscape types are predicted during the operation of the Scheme.

13.5.4.6.4 ICHA

No impacts on intangible heritage are predicted during the operation of the Scheme.

13.5.5 Cumulative Effects

No residual effects of significance are predicted on Cultural Heritage assets as a result of cumulative effects during the construction and operation of the Scheme. These include 'Same Project' (or intra-topic) cumulative effects, where e.g. historic assets may have in combination effects with landscape and visual impacts, and as discussed in Chapter 15: Cumulative Effects.

With regard to 'Other Project' cumulative effects, a study of foreseeable and committed projects and developments in the vicinity of the Scheme was carried out (refer to Chapter 15: Cumulative Effects for more detail). It has been concluded that there is unlikely to be any significant Other Project cumulative effects from a cultural heritage perspective. This has been determined taking into consideration the following factors relating to the other projects: the proposed size of the development, the physical separation and the distance of the development from the Scheme, a conclusion of no significant effects on cultural heritage if an assessment had been completed, or the lack of a heritage assessment, indicating significant potential impacts were not anticipated.

In some cases, recently completed developments, such as the new distillery in Flood Cell 4, have been considered as part of the baseline, in which case the potential combined effects have been assessed in Sections 13.5.1 and 13.15.2.

13.6 Mitigation

13.6.1 Introduction

An explanation of the terms 'primary', 'secondary' and 'tertiary' mitigation can be found in Chapter 3: EIA Methodology Section 3.7. Primary mitigation is intrinsic to the design (see Section 13.1 for details).

13.6.2 Construction Phase

13.6.2.1 Secondary Mitigation

Scheduled Monument Consent will be required for works within Antonine Wall and Mumrills fort, Sandy Loan to A905, Falkirk (Asset 6).

Consultation with Historic Environment Scotland will be required to confirm if Scheduled Monument Consent will be required for Scheduled Monuments Antonine Wall, Millhall Burn to River Avon (Asset 7) and Antonine Wall, fort and shell middens 240m WSW of The Tower, Inver (Asset 10). While the Scheduled Monuments will be subject to marginally increased flood levels during larger flood events as a result of the Scheme, the additional effect is considered to be negligible in terms of affecting the asset, there will not be erosion or scour due to the increased flooding.

Written Schemes of Investigation (WSIs) will be produced for the mitigation outlined below.

To offset impacts on the setting of the following Cultural Heritage assets, a photographic survey (Historic England 2016; ALGAO 2013) (Mitigation Item CH1) will be undertaken to record the assets in their current condition and setting prior to construction:

- Grangemouth Road, Avon Bridge (Asset 12)
- Sacred Heart Rc Church Dalratho Road and Drummond Place (Asset 21)
- Ronaldshay Crescent and Park Road Grange Church and Church Hall (Asset 24)
- Zetland Park War Memorial And Park Gates, Grangemouth (Asset 29)

To mitigate the construction impact on Zetland Park (Asset 59), a Level 2 archaeological earthwork record (Historic England, 2017) (Mitigation Item CH2) will be undertaken prior to construction. A Level 2 record provides a basic descriptive and interpretive record comprising a written account, a drawn record and a photographic record.

A watching brief (Mitigation Item CH3) will be undertaken during the groundwork excavations for the Scheme at the Westquarter Burn near the Antonine Wall WHS (Asset 1). A watching brief will also be maintained during groundwork excavations for the formed concrete wall and flood gate in the vicinity of Jinkabout Mill (Asset 61) and the bare sheet pile wall in the vicinity of Avon Bridge Toll House (Asset 156). A further watching brief will be maintained during any groundwork excavations in the vicinity of Grangemouth Public Institute (Town Clock) (Asset 72), Bowhouse Mill (Asset 74), Grangemouth United Presbyterian Church (Asset 86) and Grangemouth Police Station (Asset 87). These shall be in accordance with 'ClfA's Standard and guidance for archaeological monitoring and recording' (ClfA 2023).

To mitigate the potential impact on Grangemouth Road, Avon Bridge (Asset 12) vibration monitoring transducers will be installed around the bridge in locations advised by a vibration specialist and a base log of vibration information gathered. These transducers will also be used to monitor vibration and ensure works remain below an appropriate threshold to be determined by the appointed Contractor (Mitigation Item CH4).

To mitigate the potential impact on previously unknown archaeological remains associated with the construction of the Scheme, a watching brief will be undertaken on areas of archaeological potential within the Scheme, in order to identify and record archaeological remains (Mitigation Item CH5). This shall be in accordance with 'ClfA's Standard and guidance for archaeological monitoring and recording' (ClfA 2023). The areas requiring a watching brief will be agreed with HES and with Falkirk Council.

Ground works and construction traffic are to be avoided or minimised as much as possible within the Scheduled Monument boundary at Antonine Wall and Mumrills fort, Sandy Loan to A905, Falkirk (Asset 6). A Scheduled Monument Method Statement (CH6) will be produced by the contractor to accompany the Scheduled Monument Consent as the Scheme progresses through the detailed design and construction planning stages. The Scheduled Monument Method Statement is to be agreed with Historic Environment Scotland before any work commences within the Scheduled boundary.

In order to remove impacts on the Children's Day fair (IH1), the mitigation outlined in Chapter 6: Population and Human Health is to be followed. Mitigation Item PHH4 requires that all potentially disruptive works or plant movements are ceased at key locations during the one-week fair leading up to Children's Day celebrations at Zetland Park.

13.6.2.2 Tertiary Mitigation

The Council will consult with an appropriate archaeological subject matter expert should any archaeological or Cultural Heritage finds or sites be discovered or revealed during construction to enable appropriate measures to be implemented to mitigate potential impacts.

13.6.3 Operational Phase

No mitigation was identified for Cultural Heritage assets during the operation of the Scheme.

13.6.4 Cumulative Effects

No additional mitigation was identified for Cultural Heritage assets in relation to cumulative effects, as no significant cumulative effects were identified.

13.7 Residual Effects

13.7.1 Construction Phase

Residual effects of **Moderate significance** and above are considered to be significant. No significant residual effects are predicted on Cultural Heritage assets during the construction of the Scheme. Non-significant residual effects are presented in Table 13-14 below:

Table 13-14: Residual construction effects on Cultural Heritage assets

Asset	Designation	Value	Potential Impact		Mitigation Item	Residual Effect	
			Magnitude	Significance		Magnitude	Significance
Construction							
Archaeological Remains							
1: Antonine Wall Flood Cell 4	World Heritage Site	Very High	Negligible	Slight	None proposed	Negligible	Slight

Asset	Designation	Value	Potential Impact		Mitigation Item	Residual Effect	
			Magnitude	Significance		Magnitude	Significance
6: Antonine Wall and Mumrills fort, Sandy Loan to A905, Falkirk Flood Cell 4	Scheduled Monument	Very High	Minor	Moderate	CH3	Minor	Slight
61: Jinkabout Mill Flood Cell 5	None	Negligible	Negligible	Neutral	CH3	Negligible	Neutral
64: Carron Lighthouse Flood Cell 3	None	Negligible	Negligible	Neutral	None Proposed	Negligible	Neutral
156: Avon Bridge Toll House Flood Cell 5	None	Negligible	Negligible	Neutral	CH3	Negligible	Neutral
Historic Buildings							
12: Grangemouth Road, Avon Bridge Flood Cell 5	Category C Listed Building	Low	Minor	Slight	CH1 And CH5	Minor	Neutral
21: Sacred Heart Rc Church Dalratho Road and Drummond Place Flood Cell 4	Category C Listed Building	Low	Minor	Slight	CH1	Negligible	Neutral
24: Ronaldshay Crescent and Park Road Grange Church and Church Hall Flood Cell 4	Category B Listed Building	Medium	Minor	Slight	CH1	Negligible	Neutral
27: Grangemouth Dock, Former Workshop Building Flood Cell 2	Category C Listed Building	Low	Negligible	Neutral	None Proposed	Negligible	Neutral
29: Zetland Park War Memorial and Park Gates, Grangemouth Flood Cell 4	Category B Listed Building	Medium	Minor	Slight	CH1	Negligible	Neutral
48: Carron Bridge Flood Cell 1	None	Negligible	Negligible	Neutral	CH4	Negligible	Neutral

Asset	Designation	Value	Potential Impact		Mitigation Item	Residual Effect	
			Magnitude	Significance		Magnitude	Significance
59: Zetland Park Flood Cell 4	None	Low	Minor	Slight	CH2	Negligible	Neutral
72: Grangemouth Public Institute (Town Clock) Flood Cell 1	None	Negligible	Major	Slight	CH3	Negligible	Neutral
74: Bowhouse Mill Flood Cell 4	None	Negligible	Moderate	Slight	CH3	Negligible	Neutral
86: Grangemouth United Presbyterian Church Flood Cell 2	None	Negligible	Major	Slight	CH3	Negligible	Neutral
87: Grangemouth Police Station Flood Cell 2	None	Negligible	Major	Slight	CH3	Negligible	Neutral
89: Madison Place (21 Abbots Rd) Flood Cell 4	None	Low	Minor	Slight	None Proposed	Minor	Slight
127: Falkirk Tram Depot Flood Cell 1	None	Low	Minor	Neutral	None Proposed	Minor	Neutral
128: Stirling Road Bus Depot Flood Cell 1	None	Low	Minor	Neutral	None Proposed	Minor	Neutral
132: Lightwater Burn Bridge Flood Cell 1	None	Low	Minor	Neutral	CH4	Negligible	Neutral
Historic Landscape Types							
HLT1: Late 20 th Century-Present Industrial-Scale Farming Unit Flood Cell 1	None	Negligible	Negligible	Neutral	None Proposed	Negligible	Neutral
HLT3: Late 20 th Century-Present Industrial-Scale Farming Unit Flood Cell 1	None	Negligible	Negligible	Neutral	None Proposed	Negligible	Neutral
HLT4: 19 th Century-Present Recreation Area Flood Cell 1,4	None	Low	Negligible	Neutral	None Proposed	Negligible	Neutral

Asset	Designation	Value	Potential Impact		Mitigation Item	Residual Effect	
			Magnitude	Significance		Magnitude	Significance
HLT5: 19 th Century-Present Maritime Installation Flood Cell 2,3, 4	None	Negligible	Negligible	Neutral	None Proposed	Negligible	Neutral
HLT7: 19 th Century-Present Urban Area Flood Cell 1, 2, 4	None	Negligible	Negligible	Neutral	None Proposed	Negligible	Neutral
HLT8: 19 th Century-Present Rectilinear Fields and Farms Flood Cell 1, 5, 6	None	Low	Negligible	Neutral	None Proposed	Negligible	Neutral
HLT9: 19 th Century-Present Industrial or Commercial Area Flood Cell 1,2, 3, 4, 5, 6	None	Negligible	Negligible	Neutral	None Proposed	Negligible	Neutral
HLT10: 20 th Century-Present Plantation	None	Negligible	Negligible	Neutral	None Proposed	Negligible	Neutral
HLT12: 19 th Century-Present Cultivated Former Parkland Flood Cell 1	None	Low	Negligible	Neutral	None Proposed	Negligible	Neutral
HLT13: 17 th -20 th Century Designed Landscape Flood Cell 1	None	Negligible	Neutral	Slight	None Proposed	Negligible	Neutral
HLT17: Grangemouth Area of Townscape Value Flood Cell 4	None	Medium	Minor	Slight	None Proposed	Minor	Slight
Intangible Heritage							
IH1: Children's Day fair	None	Medium	Minor	Slight	PHH4	Negligible	Neutral

13.7.2 Operational Phase

Residual effects of **Moderate** and above are considered to be significant.

No significant residual effects are predicted on Cultural Heritage assets during the operation of the Scheme. Non-significant residual effects are presented in Table 13-15 below:

Table 13-15: Residual operation effects on Cultural Heritage assets

Asset	Designation	Value	Potential Impact		Mitigation Item	Residual Effect	
			Magnitude	Significance		Magnitude	Significance
Operation							
Archaeological Remains							
1: Antonine Wall WHS Flood Cell 4	World Heritage Site	Very High	Negligible	Slight	None Proposed	Negligible	Slight
Historic Buildings							
29: Zetland Park War Memorial and Park Gates, Grangemouth Flood Cell 4	Category B Listed Building	Medium	Minor	Slight	None Proposed	Negligible	Neutral
59: Zetland Park Flood Cell 4	None	Low	Minor	Slight	None Proposed	Minor	Slight
89: Madison Place (21 Abbots Rd) Flood Cell 4	None	Low	Negligible	Neutral	None Proposed	Negligible	Neutral
Historic Landscape Types							
HLT17: Grangemouth Area of Townscape Value Flood Cell 4	None	Medium	Minor	Slight	None Proposed	Minor	Slight

13.7.3 Interaction with other environmental disciplines

No additional residual effects in relation to 'Same Project' (or intra-topic) cumulative effects on any cultural heritage assets have been identified.

13.7.4 Cumulative Effects

It is not anticipated that the Scheme will result in any significant residual cumulative effects on Cultural Heritage assets in combination with other developments identified within the area. More details are provided in Chapter 15: Cumulative Effects.

13.8 Monitoring

Other than the recording and monitoring measures during the construction phase that are outlined in Section 13.6.2.1, no requirement for long-term monitoring is envisaged.

13.9 References

- ALGAO, Scotland 2019 Historic Building Recording Guidance for Curators, Consultants and Contractors
- Chartered Institute for Archaeologists 2023 Standard and guidance for archaeological monitoring and recording
- Falkirk Council (2020) Falkirk Local Development Plan 2 (FLDP2)
- Historic England 2016 Understanding Historic Buildings: a guide to good recording practice
- Historic England 2017 Understanding the Archaeology of Landscapes: a guide to good recording practice.
- Historic Environment Scotland 2016a *Historic Environment Circular*
- Historic Environment Scotland 2016b Managing Change in the Historic Environment: Setting.
- Historic Environment Scotland 2016c Managing Change in the Historic Environment: World Heritage.
- Historic Environment Scotland 2019a Historic Environment Policy for Scotland.
- Historic Environment Scotland 2019b *National Record of the Historic Environment* [online] Available at: <https://pastmap.org.uk/> (Accessed July 2019)
- Historic Environment Scotland 2019c '*Historic Landuse Assessment*' [online] Available at: <https://hlamap.org.uk/> (Accessed July 2019)
- Historic Environment Scotland 2019d Scheduled Monument Consents Policy.
- Historic Scotland. 2016. Frontiers of the Roman Empire (Antonine Wall) World Heritage Site Supplementary Planning Guidance
- Historic Scotland et al. 2014 *The Antonine Wall Management Plan 2014-19* [online] Available at: https://www.antoninewall.org/system/files/documents/494733_283836_Antonine_Wall_MP_WEB_2_0131125134011.pdf
- ICOMOS 2011 Guidance on Heritage Impact Assessments for Cultural World Heritage Properties
- Scottish Government 2011 Planning Advice Note 2/2011: Planning and Archaeology
- Scottish Government 2015 Scotland's National Marine Plan
- Scottish Government 2023 National Planning Framework 4 (NPF4)
- UNESCO et al. 2022 Guidance and Toolkit for Impact Assessments in a World Heritage Context
- World Heritage Centre 2021 Operational Guidelines for the Implementation of the World Heritage Convention