Environmental Impact Assessment Report

Chapter 3 Environmental Impact Assessment Methodology

Grangemouth Flood Protection Scheme 2024
Falkirk Council

GRANGEMOUTH
Flood Protection Scheme
Protecting the heart of our communities

Grangemouth Flood Protection Scheme

Environmental Impact Assessment Report

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Acronyms

CEMP	Construction Environmental Management Plan
CIEEM	Chartered Institute of Ecology and Environmental
EIA	Environmental Impact Assessment
HES	Historic Environment Scotland
IEMA	Institute of Environmental Management and Assessment
MW	Marine Works
NPF	National Planning Framework
RSPB	Royal Society for the Protection of Birds
SEPA	Scottish Environment Protection Agency

3. Environmental Impact Assessment Methodology

3.1 Introduction

This chapter outlines the general approach that has been undertaken for the Environmental Impact Assessment (EIA) of the Scheme. The EIA has been undertaken in accordance with the requirements of The Flood Risk Management (Flood Protection Schemes, Potentially Vulnerable Areas and Local Plan Districts) (Scotland) Amendment Regulations 2017 (FRM Regulations) and takes into consideration the Marine Works (Environmental Impact Assessment) (Scotland) Regulations 2017 (as amended) (MW Regulations) referred to in Chapter 1: Introduction and Chapter 2: Legislative and Regulatory Framework. Other relevant guidance that has been taken into consideration and detailed assessment methodologies are provided in the respective assessment chapters (refer to Chapters 6 – 14 for details).

The key elements undertaken as part of the EIA process are as follows:

- input into the options appraisal and design process for the Scheme;
- consideration of alternatives;
- consultation with statutory bodies for EIA, other third parties and stakeholders;
- information and data gathering to inform the EIA and study area;
- identification of environmental constraints and opportunities relevant to the Scheme and their value and/ or sensitivity;
- the identification and assessment of the likely significant adverse and beneficial environmental impacts and effects (direct and indirect) of the Scheme on the following environmental factors:
  - Population and Human Health (Chapter 6)
  - Biodiversity (Chapter 7)
  - Noise and Vibration (Chapter 8)
  - Landscape and Visual (Chapter 9)
  - Water Environment (Chapter 10)
  - Soils, Geology and Land Contamination (Chapter 11)
  - Air Quality and Climate (Chapter 12)
  - Cultural Heritage (Chapter 13)
  - Traffic and Transportation (Chapter 14)

  (the structure of the environmental topic chapters 6-14 is set out in Section 1.5 Document Structure of Chapter 1 : Introduction)
- an assessment of cumulative effects (refer to Chapter 15);
- the identification of mitigation measures to avoid, reduce or offset significant adverse impacts and effects, or in some cases to enhance beneficial impacts and effects;
- assessment of the residual adverse and beneficial environmental effects of the Scheme;
- provision of a Schedule of Environmental Commitments to enable mitigation measures to be carried through to the construction and operational phases of the Scheme;
- the identification of measures to monitor significant adverse effects; and

- the preparation of an EIA Report that presents and documents the findings of the EIA, including provision of a non-technical summary.

The approach for assessing environmental impacts and effects follows the general principles and methodology for undertaking EIAs that are set out in the Environmental Impact Assessment Handbook (Scottish Natural Heritage (SNH) and Historic Environment Scotland, 2018). Where applicable, assessments for the environmental factors followed EIA guidelines more specific to the relevant factors, e.g. Chartered Institute of Ecology and Environmental Management (CIEEM) Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine (CIEEM 2022) for the biodiversity assessment, and the Guidelines for Landscape and Visual Impact Assessment 3rd Edition [GLVIA3] (Landscape Institute and IEMA, 2013) for the landscape and visual impact assessment.

Following the assessment process for each of the environmental factors, an assessment of the cumulative impacts and effects was undertaken which covers impact interactions as a result of the Scheme's construction and operation, as well as those associated with other proposed and consented developments (Chapter 15: Cumulative Effects).

3.2 EIA Factors

Regulation 2A(3) of the FRM Regulations sets out the factors for which the direct and indirect effects of a proposed development must be considered as part of the EIA process. These factors have been extended to follow best practice guidelines for each of the environmental topics as shown in Table 3-1.

Table 3-1: Factors set out in the FRM Regulations and their incorporation into the EIA Report

Factors set out in FRM Regulations	Environmental Factors in the EIA Report
2A(3) The factors are:	
population and human health	Chapter 6: Population and Human Health Chapter 8: Noise and Vibration Chapter 14: Traffic and Transportation
biodiversity, and in particular species and habitats protected under Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora(a) and Directive 2009/147/EC of the European Parliament and of the Council on the conservation of wild birds(b)	Chapter 7: Biodiversity
land, soil, water, air and climate	Chapter 11: Soils, Geology and Land Contamination Chapter 10: Water Environment Chapter 12: Air Quality and Climate

Factors set out in FRM Regulations	Environmental Factors in the EIA Report
material assets, cultural heritage and the landscape	Chapter 6: Population and Human Health Chapter 9: Landscape and Visual Impact Assessment Chapter 11: Soils, Geology and Land Contamination Chapter 12: Air Quality & Climate Chapter 13: Cultural Heritage
2A(4) The effects to be identified, described and assessed under paragraph (2) include the expected *effects deriving from the vulnerability of the scheme to risks, so far as relevant to the scheme, of major accidents and disasters.]*	Chapter 6: Population and Human Health
6(2) The EIA report must include—	
(a) a description of the scheme comprising information on the site, design, size and other relevant features of the scheme	Chapter 4: The Scheme
(b) a description of the likely significant effects of the scheme on the environment	Chapters 6-14 (Assessment sections)
(c) a description of the features of the scheme and any measures envisaged in order to avoid, prevent or reduce and, if possible, offset likely significant adverse effects on the environment	Chapters 6-14 (Mitigation sections)
(d) a description of the reasonable alternatives studied by the local authority, which are relevant to the scheme and its specific characteristics, and an indication of the main reasons for the option chosen, taking into account the effects of the scheme on the environment	Chapter 4: The Scheme (Section 4.2: Scheme Evolution and Alternatives Appraisal Process)
(e) a non-technical summary of the information referred to in sub-paragraphs (a) to (d)	The separate Non-Technical Summary
(f) any additional information specified in schedule 2 relevant to the specific characteristics of the scheme or of the type of operations in the scheme in question and to the environmental features likely to be affected.	Introductory Chapters 1-5

The structure of the environmental topic chapters (Chapters 6-14) is set out in Section 1.5 of Chapter 1: Introduction.

3.3 EIA Screening and Scoping

3.3.1 Introduction

Screening and scoping assessments were undertaken as part of the EIA assessment as reported in this EIA Report, following relevant guidance and taking into account the requirements of the FRM Regulations.

EIA screening is the process which determines whether a project should be considered an EIA development, as outlined in Regulation 4 of the FRM Regulations. The Grangemouth area is regarded as a sensitive built and natural environment (including nature conservation and heritage designations of international and national importance). Furthermore, the Scheme is large in extent and elements of it are located in near proximity to many residents. Based on this context, it was considered at an early stage that the Scheme would have the potential to generate significant environmental effects and was regarded as an EIA Development under the FRM Regulations.

EIA scoping is the process of determining the scope of the assessment and outlines the methodology to be used for the EIA. An EIA Screening/ Scoping Report (Appendix C3.1: EIA Screening/ Scoping Report) was prepared and submitted to Falkirk Council in October 2018 for consideration by their Planning Department and by relevant consultative bodies and stakeholder organisations. The EIA Screening and Scoping Report was also provided to Marine Scotland (now Marine Directorate) under the MW Regulations.

The EIA Screening/ Scoping Report provided a description of the alternative and preferred Scheme options and outlined the environmental characteristics of the areas potentially affected by the Scheme. It also specified the proposed scope and methods of environmental studies to be carried out as part of the EIA.

The following statutory and non-statutory consultees were among those invited to comment on the EIA Screening/ Scoping Report (either directly, or through the Marine Scotland scoping consultation) and to provide additional relevant environmental information where available.

- Falkirk Council (Biodiversity, Contaminated Land, Heritage, Landscape Transport and Access Officers)
- Scottish Environment Protection Agency (SEPA)
- Scottish Natural Heritage (SNH; now NatureScot (NS))
- Scottish Water
- Historic Environment Scotland (HES)
- Health and Safety Executive
- Royal Society for the Protection of Birds (RSPB) Scotland
- Fife Council
- Forth Port Authority
- Maritime and Coastguard Agency
- Ministry of Defence
- Northern Lighthouse Board
- Royal Yachting Association Scotland

- Visit Scotland

Formal responses from those consulted are provided in Appendix C3.2: EIA Scoping Report Responses along with the Scoping Opinion received from Marine Scotland (now Marine Directorate).

3.3.2 Scoping outcomes

Table 3-2 below provides a summary of the scoping exercise undertaken for the project with the outline potential for significant effects, scoping conclusion and any consultee responses received in relation to recommendations to either scope in or out certain topics (see Appendix C3.2 for scoping responses). While none of the EIA topics appraised were scoped out of the EIA, it is noted that the Noise & Vibration, Air Quality & Climate and Traffic and Transportation chapters of the EIA Report are limited to appraising potential impacts on receptors during construction only, with the exception of an assessment of the impact on effects associated with active travel (foot/cycle paths) and climate.

Table 3-2: Summary of Scoping outcomes

Environmental Factor	Potentially significant construction impacts	Potentially significant operational impacts	Scoping outcome	Consultee comments in relation to scoping outcomes	Response to comments
Population and Human Health	Yes: Medium-term disruption and access to key facilities and green spaces.	Yes: Assumed to be overall positive impact against scenario without defences in place and major flood event (i.e. improved or avoided significant effects on health determinants).	Full Health Impact Assessment not required and vulnerability to major accidents or disasters subject to consultation. EIA chapter will focus on health and well-being impacts as well as effects on the economy.	No comments that amend scoping outcomes.	Acknowledged.

Environmental Factor	Potentially significant construction impacts	Potentially significant operational impacts	Scoping outcome	Consultee comments in relation to scoping outcomes	Response to comments
Biodiversity	Yes: Potential impacts on SPA, protected and important species.	Yes: Potential impact on footprint of SPA, protected and important species.	EIA chapter will include Ecological Impact Assessment (Biodiversity). Habitats Regulations Appraisal (HRA) subject to separate reporting but linked to EIA.	SNH advised that a detailed assessment of impacts on the Site of Special Scientific Interest (SSSI) should be included in the Environmental Statement (now EIA Report) and listed five other Natura sites whose qualifying interests may be impacted by the Scheme (to be considered in the HRA). RSPB comment that more ornithology survey data may be needed at pre-construction.	The comments were taken on board and the sites included in the assessments. A commitment to undertake pre-construction surveys as required was adopted.
Noise & Vibration	Yes: Potential impacts upon local receptors during construction period.	No	Brief EIA chapter on potential impacts and mitigation / monitoring.	No comments that amend scoping conclusion.	Acknowledged.

Environmental Factor	Potentially significant construction impacts	Potentially significant operational impacts	Scoping outcome	Consultee comments in relation to scoping outcomes	Response to comments
Landscape and Visual Amenity	Yes: Potential impacts (mitigation measure to reduce visual and landscape impacts in urban areas during construction phase to be explored).	Yes: Potential visual and landscape impacts.	EIA chapter will constitute a Townscape and Visual Impact Assessment.	SNH advised that an integrated and design-led approach should be taken towards the design of defences and requested that mitigation is clearly communicated in drawings and measures to enhance habitats are explored.	. The design team were assisted by a landscape architect. The EIA Report includes an outline Landscape and Environmental Habitat Management Plan, which details how habitats will be restored with improved biodiversity where possible.
Water Environment	Yes: Potential for impacts on hydrology, geomorphology and contamination of the water environment during construction works.	Yes: Potential for impacts on hydrology, geomorphology and contamination of the water environment resulting from the Scheme.	EIA chapter will assess hydrology, geomorphology and water environment impacts.	Scottish Water advised that they are unable to reserve capacity at their water and/or wastewater treatment works for the Scheme. SEPA made recommendations for corrections and updates to information presented and advised that consideration be given to mitigation and enhancement opportunities, e.g. channel widening or riparian habitat restoration.	The EIA Report includes an assessment of the effects of the Scheme on the water environment, taking account of the scoping responses. An internal, interdisciplinary, collaborative exercise to identify potential enhancements to the water environment, where feasible was undertaken.
Land-use, Geology and Contamination	Yes: Potential to release contaminants.	No: Slight risk of operational phase contamination but assumed risks will be addressed during	EIA chapter will focus on contamination risks during construction.	No comments that amend scoping conclusions.	During subsequent review and consultation with the Council Environmental Health Officer (EHO), it was

Environmental Factor	Potentially significant construction impacts	Potentially significant operational impacts	Scoping outcome	Consultee comments in relation to scoping outcomes	Response to comments
		detailed design and construction.			agreed that a desk-based assessment only was required for the EIA with a Ground Investigation Report (GIR) being subject to separate consultation once complete (2020-21).
Air Quality and Climate	No: However, recommendation for further consideration relating to dust impacts during construction and air contamination.	No: however appraisal of embedded carbon to be included in relation to climate change policy.	Chapter will assess construction impacts on air quality and the effects of the scheme on and its vulnerability to the effects of climate change will be appraised.	No comments that amend scoping conclusion.	Acknowledged.
Cultural Heritage	Yes: Potential to disturb archaeological assets.	Yes: Potential adverse impacts on the setting of Antonine Wall World Heritage Site (WHS), Scheduled Monuments and listed buildings.	EIA chapter will incorporate cultural heritage desk-based assessment (DBA).	HES: Advised that any potential impacts on the WHS are likely to be on its Outstanding Universal Value (OUV) rather than cultural heritage and recommended that guidance from HES' EIA Handbook is taken into account. Falkirk Council: Scheme's impact on Zetland Park and the Area of Townscape Value contest the report's assessment of a number of non-designated assets as being of low cultural value. Noted that Areas of Townscape Value are a non-statutory designation in the Local	Acknowledged. A separate consultation exercise with key stakeholders was undertaken over a two-year period with the final design in the vicinity of the WHS being amended substantially as a result.

Environmental Factor	Potentially significant construction impacts	Potentially significant operational impacts	Scoping outcome	Consultee comments in relation to scoping outcomes	Response to comments
				Development Plan (LDP) and LDP2 and therefore should be included in the consideration of impact.	
Traffic and Transportation	Yes: Potential impacts on the local traffic network resulting from temporary closures and transport/ construction vehicle movements.	No	Chapter will assess likely impacts on traffic and transportation during the construction phase.	Falkirk Council: A Transport Statement and Construction Traffic Management Plan will need to be produced for various phases of the works. The choice of sensitive receptors and the location of any temporary Automatic Traffic Count should be agreed with Falkirk Council's Planning and Environment Unit. NTRF Low Growth factors should be applied to all base flows for analysis purposes.	Consultation was ongoing with Council officers to finalise assessment method. The mitigation proposals include the need to prepare a Construction Traffic Management Plan (and Transport Statements as required), to be prepared by the contractor and in consultation with Falkirk Council.
Cumulative Effects	Yes: Potential for same- and other project effects of significance.	No: however will be considered in the assessment.	Chapter will assess same and other project cumulative effects using updated baseline.	Falkirk Council: Recommend update to baseline.	Acknowledged. The baseline was updated in August 2023.

All comments and information received from the consultees, where appropriate, have been used to inform the EIA process, including the scope and methods used to carry out the various environmental assessments required. Key comments that have influenced the development of the EIA and the outline design are set out in Chapter 5: Stakeholder Engagement.

3.4 Study Areas

The study areas for the Scheme can be defined as the geographical area over which the Scheme has a direct or indirect influence on the environment and the receptors/ resources therein. It is often difficult to establish a single discrete area of environmental influence for a project or development because the spatial extent of environmental impacts varies across the range of environmental factors. There can also be variability in the spatial extent of the area of influence within disciplines (e.g. static vs. mobile receptors, seasonal influences). Therefore, an area of environmental influence for the Scheme is not established as a single geographic region; rather several such areas are defined, as appropriate, for each environmental factor, within each assessment chapter (Chapters 6-14).

3.5 Establishment of Baseline Conditions

3.5.1 Baseline

The environmental baseline for each of the environmental factors assessed was first established at the scoping stage and has been updated with detailed field surveys, modelling exercises, desk studies, consultation feedback and literature reviews. The methods used to define the baseline conditions for each environmental factor area are described in each of the relevant EIA assessment chapters.

3.5.2 Future Baseline

The future baseline was considered in the context of the 'do nothing' scenario during the early stages of identifying the need for flood risk management options (refer to Section 4.2 in Chapter 4: The Scheme). Determining the future baseline was, however, limited by the length of Scheme's design life (100 years), making it difficult to determine how the environmental baseline might develop or change within that timeframe.

Where appropriate, the future baseline, in terms of observable trends, is also considered in the context of the impacts the Scheme may have on the environment in the assessment chapters (e.g. identifying current pressures on waterbodies leading to future changes in condition if not addressed).

3.6 Assessing Impacts and Significance of Effects

3.6.1 Introduction

The supporting guidance used to determine the significance criteria of specific impacts and effects varies between environmental factors and reference is made to specific chapter methodology sections (Chapters 6-14) for the guidance adopted. The Environmental Impact Assessment Handbook (SNH and Historic Environment Scotland, 2018) has also been referred to for further guidance.

3.6.2 Determining the Value or Sensitivity of Receptor or Resource

The general criteria used to evaluate the value or sensitivity of receptors or resources are presented in Table 3-3. Where appropriate, further justification for the assessment of the value or sensitivity of a receptor or environmental resource is provided within each of the relevant assessment chapters (Chapters 6-14) of this EIA Report.

Table 3-3: General criteria for determining the value or sensitivity of environmental receptors/resources

Criteria	Value / sensitivity
International importance	Very High
National importance	High
Regional/ county importance	Medium
District/ parish importance*	Low
No listed importance	Negligible
* The district/ parish importance value of low refers to the receptor's value on a national scale. Locally, the receptor may still be considered important.	

3.6.3 Determining the Magnitude of Environmental Impacts

For the purposes of the EIA, the magnitude of an environmental impact can generally range from negligible to very large and is usually considered as a function of its duration and scale. The criteria used for determining impact magnitude are discussed in the assessment chapters (Chapters 6-14) and, where there are uncertainties, a precautionary or worst-case prediction is assessed.

The environmental impacts of the construction and operation stages of the Scheme are included in the assessment. It is not expected that the Scheme will be demolished in the foreseeable future, as the proposed engineered measures are anticipated to be maintained for approximately 100 years, with future extensions or improvement being developed as required. The decommissioning phase of the Scheme is therefore not considered relevant for this EIA.

3.6.4 Assessing Significance of Effects

Assessing the significance of both adverse and positive environmental effects takes into account the magnitude of the impact and the value of the receptor, with the levels of significance generally identified as Negligible, Minor, Moderate, Moderate-Major or Major. However, the specific criteria applied when assessing the significance of effects for each of the different environmental factors included in this EIA Report are set out in the assessment chapters (Chapters 6-14).

In general terms, adverse effects of Moderate, Moderate-Major and Major significance are considered to be significant such that mitigation measures, where possible, are required to reduce the significance of such effects to Minor or Negligible. Impacts and effects are deemed to be adverse unless otherwise stated.

Where it is not possible to quantify environmental effects, a qualitative assessment has been carried out based on available knowledge and professional judgement. Where uncertainty exists, it is noted in the relevant assessment chapter (Chapters 6-14).

3.6.5 Cumulative Effects

The FRM Regulations require consideration of interactions between environmental factors, i.e. where effects identified in each technical chapter combine, or Scheme impacts that, when considered together with those from other developments, result in a cumulative significant effect.

Two types of cumulative effect have been assessed in this EIA Report:

- Same project: EIA factor specific effects that combine to produce further or exacerbated effects, e.g. restricted access and dust from construction may combine to exacerbate effects on specific receptors during the construction period.

- Other projects: impacts and effects from other projects combine with the Scheme effects to exacerbate individual effects or create new ones, e.g. future developments affecting traffic which, when considered together with traffic generated by the Scheme, produce cumulative effects.

The assessment of cumulative effects is mainly qualitative and relies on using professional judgement by the technical chapter authors (refer to Chapters 6-14 for details). The assessment also uses environmental reporting in relation to other developments that are considered to have potential cumulative effects on receptors identified in this EIA. A list of potential projects and land-use allocations that may result in potential cumulative effects in relation to the Scheme is provided in Chapter 15: Cumulative Effects, along with a summary of what was concluded for each environmental discipline for cumulative effects.

3.6.6 Limitations

Where relevant, each assessment chapter (Chapters 6-14) identifies any knowledge gaps, limitations or assumptions made in the establishment of baseline conditions and in the assessment of impacts and the significance of effects.

3.7 Mitigation

Mitigation refers to measures employed to avoid or reduce the significance of adverse effects on the environment. EIA guidance (SNH and Historic Environment Scotland, 2018) identifies four tiers of mitigation to address potentially significant effects on the environment as follows:

- Avoidance (e.g. move flood defences to avoid impacting upon a receptor).
- Cancellation (e.g. keep flood defences in place but add a feature that cancels the effect such as providing a ramp over the defence to address loss of access to a greenspace).
- Reduction (e.g. adopting suitable measures to reduce impacts on riparian habitats when working in the river channel).
- Remedial / Compensatory (or offsetting) (e.g. planting trees at another location to compensate for permanent tree loss along the flood defence alignment).

The potential effectiveness of mitigation measures and any associated monitoring commitments required to ensure their practical implementation are also addressed in each of the assessment chapters (Chapters 6-14).

The Institute of Environmental Management and Assessment (IEMA 2015) defines three key types of mitigation and how they relate to the development process as follows:

- Primary (embedded) mitigation is defined as an intrinsic part of the project design, i.e. mitigation that has been developed and adopted through design, which is included in the project description and relevant plans. An example may include the use of glass panels within a flood defence wall to reduce the impact on views.
- Secondary Mitigation is defined as those measures identified during the EIA/ design process which are proposed to avoid or reduce environmental effects that have been assessed as significant so that they become of lesser significance or not significant, where possible. Such measures may be imposed as part of (deemed) planning consent as conditions.
- Tertiary mitigation includes actions that are required to be undertaken to meet legislation or which are considered standard practice and used to manage commonly occurring environmental effects. Such mitigation may be included as recommendations to the contractor for inclusion in Construction Method Statements or a Construction Environment Management Plan (CEMP).

This EIA Report provides an outline of the primary (embedded) mitigation adopted within the design as a result of the early stages of the EIA process, consultation feedback and the design iteration process, (Chapter 4: The Scheme), while all secondary and tertiary mitigation is provided in the relevant assessment chapters (Chapters 6-14) and in the Schedule of Environmental Commitments (Chapter 16).

Consideration is also given to potential enhancement measures where opportunities arise to meet broader policy objectives for the local area, e.g. improving biodiversity while reinstating land temporarily affected by the Scheme. Opportunities to assist in the delivery of other local strategy objectives promoted by other parties (e.g. active travel network and Sustrans) and the requirement through National Planning Framework (NPF) 4 to achieve 'positive effects for biodiversity' (Scottish Government, 2023) are also considered, with commitments to the latter set out in Appendix 7.4 Approach to Positive Effects for Biodiversity.

3.8 Residual Effects

Residual effects are those that remain following the implementation of committed mitigation measures. These are set out in each assessment chapter (Chapters 6-14), while opportunities to improve or enhance the environment as part of the detailed design process are also proposed where appropriate. Where uncertain effects have been identified, or where there is uncertainty about the effectiveness of mitigation identified, this has also been discussed.

3.9 Monitoring

Where appropriate, in addition to the mitigation required to address significant effects associated with the Scheme's construction and operation, monitoring measures have been identified to enable, for example, the effectiveness of any proposed mitigation measure to be ascertained, or to monitor the environmental baseline for any unforeseen potentially significant changes.

3.10 References

Institute of Environmental Management and Assessment (IEMA) 2015 'Delivering Quality Development' [online] Available at: http://www.iema.net/assets/newbuild/documents/Delivering%20Quality%20Development.pdf (Accessed July 2017)

Landscape Institute and IEMA (2013). Guidelines for Landscape and Visual Impact Assessment 3rd Edition [GLVIA3]. Available at: https://www.landscapeinstitute.org/technical/glvia3-panel/ (Assessed February 2023)

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