Environmental Impact Assessment Report

Chapter 15 Cumulative Effects

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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15. Cumulative Effects

15.1 Introduction

This chapter considers the potential for cumulative effects occurring as a result of the Scheme construction and operation including those associated with other proposed developments within varying vicinity of the Scheme boundary. The assessment of cumulative effects on environmental receptors from multiple sources (e.g. noise, dust and visual effects) and incremental effects from (clusters of) developments in combination with those of the Scheme, are considered here and in the respective assessment chapters (Chapters 6-14), with the overall outcomes set out in this chapter.

15.2 Policy and legislative framework

Schedule 2 of The Flood Risk Management (Flood Protection Schemes, Potentially Vulnerable Areas and Local Plan Districts) (Scotland) Amendment Regulations 2017 sets out the information for inclusion in an EIA. Paragraph 5 requires "A description of the likely significant effects of the scheme on the environment resulting from, inter alia: (e) the cumulation of effects with other existing and/or approved projects taking into account any existing environmental problems relating to areas of particular environmental importance likely to be affected or the use of natural resources". The text goes on to state that "The description of the likely significant effects on the factors specified in regulation 2A(3) should cover the … cumulative … effects of the scheme." These regulatory requirements are respectively consistent with the assessment of 'same project' and 'other project' cumulative effects assessed in this chapter.

15.3 Methodology

15.3.1 Introduction

The assessment of cumulative effects draws from methodologies set out in Planning Inspectorate 'Advice Note Seventeen: Cumulative Effects Assessment Relevant to Nationally Significant Infrastructure Projects' (IPI 2019) and 'Guidelines for the Assessment of Indirect and Cumulative Impacts as well as Impact Interactions' (EC 1999).

In accordance, the type of cumulative effects assessed include impact interactions, cumulative, synergistic and incremental effects, with a focus on the following sources:

- Same project: the combined effect of a number of different environmental impacts from the Scheme on a single receptor/resource (synergistic or incremental effects), and
- Other projects: the combined effect of likely environmental impacts resulting from planned development projects in combination with those of the Scheme (additive or incremental effects).

15.3.2 Same project cumulative effects

The assessment of same project cumulative effects is carried out in each of the assessment chapters (Chapters 6-14), taking into consideration potential impacts identified for a given receptor / resource in the topic-specific assessments of this EIA Report. The assessment across the chapters is summarised in Section 15.4.1. The assessment is mainly focused on human or animal receptors subject to incremental and/or synergistic residual effects identified in Chapters 6 to 14. For example, Chapter 6: Population and Human Health considers interdisciplinary effects (i.e. from noise, dust, visual, access, recreation) on human receptors. In addition, a broader appraisal of any potential for residual effects of

Minor adverse significance combining (incremental effects) and resulting in effects of Moderate to Major adverse significance was conducted. Professional judgement was employed where discipline specific methodologies could not be used to determine the resultant significance of potential cumulative effects.

15.3.3 Other project cumulative effects

A desk-based study was undertaken to identify other foreseeable developments that may result in cumulative (incremental) effects in combination with the Scheme. For the purpose of this assessment, the term 'foreseeable developments' refers to committed (existing or approved) developments as well as developments that are yet to be determined, where some information may be known about their potential for environmental effects. Proposals that relate to minor works (e.g. minor improvement works, alterations or extensions) were generally excluded from further consideration, unless they overlapped with the Scheme boundary or were clustered in locations where they may have a potentially significant cumulative effect on local receptors.

All applications for "major" development (i.e. >1ha in size) were assessed across the Falkirk Council Local Authority area. The potential for cumulative effects with other projects located in other local authority areas was only considered where a link to potentially affected receptors was identified (e.g. the Firth of Forth and the various transboundary surface and groundwater bodies).

Once the full list of developments had been identified via consultation with Falkirk Council planning department and uploaded to Scheme GIS mapping software, professional judgement was used by the EIA team to determine any likelihood of significant cumulative effects occurring depending on the nature and character of the receptors / resource and the characteristics of any impact (including e.g. proximity to Scheme, nature and scale of development proposal and likely impacts, including any potential for synergistic or incremental changes). In addition, consideration was given to future potential development areas (sites allocated for economic, recreational and residential development) identified in the Falkirk Council Local Development Plan 2[1].

15.3.4 Assumptions and limitations

It is generally difficult to assess the probability, nature and significance of cumulative impacts given the complexity of impact interactions as well as uncertainties associated with the proposed Scheme being at an outline design stage. Detailed construction methodologies can only be known once a contractor is procured, and they submit methodologies. As such, broad assumptions have been made on likely construction methodologies based on the experience of Jacobs design team and civil engineers delivering similar projects across Scotland and the UK.

Limitations to the cumulative assessment include limited understanding on the potential impacts of other projects, their timings/durations and proposed construction methods. The assessment therefore mainly relies on professional judgement and qualitative assessment, limited by the information available at the time of writing.

The assessment is also limited to appraising known future developments, and any planning applications submitted prior to August 2023 (when the final data set on other projects was provided by Falkirk Council planning department). In addition, considering planning approvals require that construction commences three years from the date of consent, the applications considered cover the period between January 2020 and August 2023, and most are likely to be constructed where consent is granted, and they proceed as intended.

[1] Online at: https://www.falkirk.gov.uk/services/planning-building/planning-policy/local-development-plan/plan-two/docs/LDP2%20Proposed%20Plan%20September%202018.pdf?v=201906271131 (Accessed April 2020)

It is however understood that prior to construction of the Scheme, a review of the development environment in the vicinity of the Scheme boundary may be conducted in consultation with planning officers to determine where any further appraisal of potential cumulative impacts associated with coinciding construction may be required.

15.4 Cumulative effects assessment

15.4.1 Same project cumulative effects

15.4.1.1 Construction stage effects

An appraisal of potential synergistic cumulative effects was undertaken to determine where, if any, residual effects of minor significance from differing environmental disciplines may combine to adversely affect receptors during construction (Table 15-1). Each of the environmental discipline chapters (Chapters 6-14) considered the potential for cumulative effects resulting from multiple impacts on receptors, however, none concluded that any of the effects may be significant (see each chapter for detail; Chapter 6: Population and Human Health considers effects from multiple disciplines on human health).

Table 15-1 Matrix appraising potential synergistic cumulative effects during construction (green shading = no or negligible effect; yellow = effect of minor significance)

Construction	CH	T&T	AQ&C	SG&C	LVIA	WE	N&V	Bio	P&HH	Cumulative, synergistic appraisal
CH										Potentially affected receptors associated with cultural heritage include Listed Buildings. Potential cumulative synergistic effects may result when residual effects combine with adverse landscape and visual effects and surface water flooding, which may affect the setting of features and the amenity value to human receptors. Given the temporary nature of the effects and the proposed mitigation for each discipline (screening and surface water management), any overall effect is predicted to be of minor significance.
T&T										Potentially affected receptors associated with traffic and transportation include drivers and non-motorised users of roads and foot/cyclepaths. Potential cumulative synergistic effects may result when residual adverse effects combine (traffic and path disturbance combined with visual and noise disturbance and adverse effects on habitats (natural heritage). Given the temporary nature of the effects and the proposed mitigation for each discipline (i.e. diversions, screening), any overall additive effect is predicted to be of minor significance.
AQ&C										No potentially significant synergistic effects are predicted for air quality or climate.
SG&C										Potentially affected receptors associated with Soils, Geology and Contamination include land contamination as a result of disturbance, direct or indirect mobilisation and migration could additionally be affected by changes in groundwater or surface water levels, flows or flooding. Such effects are already considered in Chapter 11: Soils, Geology and Contamination and are predicted to be negligible to minor significance.
LVIA										Potentially affected Landscape and Visual receptors include landscape character and visual receptors potentially cumulatively affected by impacts on built heritage as well as impacts on biodiversity affecting natural heritage. Such effects are already considered in Chapter 9: Landscape and Visual Impact Assessment and are predicted to be negligible to minor significance.
WE										Potentially affected Water Environment receptors include waterbodies potentially cumulatively affected by impacts associated with construction traffic and land contamination. Such effects are already considered in Chapter 10: Water Environment and are predicted to be negligible to minor significance.

Construction	CH	T&T	AQ&C	SG&C	LVIA	WE	N&V	Bio	P&HH	Cumulative, synergistic appraisal
N&V										Potentially affected receptors associated with Noise and Vibration include local residents and buildings, with potentially synergistic effects associated with combined effects from disturbance and surface water inundation. Any such synergistic effects are considered in Population and Human Health and Cultural Heritage and are anticipated to be negligible to minor significance.
Bio										Potentially affected receptors associated with Biodiversity include terrestrial and aquatic species as well as habitats. Such effects are already considered in Chapter 7: Biodiversity and are predicted to be negligible to minor significance.
P&HH										Impacts on human receptors from multiple environmental sources are considered in detail in Chapter 6: Population and Human Health.

15.4.1.2 Operational stage impacts

An appraisal of potential synergistic cumulative effects was undertaken to determine where, if any, effects of minor significance may occur as a result of adverse effects from differing environmental disciplines combining to adversely affect receptors during operation (Table 15-2). Some synergistic effects during the first few years of Scheme operation may be anticipated for LVIA receptors associated with the combination of adverse effects on cultural heritage (setting of historic features) and natural heritage assets (temporary habitat loss and associated species such as birds). However, given the scale and duration of the effects, any additive effect is anticipated to be of minor significance.

Table 15-2 Matrix appraising potential synergistic cumulative effects during operation (green shading = no or negligible effect; yellow = effect of minor significance)

Operation	CH	T&T	AQ&C	SG&C	LVIA	WE	N&V	Bio	P&HH	Cumulative, synergistic appraisal
CH										The Scheme operation is not anticipated to have any long-term effects of significance on Cultural Heritage receptors, and Chapter 13: Cultural Heritage assesses townscape and visual effect in relation to the impacts on the setting of features. As such, no additional synergistic effects are anticipated.
T&T										The Scheme will not have any effects of significance on traffic and transportation and no cumulative effects from other disciplines are anticipated.
AQ&C										No cumulative synergistic effects are anticipated that may result in additive impacts on air quality or climate receptors.
SG&C										No cumulative synergistic effects are anticipated in relation to Soils, Geology and Contamination as all potential effects are assessed in the chapter.
LVIA										Cumulative synergistic effects may be anticipated in relation to Landscape and Visual receptors affected by significant townscape and visual effects in the first years of Scheme construction (while planted vegetation matures) combined with a reduction in natural heritage (temporary habitat loss and associated species such as birds). However, given the temporary nature of the effect, the additive effect is anticipated to be of minor significance on receptors during operation.
WE										No cumulative synergistic effects are anticipated that may result in additive impacts on the Water Environment.
N&V										No cumulative synergistic effects are anticipated that may result in additive impacts on Noise and Vibration receptors.
Bio										No cumulative synergistic effects are anticipated that may result in additive impacts on Biodiversity receptors (see Landscape and Visual impact above for effects on human receptors enjoying natural heritage).
P&HH										No cumulative synergistic effects are anticipated that may result in additive impacts on Population and Human Health receptors.

15.4.2 Other projects cumulative effects

A full list of the 'reasonably foreseeable' other developments and land-use allocations considered as part of the assessment is provided in Appendix Tables B15.1 and B15.2 and illustrated in Appendix Figures B15.1 and B15.2 in Appendix B15. This includes a number of planning applications whose construction periods may overlap with the Scheme's construction period (anticipated to be between 2026 and 2036), although the construction programme of the Scheme and for each development is uncertain.

A total of nine proposals partially overlap with the limit of land affected by the Scheme construction (see Table B15.1: P/20/0305/FUL, P/20/0344/FUL, P/21/0061/FUL, P/21/0241/CPL, P/21/0564/VRC, P/21/0629/FUL, P/21/0520/FUL, P/22/0069/ADV, P/22/0282/FUL), however, it is noted that of the relevant applications, only partial sections of the red line boundaries overlap, and none of the proposed construction work areas overlap with those of the Scheme.

The only potential issue may be associated with the timing of construction for the Scheme, but any adverse effects associated with access and noise and visual disturbance for construction vehicles is not predicted to be significant given the scale and duration of effects, and assuming appropriate site management is implemented as set out in Chapters 6 (Population and Human Health), 8 (Noise and Vibration), 9 (Landscape and Visual Impact Assessment) and 14 (Traffic and Transportation).

With regard to the major applications appraised that do not intersect with the limit of land affected, given the location of the developments and nature of the surrounding road network, it is considered unlikely that any of the development sites will be significantly affected by the Scheme footprint. As such, none the proposed major applications developments listed in Table B15.2 in Appendix B15 is predicted to result in significant adverse cumulative effects (see each assessment chapter (Chapters 6-14) for details).

15.5 Spatial planning

15.5.1 Introduction

This section assesses the potential for cumulative effects associated with the strategic planning initiatives in the Scheme area. All strategic planning instruments adopted prior to the adoption publication and adoption of the Falkirk Local Development Plan 2 (LDP2; 2020) are assumed to be considered appropriately within the national planning hierarchy and zoned appropriately within LDP2. Section 15.5.3 considers any strategic plans adopted since 2020.

15.5.2 Falkirk Local Development Plan 2

A cumulative effects assessment of the land allocations set out Falkirk Local Development Plan 2 is provided in Table 15-3 below.

Table 15-3 Table of Allocations Identified in LDP2 and Near Defences (FC,2020)

Flood Cell	Allocation Ref No / Description	Location	Potential Cumulative Effect?
2	BUS14 (089) – South Bridge Street Planning Allocation related to Employment Land (Business/Industry) Development which is approximately 2.9ha. Land remains undeveloped.	Parcel of land located on South Bridge Street, Grangemouth, approximately 0.12 km from the nearest proposed defence structures (Working Area 1-1)	Not Significant. With all the allocated sites, there is a low risk some of the future construction works coinciding, with some potential for additive effects on traffic and the local road network caused by construction traffic. It is, however, considered that with standard mitigation in place, these are unlikely to result in a significant cumulative effect. Given the location of the proposals in relation to the Scheme and the surrounding environment, no significant operational cumulative effects are anticipated.
2 & 3	BUS15 (090/190) – Grangemouth Docks West Planning Allocation related to Employment Land (Port related industry/Storage and distribution/logistics/energy) Development which is approximately 41.2ha.	Three clusters of allocated land located west of Grangemouth Docks, directly adjacent to the nearest proposed defence structures (Working Area 1-1)	
4	MU18 (074) – Grangemouth Town Centre Planning Allocation related to Mixed Use Development which is approximately 6.5ha. H45 – Avonhall Planning Allocation related to Residential Development which is approximately 0.8ha and consists of 11 residential units. Permission already granted and land developed.	MU18 is located 100m away from the nearest proposed defence structure. H45 is located 500m away from the nearest proposed defence structure.	
1 & 3	Core Business Sites Large extent of allocated land under provisions for policy JE02 Core Business Areas.	Grangemouth Docks, Grangemouth Refinery and other key industrial areas.	

15.5.3 Other strategic planning initiatives

Since 2020, the following initiatives for the Grangemouth area have been identified:

- Freeport (2023): Forth Green Freeport will act as a catalyst for "new green technologies, Forth Green alternative fuels and renewable energy manufacturing – accelerating the nation's just transition to net zero." The Scheme design team and Falkirk Council are in regular contact with Forth Ports, and it is assumed that any development that may arise from the initiative will consider the construction and operation of the Scheme, and no cumulative effects of significance are anticipated.
- Just Transition for the Grangemouth industrial cluster: discussion paper (SG 2023): The paper is a report on progress of the 'just transition to net zero' referenced above, and it sets out the need to establish carbon baseline for the site to identify key actions and effectiveness. No cumulative effects of significance are anticipated.
- Scotland 2045 - Fourth National Planning Framework (Scottish Government,2021): This policy statement identifies the role Grangemouth shall play in addressing lifecycle greenhouse gas

emissions stating that "Grangemouth Investment Zone will be a focus for transitioning the petro-chemicals industry and associated activities into a leading exemplar of industrial decarbonisation". Grangemouth will also form part of the 'Scottish Cluster', which "encompasses a Carbon Capture, Utilisation and Storage (CCUS) projects network". The note does acknowledge that "Grangemouth FPS will comprise 25km of flood defences (including walls and embankments)", so it is assumed that any proposals arising from the initiative will consider the construction and operation of the Scheme, and no cumulative effects of significance are anticipated.

15.5.4 Marine Licencing Applications

An assessment of potential cumulative effects associated with Marine Licencing applications within the Inner Firth of Forth is provided in Table 15-4 below. The appraisal is limited to assessing offshore applications with landfall applications available on the Marine Directorate database in October 2023. Considering the time and uncertainty around the time that will elapse between Scheme confirmation and construction, it is assumed that a further appraisal of marine license applications will be undertaken as part of the Marine Licensing process that will be initiated prior to construction.

Table 15-4 Table of Marine Licensing Applications within the Inner Firth of Forth

Link to application	Reference	Location	Potential Cumulative Effect?
https://marine.gov.scot/ml/marine-licence-water-injection-maintenance-dredging-grangemouth-and-leith-locks-00008842	00008842 Marine Licence - Water Injection Maintenance Dredging - Grangemouth and Leith Locks Submitted by Forth Ports Ltd for Dredging and decided on 16/12/2020	Located on Grangemouth Docks	The proposed works had a completion date of 9/08/2023. As such, given the timing of the works, no cumulative effects of significance are anticipated.
https://marine.gov.scot/ml/marine-licence-sediment-sampling-grangemouth-stirlingshire-0000896800009021	00009021 Marine Licence - Sediment Sampling - Grangemouth, Stirlingshire Submitted by Falkirk Council for Removal of any substance or object and decided on 16/11/2020	Located North of Grangemouth Oil Refinery	The proposed works had a completion date of 03/04/2021. As such, given the timing of the works, no cumulative effects of significance are anticipated.
https://marine.gov.scot/ml/marine-licence-berwick-bank-offshore-wind-farm-firth-forth-00010189 https://marine.gov.scot/ml/marine-licence-offshore-transmission-infrastructure-part-1-firth-forth-00010190 https://marine.gov.scot/ml/marine-licence-	Marine Licence - Berwick Bank Offshore Wind Farm - Firth of Forth – 00010189 Construction of Offshore Transmission Infrastructure (Part 1) – 00010190 Construction of Offshore Transmission Infrastructure (Part 2) - 00010191	Located in the outer Firth of Forth with some transmission infrastructure making landfall in the vicinity of Dunbar.	The EIA documentation for the main application concludes that there will be no likely significant or transboundary effects predicted for the development. The position on the HRA is ongoing, but additional information has been provided to support the conclusion of no adverse effects on site integrity, but also effectiveness of derogation

offshore-transmission-infrastructure-part-2-firth-forth-00010191			activities to compensate for unavoidable effects. Given the location and nature of the works, no cumulative effects of significance are anticipated in relation to the Scheme.
https://marine.gov.scot/node/24022	Marine Licence - Cambois Cable Connection - Berwick Bank Offshore Wind Farm - Firth of Forth - 00010501	The Proposed Works will be located within the proposed Berwick Bank Offshore Wind Farm array area located approximately 39.2km east of the East Lothian coastline in the outer Firth of Forth to a proposed landfall location located near Cambois, Northumberland, England.	The HRA Screening Report and Response indicate that the only likely significant effects on European Sites will be at the Northumbria Coast SPA and Ramsar, and the Northumberland Marine SPA. Given the location and nature of the works and the outcome of the EIA and HRA processes, of the works, no cumulative effects of significance are anticipated.
https://marine.gov.scot/node/24433	Inch Cape Offshore Windfarm (Revised Design) - Firth of Forth - Additional Landfall Works - Marine Licence Application - 00010546	Located in the outer Firth of Forth with some transmission infrastructure making landfall in the vicinity of the former Cockenzie Power Station at Prestonpans.	The application is for works that include sections of the existing sea defence wall at Cockenzie being temporarily removed and then reinstated on completion of the cable installation. The works were subject to an EIA Screening for the works which concludes no significant effects. The HRA update also concludes no Adverse Effects on Site Integrity. Given the scale and nature of the proposed works, no cumulative effects of significance are anticipated.

15.6 The Musselburgh Flood Protection Scheme

In addition to assessing the potential cumulative effect of projects identified through Marine License applications, the potential cumulative effect of the Musselburgh Flood Protection Scheme was considered in relation to potential effects on ecological receptors (birds) associated with the designated Inner and Outer Firth of Forth Special Protected Areas (SPA) as part of the Ecological Impact Assessment and Habitats Regulations Appraisal for the Scheme (see Chapter 7: Biodiversity for details). The assessment concluded that the Scheme is unlikely to have any cumulative effects of significance on the qualifying species of the designated sites.

15.7 Conclusions

While the Scheme is predicted to take some 10 years to construct, due to the phasing of works, disturbance on receptors at any single location will be temporary in nature. While some same project

cumulative effects may be expected, due to the nature, magnitude and duration of the effects, none are predicted to be significant.

Construction stage mitigation has been proposed in the corresponding chapters to reduce disturbance impacts where possible. It is anticipated that mitigation measures will be transferred into the construction contracts as environmental commitments and built into the Construction Environmental Management Plan (CEMP) along with a community liaison strategy, to ensure mitigation is implemented. In addition, any potentially affected parties will be engaged with prior to and during construction to ensure any impacts are managed appropriately and communicated accordingly.

With regard to other projects identified that may be constructed simultaneously within the vicinity of the Scheme, the additive effect of such development on environmental receptors, including the transport network, are unlikely to be significant. Pre-construction monitoring of the development and construction landscape around the Scheme construction areas will be undertaken to determine whether any further appraisal or mitigation may be required, particularly in relation to construction traffic management.

15.8 References

European Commission (1999) 'Guidelines for the Assessment of Indirect and Cumulative Impacts as well as Impact Interactions' [Online] Available at: https://tethys.pnnl.gov/sites/default/files/publications/European-Commission-1999.pdf (Accessed August 2023)

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Scottish Government (2021) 'Scotland 2045: fourth National Planning Framework - draft: lifecycle greenhouse gas emissions – research' [Online] Available at: https://www.gov.scot/publications/scotland-2045-scotlands-fourth-national-planning-framework-draft-research-project-lifecycle-greenhouse-gas-emissions-npf4-proposed-national-developments-assessment-findings/pages/3/ (Accessed August 2023)

Scottish Government (2023) 'Just Transition for the Grangemouth industrial cluster: discussion paper' [Online] Available at: https://www.gov.scot/publications/discussion-paper-transition-grangemouth-industrial-cluster/documents/ (Accessed February 2024)